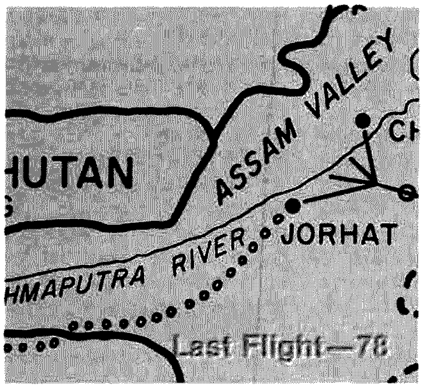
January 1981 $2.95

73 MAGAZINE
FOR RADIO AMATEURS

The Ups & Downs of VHF Contesting

73 MAGAZINE jan. 81



to doom any effort to failure. Bureaucrats exist by adhering to rules, and their greatest fear is making a decision or proposing some idea which is controversial and could thus reflect poorly on their record.

In this I found that the problems of dealing with China are quite different from dealing with most other countries for, despite the impressions we have been getting from our media, no one person is in charge in China. There are many factions, all jostling for more power, and the country is thus run by committee. This probably goes a long way towards explaining why they seem to be about a hundred years behind us.

Despite all these problems, I am going to start work on the situation and see what I can do to get some interest in the highest official circles. I'm available to fly over there and deal directly, should that be beneficial. Sure, I'd love to have a week or two of DXing from China, but I have too much going on these days for that, so perhaps we can work on longer range plans for getting amateur radio introduced. I know that a number of DXers will be glad to help out, should anything start to break loose. Lloyd Colvin (W6KG) and his wife Iris (W6QL) would be on a plane tomorrow if they thought it would help.

The trip to Asia was, again, fantastic and I'm sorry that more of you did not have the time to go along. Those who did had the time of their lives. I did write about it and invite all of you to make the trip. . . and it was certainly a bargain, with first class hotels everywhere, wonderful meals, and the excitement of a completely different world.

BOMBSHELL IN TAIWAN

In addition to my talk to the China Youth Association scheduled in the Grand Hotel, I was also called upon to speak briefly to several hundred members of the electronics industry on Taiwan at a business breakfast. I made all the papers with my short talk.

Without putting you through the complete text of the talk, I got their attention by saying flatly that Taiwan's electronics products, while impressive, were not by any means state of the art. I pointed out that Taiwan was in the position of having to import technology from Japan and the US and was depending entirely on being able to pro-

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Well. . . I Can Dream, Can't I? by Bandel Linn K4PP

"Congratulations! You have just won the top prize! You and Bo Derek will be flown to the Indian Ocean for an island romance and ham funfest!"

LOOKING WEST

Bill Pasternak WA6ITF
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FIGHT BACK

Have you ever heard of David Horowitz? No, David is not an amateur radio operator. David Horowitz is the host of a weekly syndicated NBC television program called *Fight Back*. David is the author of a new book of the same name, and, in my opinion, it's the best book on consumer awareness I have ever set my eyes on. Basically, it tells you how to avoid getting ripped off and what to do if you are. I won't try to review the book here, but it's more than just another consumer awareness volume. I *will* tell you the same thing I told David a few weeks ago when I happened to run into him at the NBC studios in Burbank: "That's one heck of a book!" If you ever have been ripped off or if you want to be sure it never happens to you, then read *Fight Back*.

CALIFORNIA VS. THE PAY-TV PIRATES

On October 1st, 1980, California Governor Jerry Brown signed a law into the state statute books which this author feels is one of the most irresponsible pieces of state legislation ever enacted. In fact, by the time you read this, the law may be a thing of the past, this because many people have vowed to fight it on various grounds. The law I speak of is called Section 593e of the California State Penal Code. It makes it a crime for any person "who for profit manufactures, distributes, or sells any device, plan, or part for the knowing purpose of facilitating an unauthorized interception or decoding of subscription television signals." Additionally, it provides for a jail term of up to 90 days and/or a fine of up to $2500 per count on any conviction. Not a bad law, you say? I quite agree. But not a law for California or any other state to enact.

Here, again, we see the classic example of a state trying to usurp the jurisdiction of the federal government. Unless the Communications Act has been rewritten without anyone noticing, the role of the FCC in such matters has been clearly defined for years. It is not the prerogative of California or any other state to try to usurp that which is governed by federal jurisdiction. But neither our Governor nor State Assemblyman Mel Levine, who sponsored the bill, seems to have bothered to read the Communications Act or any subsequent FCC interpretation. They never bothered to consult the findings in the Cerritos tower case in which the government stated specifically that it had jurisdiction over radio communication, and, in effect, told California to keep its nose out of the FCC's business. No, our state legislators failed to do their homework. If they had, they would not have permitted themselves to get caught in what may well become a "Catch 22" situation.

No, I am not on the side of the pay-TV pirates. I want this clear from the start. I understand the intricacies of pay-TV, the most important of which being that for subscription television programming to survive, the companies that provide such services must be assured that they will make a profit. If this assurance is destroyed because of widespread piracy of such services, then subscription television will fail, and eventually there will be nothing left to pirate. However, I do not think that the solutions now being addressed are the proper ones. Laws are only as good as the enforcement that goes with them. In the case of the California ordinance, most lawyers with whom I have consulted agree that the federal government, not the state, is the governing body, and that 593e was nothing but a lot of wasted effort.

Further, I have to question the concept of getting federal laws passed to protect subscription television. While the Commission may be good at generating rules and regulations to govern just about every eventuality occurring in the electromagnetic spectrum, their record on enforcement leaves a bit to be desired. And...what's to keep someone or some group from challenging such laws, the result of which is a court battle that will last years and cost us taxpayers. No, my feeling is that there is only one answer to the problem of pay-TV piracy, and that answer is technology.

The major problem, as I see it, comes from the fact that the majority of subscription television systems are just too easy to pirate. As with anything else, when the systems were developed, the cost factor of the system was one of the prime concerns to those developing it. Therefore, with but one exception, the pay-TV encoding systems of today are so simple to decode that a high-school student with only a bit of knowledge in electronics can overcome them. In fact, if you know how to read and understand a composite TV video waveform, there is no way for you not to figure out how a given subscription television system works. Once you have this knowledge, you are halfway home.

The key to combatting subscription TV piracy then becomes one of developing a pay-TV encoding system so complex as to make piracy uneconomical. In the end, it comes down to simple economics. If it's cheaper to purchase a pirate decoder than to pay the monthly subscription fee, then such decoders will become as fashionable as linear amplifiers for CB. But, should the subscription television services finally get together and, with their collective resources, develop a highly complex encoding/decoding system, one so complex as to make illegal decoders non-cost-effective items, they can ensure the longevity of subscription television in this nation.

Frankly, I suspect that the opposite will happen. I feel that most subscription-TV services are themselves such bureaucracies that they cannot see the forest for the trees. They will probably continue their court battles. They may eventually obtain the federal laws they seek to theoretically curtail the manufacture and distribution of such devices. In the long run, they will be the losers. I need only point to the 10-meter amplifier ban to make my point. The only one who tells us that the amplifier ban is a success is the FCC. You wouldn't know it by listening to 11 meters and hearing operators extol the virtues of their *new* "Super Whizbanger 10K" and such. If the subscription-TV people want a quick solution, leave it to the engineers to find it. Keep trying to change the laws, and they will only develop the same black market for decoders that now exists for CB linears.

I doubt if it will ever be possible to curtail the piracy problem completely. There will always be an individual somewhere who will figure out even the most complex of systems and find a way to beat it. Sort of like those who sit for hours trying to break the "top-secret" control codes on remote-base and repeater systems. But, they are a minority and as long as they cannot produce a cost-effective product to mass merchandise, they are no real threat to the survival of pay-TV. A few years ago, I predicted to a friend that this problem would occur. I based my assumption upon my understanding of the current pay-TV systems and human nature. Now, three years later, I find that I am correct.

Here, in California, and elsewhere, the problem with subscription TV piracy is growing, and, as I predicted then, the pay-TV people are grasping for straws in trying to solve it. Yet, the answer is in front of them. It will cut deeply into corporate earnings in the short term, but will give them long-term security. Let's see if these bigwigs of high finance are smart enough to realize this and initiate a technological change. If they're the typical bureaucrats I think them to be, I doubt if they will. In the end, you and I will pay the price, as cases are fought with our tax dollars. Even those of you who do not have subscription television will be the losers if this happens. Maybe we can at least start the ball rolling to forbid the use of our tax dollars for use in such litigation. Frankly, if the pay-TV people want protection, then they should be prepared to foot every penny it costs. If this means that it will cost their subscribers more, then so be it.

By the way, I am one of this nation's pay-TV subscribers and want to see subscription TV survive. I enjoy our HBO service and feel that it's worth the monthly service fee. If I wanted to pirate

Continued on page 149

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

HUNTING LIONS IN THE AIR CONTEST

Starts: 1200 GMT January 10
Ends: 1200 GMT January 11

The contest is sponsored by Lions Clubs International and coordinated by Lions Club Rio de Janeiro Arpoador, Brazil. Participation in the contest is open to all duly licensed radio operators, Lion and non-Lion. There are two modes—phone and CW. Participation in both modes is allowed, but points are counted separately. All amateur stations participating must operate within their licensing regulation. Separate categories will exist for single operator and radio clubs/societies. Multi-operators may participate, but each prefix must be listed on the log.

Use all bands, 80 through 10 meters. Only one QSO with the same station on each band may be counted. Remember that phone and CW are counted separately!

EXCHANGE:

RS(T) and sequential QSO number. When contacts are made with Lions and Leos, the name of the Lions Club or Leo Club contacted should be clearly identified.

SCORING:

QSOs within the same continent count 1 point, while those between different continents count 3 points. Score 1 extra bonus point for each QSO with a member of a Lions Club or Leo Club and 5 points for a QSO with a member of the Lions Club Rio de Janeiro Arpoador. Contacts between Brazilian stations and members of the Arpoador club will count only 2 extra points.

AWARDS:

Lions Club International will present awards for single operators for first, second, and third place on both modes. The first-place winner in each mode will receive a trophy, the second-place winner will receive a medallion, and the third-place winner will receive a plaque. A trophy will be awarded to the first-place radio club on each mode. Certificates will be awarded fourth- through tenth-place winners in each mode for single operators. In addition, each log sent by participants, radio clubs, or radio societies will receive a special certificate. The contest committee will also select and award the most active Lions Club participating in the contest.

ENTRIES:

Keep a separate log for each mode. Each participant will note in the logs the callsign and information exchanged. Confirmation of contacts will be made by comparing the logs of the participants. Participants should send their logs not later than 30 days after the contest to: Contest Committee—Hunting Lions in the Air, Lions Club of Rio de Janeiro Arpoador, Rua Souza Lima #310, Apt. 802, 22081 Rio de Janeiro RJ Brazil.

2nd ANNUAL INTERNATIONAL 160-METER PHONE CONTEST

Sponsored by 73 Magazine
Starts: 0000 GMT January 17
Ends: 2400 GMT January 18

This is the second annual 160-meter contest sponsored by our magazine. The object is to work as many stations as possi-

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CALENDAR

Jan 3-5	**Zero District QSO Party**
Jan 10-11	**Hunting Lions in the Air**
Jan 17-18	73's International 160-Meter Phone Contest
Jan 17-18	**Michigan ARP Club CW Contest**
Jan 17-18	**ARRL VHF Sweepstakes**
Jan 17-19	**QRP SSB QSO Party**
Jan 18	**FRACAP Worldwide Contest**
Jan 24-25	**Texas QSO Party**
Jan 31-Feb 8	**ARRL Novice Roundup**
Feb 2-3	**CWSP International DX Competition**
Feb 14-15	**QCWA QSO Party—CW**
Feb 21-22	**ARRL DX Contest—CW**
Mar 7-8	**1981 SSTV Contest**
Mar 7-8	**ARRL DX Contest—Phone**
Mar 14-15	**QCWA QSO Party—Phone**
Mar 21-22	**Bermuda Contest**
Mar 21-22	**CARF Phone Commonwealth Contest**
Aug 8-9	**European DX Contest—CW**
Sep 12-13	**European DX Contest—Phone**
Nov 14-15	**European DX Contest—RTTY**

AMATEUR RADIO NEWS SERVICE (ARNS)
1980 PUBLICATION CONTEST INFORMATION

Mail one copy each of any of three issuances during the period from July, 1979, through July, 1980, to:

Arny Gamson K6PXA, Chairman
ARNS Publication Contest
8034 Gentry Ave.
North Hollywood CA 91605

Papers will be reviewed by a team of three judges. Points will be awarded by each judge independently based upon the criteria discussed below. Final average totals will be adjusted up or down based upon a group reevaluation of all papers. All papers will receive an award and, based upon adjusted point value, will be judged OUTSTANDING, EXCELLENT or HONORABLE MENTION. All papers will also receive a summary critique on their favorable qualities and the judges' constructive suggestions for improvement.

Criteria for judging will include achieving the apparent goals of:

- Purpose of publication
- Interest to readers
- Imagination and attractiveness of layout
- Mast, titles, and layout
- Humor and cartoons
- Members' involvement and contribution
- Ease of readability of product

The following "housekeeping" items will be considered:

- Date and frequency of issue
- Name and address of editor and officers of sponsoring organization
- Utilization of ARNS emblem and ARNS contributions from the *Bulletin* (if member)
- Minimal effect will result from method of reproduction unless it affects the readability
- Technical articles and recruiting/training/subscriber solicitation material will be evaluated on an appropriate basis

Decision of the judges will be final. Scores/critiques of individual papers will be issued to individual entrants. Categories earned will be publicized.

There is no entry fee or membership in ARNS required. The contest is international and open to all amateur radio clubs, societies, organizations, groups, etc., issuing periodicals. Include separate recruiting, training, etc., material issued in connection with your paper.

Deadline for submissions two weeks after receipt of this publication.

INFORMATION TO BE INCLUDED WITH PUBLICATION CONTEST APPLICATION

1. Name of publication
2. Frequency of issue
3. First issue date
4. Circulation (No. sent to members/Complimentaries)
5. Club dues or subscription rate
6. Sponsoring group (if any)
7. Club mailing address
8. Editor's name, call, phone number
9. Editor's address
10. Editor's city, state, ZIP
11. Editor: How long this paper? Other papers (list and how long associated)?
12. Method of printing (offset, copier, stencil, spirit)
13. Approximate cost of printing each issue
14. Postage
15. Principal objectives of your paper
16. Items judged which you feel are *not* applicable to your paper
17. Remarks
18. Amateur Radio News Service member?

'AWARDS

Bill Gosney KE7C
c/o Micro-80 Inc.
S-2665 No. Busby Road
Oak Harbor WA 98277

COMPU-WARD

As publicized in over 25 individual amateur radio publications throughout the world, the COMPU-WARDs, sponsored by Micro-80 Incorporated, are available to licensed amateurs and shortwave listeners worldwide. Emphasis of these award programs is focused on the advancement of both the amateur radio and computer hobbies through demonstrated excellence in the art of computerized communications.

Stations applying for these awards may or may not have a computerized station of his/her own; however, *all stations contacted must be computerized*, meaning the contacted station must have his/her transmitter interfaced with a computer, such as the well-known TRS-80, Apple II, Commodore PET, Heathkit, Atari, etc.

To be valid, all contacts must be made on or after January 1, 1980. There are two (2) awards being offered: (1) HF bands—29.7 MHz and below; (2) VHF/UHF—50.0 MHz and above.

All contacts must be made on one or any combination of the following modes (including any modes authorized by the FCC since the release of this announcement)—RTTY, SSTV, CW, and ASCII. Crossmode communications will not be recognized for these awards.

Single-band and mixed-band endorsements will be given with each band segment (HF, VHF, UHF, etc.). Crossband operation will only be accepted for OSCAR contacts. All OSCAR contacts will be considered only for VHF/UHF accomplishments even though some of the OSCAR satellites have receive frequencies on 10 meters. Contacts via repeaters are acceptable.

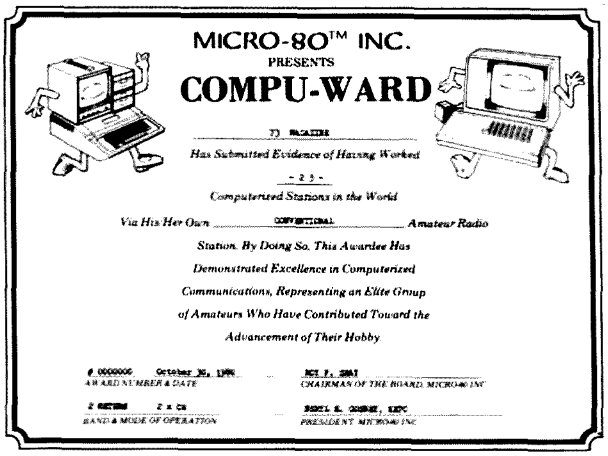
To qualify for either COMPU-WARD:

Applicants *with* a computerized station of his/her own must contact a *minimum of 15* other computerized stations on the bands and modes authorized.

Applicants *without* a computerized station of his/her own must contact a *minimum of 25* computerized stations on the bands and modes authorized.

To apply, prepare a list of contacts for each award. In prefix order, list each call worked, mode utilized, frequency or band of operation, and date and time of each contact made. *Do not send QSL cards!* Have your list of contacts and supporting QSL cards verified by two fellow amateurs or a local radio club official. The services of a notary may be sought if applicants prefer.

Forward the verified list with $4.00 for each award. Send your application to the Oak Harbor address of Micro-80 listed above. Foreign stations may substitute the awards fee by enclosing 10 IRCs for each award sought.



Last month we reviewed the very challenging Gozo Island Award and completely overlooked the very beautiful DIP-MED Award Diploma. My apologies to MARL for this obvious error.

DIP-MED AWARD

Awarded to any licensed amateur, the DIP-MED Award has no band or mode restrictions; however, single band or mode accomplishments will be recognized if requested at the time application is made.

To qualify, HF applicants must work a minimum of 15 Mediterranean countries including 9H Island of Malta. On VHF, only 5 Mediterranean countries including 9H Malta need to be confirmed.

To apply, prepare a list of claimed contacts indicating callsign, date and time in GMT, the band and mode of operation, and the country contacted. Have this list verified by at least two fellow amateurs or a local radio club official. Forward the application and $3.00 or 12 IRCs to: MARL, PO Box 575, Valletta, Island of Malta.

Mediterranean countries include: Malta, Spain, Balearic Islands, Ceuta and Melilla, France, Corsica, Morocco, Algeria, Tunisia, Monaco, Italy, Sicily, Sardinia, Greece, Cyprus, Crete, Dodecanese Isles, Gibraltar, Yugoslavia, Albania, Israel, Lebanon, Egypt, Turkey, Syria, and Libya.

GUAM ISLAND AWARD

I am proud to announce the very latest award being offered by the Mariana Amateur Radio Club of Guam Island, known as the Guam Island Award. The requirements of the award are very straightforward. Applicants must work and confirm at least five (5) individual amateurs located on Guam Island.

There are no band or mode restrictions; applicants must have their list of contacts verified by at least two amateurs or a radio club secretary. Be sure to give the usual log book information plus the name of the operator for the contact to count.

Enclose your application and an award fee of $1.00 or 5 IRCs to: Mariana ARC of Guam, PO Box 445, Agana, Guam 96910.

ANNUAL 73 MAGAZINE AWARD ENDORSEMENTS

The end of 1980 brings to a close another eventful year of enjoyable operating. Award seekers can now tabulate their totals and make application for their annual endorsements for the *73* DX Country Club Award and the Worked All USA Award. To learn more about both of these very challenging awards and the seventeen other programs which accompany them, turn in your back issues of *73* to my Awards column for the months of September and October. The entire details of the *73 Magazine* Awards portfolio are featured there.

WABP AWARD OF BELGIUM

The UBA Awards Manager, ON5TO, has announced the very popular WABP Award Program. This award is available to licensed amateurs and SWL stations. There is no limit as to date; there are no band or mode restrictions.

To qualify for the WABP Award, the applicant must work and confirm contact with each of the nine Belgium provinces on a minimum of two amateur bands.

Once the requirements have been met, have your list of contacts verified by a radio club official. Do not send QSL cards!

Enclose your verified application and five (5) IRCs to: ON5TO, UBA Awards Program, PO Box 634, Brussels, Belgium.

Belgium provinces include: WV—West Flanders; OV—East Flanders; AN—Antwerp; LM—Limburg; LG—Liege; LX— Luxembourg; NR—Namur; HT—Hainaut; BT—Brabant.

While in Belgium, we have learned of another award incentive which should capture the interest of most DX stations, the Onion Award.

THE ONION AWARD OF BELGIUM

Licensed amateurs or SWL stations will find this award a considerable challenge. Only contacts made with the Aalst section of Belgium will count and these contacts must be established after January 1, 1975, to be valid.

Continued on page 158

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
4006 Winlee Road
Randallstown MD 21133

Let's start off the New Year with a look back at some things we have mentioned in the past few months.

Several months ago, I reviewed the Jameco JE-610 ASCII keyboard. One of the troubles I noted was that, in spite of advertisements proclaiming the "full 128-character ASCII character set," the keyboard is unable to generate one code, $1F, as supplied, and another, underline ($5F), is omitted from the keyboard, although it can be generated with some manipulation. I related that Jameco acknowledged the problem, although no apparent fix has been offered. Well, take a look at the latest ads for the keyboard. No longer is the "full 128-character set" claimed; now the keyboard's "60 keys generate the *126* characters, upper- and lowercase ASCII set." Don't change the hardware, just the software, or something like that! Oh, well.

Also back a few months, we reviewed the iRL FSK-1000 RTTY demodulator. In it, I issued a challenge, albeit half-heartedly, to tell which button on the panel was pushed. Well, in response to the many questions, only the "170-Hz Shift" button is depressed. All others are in the "out" position. Study the picture if you don't believe me.

Now, quite some time back, extending over the many subsequent months, we have been following the progress of a firm known as Teleprinter Art, Ltd. To my knowledge, no repeat inquiries to the firm have been answered and, as of this writing date, I am forwarding a good deal of the correspondence and details received to the Postal Inspectors. I will try to keep anyone forwarding information to me informed of the progress of any investigation.

About a year ago, we passed along the saga of George Firmin WA4FSK, who wondered what weather transmissions such as 66228 05210 05315 05323 04928 66028 06525 06234 05838 mean. Now along comes a note from Robert Munro in Newport, R.I., who used a book entitled *Worldwide Marine Weather Broadcasts* to decode the above. His translation reads: 66228 = Warm front at surface, weak, and frontal characteristics decreasing. 052 N. latitude, 10 W. longitude, 053 N. longitude, 15 W. latitude, etc. 66028 = Quasi-stationary front at surface, weak, little or no change. Frontal characteristics diffused. 065 N. latitude, 25 W. longitude, etc.

Thanks to Robert for the help. He wonders if anyone has a computer program to decode this type of information. I would suggest that the data is encrypted in a rather straightforward manner and that anyone reasonably fluent in BASIC should be able to put the book's tables into a program. Ask around your area.

While we're talking about computers (slid into that one, didn't I?), George Gadbois W3FEY passes along his contribution in the form of a UART interface for the RCA VIP computer. This allows George to use his VIP, which is an 1802-based computer, on Baudot and ASCII. His straightforward design is shown in Fig. 1.

George also noted that the Red Rose Repeater Association in Lancaster, Penn., is in the center of a few two-meter RTTY repeaters. The Harrisburg machine is on 147.975/.375 and a "computer link" to Eagleville may be found on 146.235/.835. Keep up the good work, fellas!

Buzz Gorsky K8BG, of Carlisle, Penn., writes in regarding his Model 15. It seems as though a non-overline, automatic CR/LF gizmo has been added, and Buzz wants to turn it off! Of course, with such a device, intentional overlines, such as in many pictures, are impossible. Well, Buzz, there are at least three non-overline schemes I have seen used in a Model 15, and how you defeat it depends on which one or another you have. The best I can offer, sight unseen, is to look for a lever or hook that the typing basket trips as it passes the sixty-fifth space or so, roughly where the bell would ring. This usually is the actuator and has a lever which can be swung out of the way. Perhaps some of the RTTY nuts in the Red Rose Repeater Association can help you. Write them at PO Box 5029, Lancaster PA 17601.

73 does get around. A letter from John L. Webster 9Y4JW/8P6KX in Trinidad, asks about the software to put the 6800 computer on RTTY. Well, John, over the past few years several separate receiving and transmitting routines have been published in this column. Copies of these are still available at $1.00 each to cover reproduction and postage. However, these two have formed the nucleus for a bigger and far better program, a full transceive program for RTTY with a 6800. Featuring preloadable buffers, variable speeds, and a true FIFO, the program fits in less than 4K of memory. Want more? How about one key RYRY, QUICK BROWN FOX, and ID, and throw in a CW ID to boot. And how much will this wonderful program cost? Why, not a cent more than you already spend, for it shall be published soon right here in *73*! So don't let your subscription lapse; watch for this fantastic program.

Kevin McKewen WA3LPK, a new RTTYer here in the Baltimore area, has acquired a HAL ST-5 and AK-1 setup, sans literature. He wonders if data is still available. Sure is, Kevin. HAL maintains a full spectrum of literature on all their products, and I am sure that they would be glad to help out anyone who drops them a line at HAL Communications Corp., PO Box 365, Urbana, Illinois 61801. And don't forget to mention RTTY Loop, OK?

Anyone around Rockland, Massachusetts, want to give a newcomer a hand? George Beaupre KA1CGP is putting a Model 32 on the air and is looking for suitable demodulators. This brother of the ASCII Model

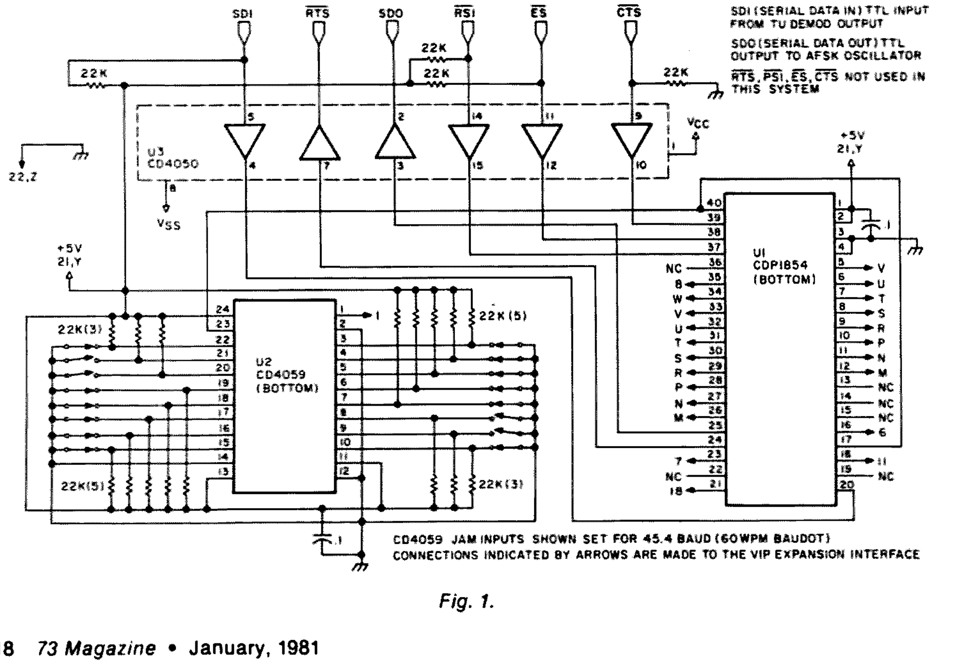


Fig. 1.

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LETTERS

H 5 H, COMRADE

This letter has been started at least a half-dozen times during the past several months, only to be pushed aside by the press of some other matter and to then be restarted when triggered by something I read or heard.

This time, the "kick" was a comment of yours in *73* calling attention to the fact that the activities of the Russian Woodpecker were markedly reduced during the time WARC was in session. I suspect, for reasons that I'll try to make clear in this letter, that although your observation is quite correct, factors other than WARC may have played a significant role.

Some months back, I found it necessary to visit the Bonn-Cologne area of the Federal Republic of Germany, a locale in which there are a great number of good friends. Some are still quite active, professionally speaking; others are retired or (as am I) semi-retired.

I decided to make an unannounced call upon one of my better friends in Bad Godesberg, Herr S., who had retired from a very senior position in the Federal Ministry of Defense a few years back.

Frau S. met me at the door as casually and as graciously as though I'd never been away and then knocked the pins out from beneath me by stating quietly that my good friend Gunter had passed away only weeks earlier. She invited me in, but I'd had enough for one day.

I went over to the Weinhaus Maternas. Frankly, I've never thought too much of the place. My wife and I used to dine there from time to time until John Le Carre mentioned it in his book, *The Spy Who Came*... After that, the prices and the crowd increased while the...well, enough said!

One thing, though—if anyone were to be found anywhere in town, it would be there. Or back at the American Embassy club in Plittersdorf, and I didn't feel like driving over to the American community right then.

I was shown to an empty table and, before my eyes were fully adjusted to the light level, someone sat at the table across from me. Actually, I didn't really have to see him—the voice and accent were enough. It was Alex K. He'd been the scientific and technical attache at one of the eastern bloc embassies during most of my period there. I thought that he'd left about the same time as I. We'd met frequently at formal functions but I don't recall ever before having been with him in as private a situation as right then.

I might add that I had often teased him about defecting to our side. He has and had a great sense of humor and took the kidding in stride...I think. At any rate, he seemed to sense my mood and appeared to be really trying to cheer me up.

After a few glasses and some trivial banter about mutual acquaintances, my humor gradually restored itself, but it was clear that Alex didn't realize it. It was about then that he inquired if there was anything that he could do for me, meaning, of course, to further cheer me up. I chose deliberately to misunderstand that. And now we come to the point: I asked him why his friends didn't turn off that "damned over-the-horizon radar" and stop "screwing up" the ham bands.

The man was shocked! He looked at me in total disbelief, accusing me of once again pulling his leg. He refused to accept the statement that the Woodpecker (by the way, he found the name amusing) was really bothering US hams. He mentioned that there were many amateurs in countries much closer to the radar's transmitter site than are the Americans.

Then, as I recall it, he said something about their technology being better than ours and able to cope with simple periodic interference. Finally, he noted that the West German amateurs seemed to have reduced the problem, referring to a technical paper that he'd seen in *CQ DL*, the FRG ham magazine, sometime in the summer of 1978. (Editor's Note: Also see *Ham Radio*, June, 1980.)

Still feigning a by-then completely dispelled ill humor, I said something like, "Dammit, I'm not smart enough, personally, to engineer a blanking circuit to eliminate the pulse noise for each of my rigs! Why don't you do the whole world a favor and just turn the thing off?"

Imagine my surprise when, after a rather lengthy pause, he very quietly said that he supposed something could be done to alleviate the problem. He didn't elaborate on that statement but did go on with something in the same vein. He said that if "that" (sic) doesn't take care of things, whenever the signal is exactly on my frequency, I am to swing my antenna to beam a signal over the pole and to send "H 5 H" in Morse.

I distinctly recall his telling me that the dot frequency should be exactly 10 Hz (about 13 wpm), as it was obvious that he was suggesting synchronization with an unnamed something, such as, for example, the Woodpecker's pulse repetition frequency. He said no more on the matter, turning the conversation towards questions of my family's health and other innocuous subjects. I left Alex and Maternas' shortly thereafter.

The meeting was prior to WARC so one can't say whether it was WARC or that chance encounter that resulted in a lessening of the Woodpecker's activities. It does seem to me that the interference has been somewhat less than in the past, even since the WARC.

I, of course, will neither admit to ever sending a coded "H 5 H" in order to clear a frequency nor will I suggest that others try Alex's proposed solution because I'm not sure whether the FCC would call such a transmission illegal coding or deliberate interference. I thought, however, that it might interest everyone to know the possibilities, not to mention knowing *really* why the Woodpecker is down.

(Name withheld by request)

Many of us have found that synchronized dots sent on the Woodpecker frequency will move it. Somehow I doubt if the FCC would have any objections to such counteraction to this invader of our bands.—Wayne.

20-YEAR KUDOS

Congratulations on 20 years of *73*! And what a fabulous issue to commemorate!

You know, I have every issue of *73* here on two shelves, and I consider them to be one of my most valuable possessions.

Best luck in the next 20 years!

Ron Johnson WA5RON
Austin TX

THINK POSITIVE

Happy Anniversary! Keep it up!

E. P. Rolek K9SQG
Dayton OH

A GOOD INVESTMENT

About 20 years ago, I took a chance on a new ham magazine called *73*. I invested my life's savings (students were very poor in those days and so were magazine publishers) in one of your life subscriptions. The deal was your life or mine.

I figure that both of us have a good investment in each other. From those early days, the magazine and you have grown and become prosperous; so have I. I now am one of those "electron" engineers. Ham radio had something to do with it. I hope the next 20 years are as good for both of us.

Until I read the anniversary issue editorials, I did not know that you were a member of MENSA. So am I.

Clive Frazier K9FWF/4
Orlando FL

CONSERVING ENERGY

Don't you think it would be appropriate at this time to devote one page of *73* to ideas and concepts of conserving energy? I'm sure amateurs the world over have experimented and come up with systems. I utilize a large heat sink placed on a coal stove and blow air over it with a muffin fan. I get heated air at 90°. I am now working on a pre-heater for the fan air by building a jacket around the stove pipe and pulling the air through it.

Continued on page 158

FUN!

John Edwards WB2IBE
78-56 86th Street
Glendale NY 11385

This month's "Fun!" offering should really set your heads spinning. Instead of concentrating on one specific operating endeavor, as in our previous quizzes, this month we'll be testing you on the entire gamut of amateur radio history, everything from spark to space communications, with lots of other interesting highlights in between. So get those thinking caps on, for this month we learn about ham history.

ELEMENT 1—CROSSWORD PUZZLE (Illustration 1)

Across

1 One end of first transatlantic QSO
2 End of contact
8 Morse question mark
9 British tube
11 Disaster Radio Service (abbr.)
13 "Shahland" prefix
15 Upstart ham organization of 1950s (abbr.)
17 Status of 11-meter amateur band
19 Initials of government man who reopened our bands after WWI
20 Low frequency (abbr.)
23 Former deceptive ham outlet
26 WWII ham substitute (abbr.)
28 Irish prefix
29 It replaced spark (abbr.)
32 80-10 meters (abbr.)
34 Old receiver
36 Our fate
38 Caribbean QTH (abbr.)
39 Former ham manufacturer

Down

1 6-meter predecessor (2 words)
2 Old traffic post (abbr.)
3 What we get on
4 Before SOS
5 Greek prefix
6 New Novice-type call
7 Triode inventor
10 Idle ham
12 November contest (abbr.)
14 Wouff__________
16 Audio frequency (abbr.)
18 Element (abbr.)
21 FCC predecessor (abbr.)
22 Long wave (abbr.)
24 Old FCC agent (abbr.)
25 Equipment
27 ARRL appointee (abbr.)
30 QRZ?
31 FCC legal step (abbr.)
33 RACES official (abbr.)
35 Cycles______second
36 Bad op
37 "The Old Man" (abbr.)
38 Former Novice prefix

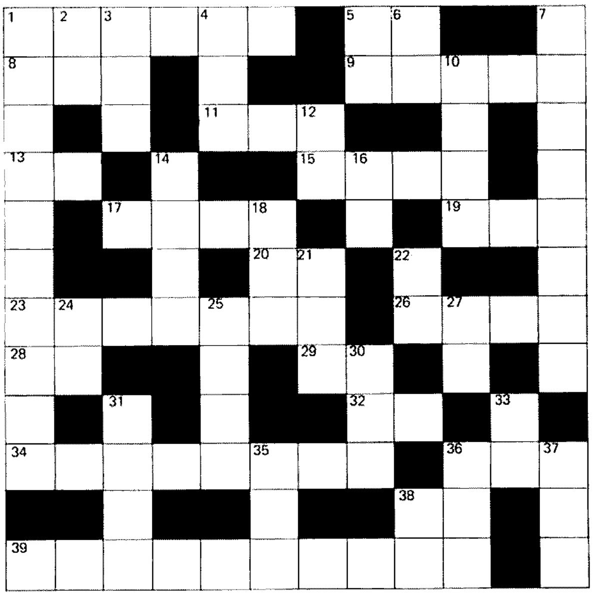


Illustration 1.

ELEMENT 2—MATCHING

Match the former ham manufacturers and distributors in Column A with their QTHs in Column B.

	Column A		Column B
1	E. F. Johnson	A	Brooklyn NY
2	RCA Electron Tubes	B	Roslyn NY
3	Gonset	C	Chicago IL
4	Lafayette Radio	D	Millington-Watchung NJ
5	Atlas Radio	E	Indianapolis IN
6	Hammarlund	F	Hicksville NY
7	Hallicrafters	G	Council Bluffs IA
8	Regency	H	New York NY, Mars Hill NC
9	Uncle Dave's Radio Shack (Fort Orange Radio)	I	Oklahoma City OK
		J	Waseca MN
10	Amperex	K	Rockford IL
11	Greenlee Tool	L	New York NY
12	Sonar Radio	M	Boston MA
13	Galaxy	N	Albany NY
14	Terminal Radio	O	Kansas City MO
15	LTV-University	P	Harrison NJ
16	RME-ElectroVoice	Q	San Francisco CA
17	Burstein-Applebee	R	Buchanan MI
18	Alltronics-Howard	S	Jamaica-Syosset NY
19	Squires-Sanders	T	Burbank-Anaheim CA
20	Sideband Engineers	U	Oceanside CA

ELEMENT 3—MULTIPLE CHOICE

1) In 1921, the "Transatlantic Tests" were held to see which amateur could first transmit a signal from America to Europe. What was so unusual about the first ham to accomplish this feat?

1) He was a pirate signing 1AAW.
2) He sent his signal on 2 meters.
3) His signal was frequency modulated.
4) He was not an American, but a Canadian.

2) Back in the 1950s, General Electric sponsored an annual award presented to an "amateur who has rendered outstanding public service." The name of this award was:

1) The Maxim Award.
2) The Baldwin Cup.
3) The Edison Award.
4) The WB2LWJ Certificate of Merit.

3) Speaking of awards, the Elser-Mathes Trophy, currently on display in Newington, will be awarded to the first amateur who accomplishes:

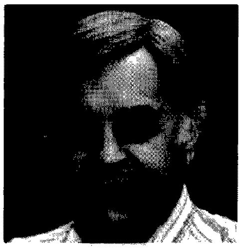
1) A 2-way contact with Mars.
2) WAS on a microwave band.
3) The first digital phone transmission.
4) DXCC on fast-scan television.

4) We all know that Guglielmo Marconi invented radio. But did you know that he had a brother who helped him with many of the invention's trial experiments? What was the first name of this "other" Marconi?

1) Luigi
2) Alfonso
3) Kevin
4) Luciano

Continued on page 150

LEAKY LINES



Dave Mann K2AGZ
3 Daniel Lane
Kinnelon NJ 07405

I've had a hankering for a long time to write about flea markets. And now that the season is over for this year, here in the north, anyway, I thought that I might make some observations. Like most guys who are somewhat quick on the trigger (I'm sometimes known as the quickest mike button in the east), I was going to shoot from the hip, quite convinced that I had a valid point of view. But after some discussions with several friends, I made a 180° turn. I must confess that I had not delved very deeply below the surface, and my ideas had been all wet.

The most important thing about flea markets is that if they weren't included, none of our ham conclaves could begin to draw the huge attendance they do. In fact, many convention symposiums and caucuses are relatively poorly attended, but flea markets are generally so crowded that you invariably have to elbow your way to get through the aisles. Flea markets are unquestionably the most popular attractions of all. Why should this be so?

Because the idea of something for nothing (or relatively nothing) is one of the most powerful motivations in all Creation. That's why there was a huge crowd when they first opened the Oklahoma Territory, why hordes of people flocked to Sutter's Mill and the Klondike when someone struck gold, and why department stores are thronged on Washington's Birthday. The prospect of a big bargain is almost irresistible.

Some flea markets are good, and some are not so good. It all depends upon just how well the individual makes out in his or her buying and selling. If you are on the prowl for a certain item and you happen to find it at a good price, then you are apt to conclude that it's a good flea market. But if you load a couple of tons of stuff into your pickup truck and lug it three or four hundred miles, then don't succeed in selling any of it, you might well be justified in thinking it's a lousy one. It all depends on your individual frame of reference... like anything else.

Flea markets generally depend upon word of mouth for success. If a given flea market turns out to be fruitful for a large number of people, you can bet that it will be even better attended next year. For there are enormous multitudes who look forward to these things, and they think nothing of traveling hundreds, if not thousands, of miles to attend. They go with bulging pockets, looking for good buys. Sometimes they find them. But frequently, they wind up buying stuff they never anticipated buying, and it is merely deposited on a shelf in the basement for future use and is rarely ever heard of any more.

I suppose that I have scores of HF connectors that I wouldn't be able to use if I lived to be a hundred. And God alone knows how many linear feet of shrink tubing and spaghetti, how much stranded #14 copperweld, how many meters, relays, tube sockets, rf chokes, capacitors, resistors, packets of electronic hardware, rubber grommets, nibblers, wire strippers, phone plugs and jacks, test leads, antenna traps, baluns, and other assorted "junk" I have squirreled away in my cellar! Why, I must have ten cigar boxes full of porcelain egg insulators alone!

Almost all of that stuff was bought at flea markets, and I will probably buy a lot more of it in ensuing years.

Tell me something if you can: What makes an otherwise intelligent guy go into the pot for over a dozen lapel badges? I have so many of the danged things that I can never make up my mind which one to wear. But I'll bet that the very next flea market I attend, if one of those birds is there grinding out callsign badges, I'll buy another! I'll see one in a color I don't have or with a couple of flickering LEDs, and there'll go another couple of bucks!

Of course, the worst part is that after you bring this stuff home, you put it in a special place so that you'll be able to lay your hands on it when you have to use it, and then you can't remember where you put it. I'm still looking for a whole box full of zeners that I stashed away for safekeeping about four years ago. I've turned the place upside down and I just can't find them.

Flea markets are viewed by some people as a golden opportunity to unload what can only be described as useless junk. They don't represent it as such, of course; that would be cutting off their nose to spite their face. I wish I had a ten spot in my pocket right this minute for every piece of equipment someone intends to take to a flea market to sell, even though he is quite aware that there is something drastically wrong with it. But this fact will be concealed so that he can "sandbag" some willing sucker. Burned-out transformers, shorted components, kits assembled with wiring errors and cold solder joints, you name it. It's par for the course.

That's why everyone who goes to a flea market ought to remember to bear the old warning *caveat emptor* constantly in mind. Some sponsoring groups have had so many complaints that they have taken to displaying a large sign: "The XYZ Amateur Radio Club makes no warranties in respect to the condition of items bought or sold. All transactions are subject to the discretion of buyers, and the club is neither directly nor indirectly responsible."

But I have another thought, and I'm not at all sure I'm incorrect about it. The good Lord must have made gullible pigeons for some purpose or another, and if they are dumb enough to allow themselves to be taken, it is probably what they deserve.

The reason this postulate doesn't disturb me is that many years of observance and experience have taught me that chiselers cannot cheat anyone who is not himself looking for an opportunity to chisel. Those who believe in dealing honestly are much harder to cheat than those who wouldn't hesitate to pull something a bit shady themselves. If you tend to doubt this, just take a look at the video tapes brought to light in the Abscam mess. Who fell for the sting operation that was set up by the FBI? You don't suppose for a moment that any scrupulously honest senator or congressman would have allowed himself to be enticed into a meeting in some seedy motel room with an Arab oil sheik, do you?

So, by all means, attend flea markets. Buy and sell to your heart's content. And if it should happen that you get stung, well, there's always another one where you might find the buy of a lifetime. I once bought a Collins 32V-2 and had the strange sensation that I was being watched. I opened the rig up and there in the rf cage I found an electrocuted field mouse... his beady little black eyes were open, staring right into mine!

You never can tell what sort of a bonanza you might run into!

RTTY LOOP

from page 18

33 should go up fairly easily, with just about any modern demodulator. I would check the ads here in *73* for something that appeals to you. Anyone who has a 32 on the air might drop George a note at 32-D Martha Drive, Rockland, Massachusetts 02370.

And now, a bit of a tease. I am currently evaluating one of the "new breed" RTTY units. This thing will speak Baudot, ASCII, and Morse at any reasonable speed, convert codes, and store data on tape. Its microcomputer brain is user accessible, so new functions can be devised. One of the cutest is sending SSTV signals with no other equipment! Want a hint? It is made by a company here in the Free State, and it is advertised in *73*. Watch for the full review, as always with both the good and the bad, in next month's RTTY Loop.

OSCAR ORBITS

Courtesy of AMSAT

The OSCAR satellites are subject to atmospheric drag, of course, and the present period of intense solar activity has accentuated the problem. During this period, our sun has been expelling huge numbers of charged particles, some of which find their way into the Earth's upper atmosphere, increasing the density (and thus the drag) there. It is through this region that the OSCARs must pass. OSCAR 8, in a lower orbit than OSCAR 7, is the more seriously affected of the two.

If the drag factor is not considered when OSCAR calculations are performed, long-range orbital projections will be in error. For example, by the end of 1979, OSCAR 8 was more than 20 minutes ahead of some published schedules. The nature of orbital mechanics is such that extra drag on a satellite causes it to move into a lower orbit, resulting in a shorter orbital period. Thus, the satellite arrives above a given Earthbound location earlier than predicted.

Using data supplied to us by Dr. Thomas A. Clark W3IWI of AMSAT, the equatorial crossing tables shown here were generated with the aid of a TRS-80™ microcomputer. The tables take into account the effects of atmospheric drag and should be in error by a few seconds at most.

The listed data tells you the time and place that OSCAR 7 and OSCAR 8 cross the equator in an ascending orbit for the first time each day. To calculate successive OSCAR 7 orbits, make a list of the first orbit number and the next twelve orbits for that day. List the time of the first orbit. Each successive orbit is 115 minutes later (two hours less five minutes). The chart gives the longitude of the day's first ascending (northbound) equatorial crossing. Add 29° for each succeeding orbit. When OSCAR is ascending on the other side of the world from you, it will descend over you. To find the equatorial descending longitude, subtract 166° from the ascending longitude. To find the time OSCAR 7 passes the North Pole, add 29 minutes to the time it passes the equator. You should be able to hear OSCAR 7 when it is within 45 degrees of you. The easiest way to determine if OSCAR is above the horizon (and thus within range) at your location is to take a globe and draw a circle with a radius of 2450 miles (4000 kilometers) from your QTH. If OSCAR passes above that circle, you should be able to hear it. If it passes right overhead, you should hear it for about 24 minutes total. OSCAR 7 will pass an imaginary line drawn from San Francisco to Norfolk about 12 minutes after passing the equator. Add about a minute for each 200 miles that you live north of this line. If OSCAR passes 15° east or west of you, add another minute; at 30°, three minutes; at 45°, ten minutes. Mode A: 145.85-.95 MHz uplink, 29.4-29.5 MHz downlink, beacon at 29.502 MHz. Mode B: 432.125-.175 MHz uplink, 145.975-.925 MHz downlink, beacon at 145.972 MHz.

At press time, OSCAR 7 was scheduled to be in Mode A on odd numbered days of the year and in Mode B on even numbered days. Monday is QRP day on OSCAR 7, while Wednesdays are set aside for experiments and are not available for use.

OSCAR 8 calculations are similar to those for OSCAR 7, with some important exceptions. Instead of making 13 orbits each day, OSCAR 8 makes 14 orbits during each 24-hour period. The orbital period of OSCAR 8 is therefore somewhat shorter: 103 minutes.

To calculate successive OSCAR 8 orbits, make a list of the first orbit number (from the OSCAR 8 chart) and the next thirteen orbits for that day. List the time of the first orbit. Each successive orbit is then 103 minutes later. The chart gives the longitude of the day's first ascending equatorial crossing. Add 26° for each succeeding orbit. To find the time OSCAR 8 passes the North Pole, add 26 minutes to the time it crosses the equator. OSCAR 8 will cross the imaginary San Francisco-to-Norfolk line about 11 minutes after crossing the equator. Mode A: 145.85-.95 MHz uplink, 29.4-29.50 MHz downlink, beacon at 29.40 MHz. Mode J: 145.90-146.00 MHz uplink, 435.20-435.10 MHz downlink, beacon on 435.090 MHz.

OSCAR 8 is in Mode A on Mondays and Thursdays, Mode J on Saturdays and Sundays, and both modes simultaneously on Tuesdays and Fridays. As with OSCAR 7, Wednesdays are reserved for experiments.

OSCAR 7 ORBITAL INFORMATION FOR JANUARY

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
28042	1	0131:05	98.7
28054	2	0030:23	83.5
28067	3	0124:37	97.1
28079	4	0023:55	82.0
28092	5	0118:09	95.6
28104	6	0017:27	80.4
28117	7	0111:41	94.0
28129	8	0010:59	78.8
28142	9	0105:14	92.4
28154	10	0004:31	77.3
28167	11	0058:46	90.9
28180	12	0153:00	104.4
28192	13	0052:18	89.3
28205	14	0146:32	102.9
28217	15	0045:50	87.7
28230	16	0140:04	101.3
28242	17	0039:22	86.2
28255	18	0133:36	99.8
28267	19	0032:54	84.6
28280	20	0127:09	98.2
28292	21	0026:26	83.0
28305	22	0120:41	96.6
28317	23	0019:58	81.5
28330	24	0114:13	95.1
28342	25	0013:30	79.9
28355	26	0107:45	93.5
28367	27	0007:03	78.3
28380	28	0101:17	91.9
28392	29	0000:35	76.8
28405	30	0054:49	90.4
28418	31	0149:03	103.9

OSCAR 8 ORBITAL INFORMATION FOR JANUARY

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
14402	1	0057:44	71.6
14416	2	0102:29	72.8
14430	3	0107:13	74.0
14444	4	0111:58	75.3
14458	5	0116:43	76.5
14472	6	0121:27	77.7
14486	7	0126:12	78.9
14500	8	0130:56	80.1
14514	9	0135:40	81.3
14528	10	0140:25	82.5
14541	11	0001:57	57.9
14555	12	0006:42	59.2
14569	13	0011:26	60.4
14583	14	0016:10	61.6
14597	15	0020:54	62.8
14611	16	0025:38	64.0
14625	17	0030:23	65.2
14639	18	0035:07	66.4
14653	19	0039:51	67.6
14667	20	0044:35	68.9
14681	21	0049:19	70.1
14695	22	0054:03	71.3
14709	23	0058:46	72.5
14723	24	0103:30	73.7
14737	25	0108:14	74.9
14751	26	0112:58	76.1
14765	27	0117:42	77.3
14779	28	0122:25	78.5
14793	29	0127:09	79.8
14807	30	0131:53	81.0
14821	31	0136:36	82.2

OSCAR 7 ORBITAL INFORMATION FOR FEBRUARY

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
28430	1	0048:21	88.8
28443	2	0142:35	102.4
28455	3	0041:53	87.2
28468	4	0136:07	100.8
28480	5	0035:25	85.7
28493	6	0129:39	99.3
28505	7	0028:57	84.1
28518	8	0123:11	97.7
28530	9	0022:29	82.5
28543	10	0116:43	96.1
28555	11	0016:01	81.0
28568	12	0110:15	94.6
28580	13	0009:32	79.4
28593	14	0103:47	93.0
28605	15	0003:04	77.8
28618	16	0057:19	91.4
28631	17	0151:33	105.0
28643	18	0050:50	89.9
28656	19	0145:05	103.4
28668	20	0044:22	88.3
28681	21	0138:37	101.9
28693	22	0037:54	86.7
28706	23	0132:08	100.3
28718	24	0031:26	85.2
28731	25	0125:40	98.8
28743	26	0024:58	83.6
28756	27	0119:12	97.2
28768	28	0018:30	82.0

OSCAR 8 ORBITAL INFORMATION FOR FEBRUARY

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
14835	1	0141:20	83.4
14848	2	0002:52	58.6
14862	3	0007:35	60.0
14876	4	0012:19	61.2
14890	5	0017:02	62.4
14904	6	0021:45	63.6
14918	7	0026:29	64.8
14932	8	0031:12	66.1
14946	9	0035:55	67.3
14960	10	0040:39	68.5
14974	11	0045:22	69.7
14988	12	0050:05	70.9
15002	13	0054:48	72.1
15016	14	0059:31	73.3
15030	15	0104:14	74.5
15044	16	0108:57	75.7
15058	17	0113:40	76.9
15072	18	0118:23	78.1
15086	19	0123:06	79.3
15100	20	0127:49	80.6
15114	21	0132:32	81.8
15128	22	0137:15	83.0
15142	23	0141:57	84.2
15155	24	0003:29	59.6
15169	25	0008:11	60.8
15183	26	0012:54	62.0
15197	27	0017:36	63.2
15211	28	0022:19	64.4

NEW PRODUCTS

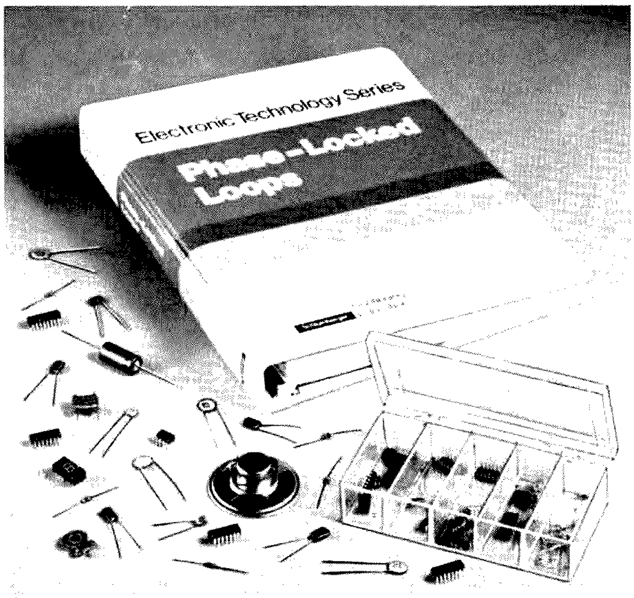
HEATH CONTINUING EDUCATION OFFERS NEW ADVANCED ELECTRONICS PROGRAMS

Heath Continuing Education, a division of Heath Company, has introduced a series of three new learn-at-home electronics programs. Each program covers an advanced electronic subject.

All three programs use programmed self-instruction textbooks that present the subject matter in easy, "bite-sized" segments. They come complete with electronic parts for optional hands-on experiments.

Operational Amplifiers, EE-101, covers the fundamentals of this commonly-used integrated circuit family, including the popular Norton and BiFET designs. The Active Filters program, EE-102, covers the design, operation, and uses of active filters. It describes low-pass, high-pass, bandpass, and state-variable filters, as well as others. The Phase-Locked Loops program, EE-104, discusses the uses, designs, and operation of PLLs. Phase-locked loops are widely used in television receivers, FM receivers, CB and 2-meter transceivers, industrial telemetry circuits, and motor controls.

For further information, contact *Heath Continuing Education, Dept. 350-160, Benton Harbor MI 49022.* Reader Service number 483.



Heath's Phase-Locked Loops program.

BENJAMIN MICHAEL INDUSTRIES' MODEL 173A STATION CLOCK

Benjamin Michael Industries has annnounced the introduction of the Model 173A station clock. The 173A provides the proper 24-hour military time format used by serious communications operators when logging transmissions or verifying contacts and reports. The unit allows the operator to directly read GMT and avoid the confusion created by various local time zones.

The 173A features quartz-crystal accuracy and greater than one year operation from a single penlight battery. Battery operation eliminates the need to reset the clock after power line failures and makes the unit ideal for mobile, field, and emergency power operations.

Time setting is accomplished by the use of two push-buttons and a hold switch which stops the clock operation and resets the internal seconds counter to zero for precise setting to WWV or other time standards. The unit is housed in an attractive aircraft instrument style case.

Benjamin Michael Industries' Model 173A station clock.

For further information, contact *Benjamin Michael Industries, PO Box 173, Prospect Hts. IL 60070.* Reader Service number 480.

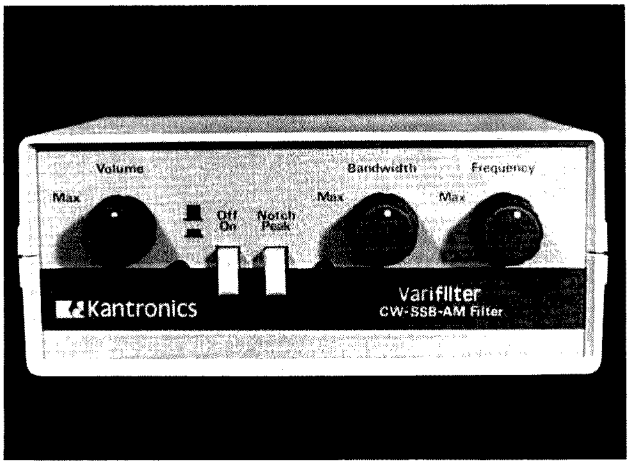
KANTRONICS' VARIFILTER™

You can vary the frequency and the bandwidth of the Varifilter™, a new addition to Kantronics' line of products. The Varifilter can be set to maximize one signal (peaking) or to minimize an interfering signal (notching), and it works with CW (Morse), single-sideband, and AM signals. The Varifilter circuitry is designed to provide optimum results without ringing, oscillating, or instability.

The bandwidth is variable from less than 30 Hz to over 1000 Hz. The frequency range runs from less than 150 Hz to over 3000. Once it has been set, the bandwidth will remain constant regardless of changes in the frequency range setting. This feature has not been readily available in variable filters until now.

The Varifilter has its own internal power supply which is switchable from 115 V ac to 230 V ac. It is able to run from 12 to 18 V dc as well. Each unit has a tuning eye that lets the operator see when he has filtered the signal he wants to.

For further information, contact *Kantronics, Inc., 1202 E. 23rd Street, Lawrence KS 66044.*



Kantronics' Varifilter™.

NEW IC DISPENSERS

OK Machine and Tool Corpor-

ation has introduced its new MDD series of DIP IC dispensers for MOS and CMOS as well as standard devices. The dispensers offer flexibility and convenience to such a unique degree that they are patented. Each channel easily accepts any standard IC shipping tube and can accommodate any standard IC from 2 to 64 pins on .300, .400, or .600 centers.

Adjustable guides position each IC individually for easy extraction, and simple gravity feed ensures reliable deposit of next IC into extraction position after previous IC is removed. Ruggedly made of unique conductive carbon-filled thermoplastic with steel supports, the MDD design ensures effective static dissipation (a grounding lug is included) as well as long and reliable performance. Available in 1-, 5-, and 10-channel versions, the dispensers will greatly facilitate any IC handling or PCB assembly process.

For further information, contact *OK Machine and Tool Corporation, 3455 Conner Street, Bronx NY 10475; (212)-994-6600.* Reader Service number 482.

WRAASE SC-422 SSTV SCAN CONVERTER

The SC-422 is a complete slow-to-fast and fast-to-slow scan converter. It has two full-size SSTV picture memories which can be used either independently to store two different pictures or together for improved picture definition of 256 pixels per line. Received pictures can also be stored in the two memories.

On transmission, a cursor is automatically inserted into the screen, indicating the portion of the SSTV picture being transmitted. The SC-422 allows you to display the fast scan content of the memory, for easy adjustment of the camera. SSTV picture transmission is not interrupted during adjustment of the camera and controls. A built-in SSTV output filter ensures a distortion-free sine wave output.

In the receive mode, a grey scale is inserted at the top of the picture to aid in the adjustment of brightness and contrast controls. An automatic "hold" circuit keeps the most recently received picture in memory when the SSTV input signal stops.

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REVIEW

S-F MOD KITS

S-F Radio Amateur Services of Culver City, California, distributes a series of modification kits for the very popular Kenwood TS-820, and makes some pretty impressive improvement claims for them. Both the receiver and transmitter sections are addressed.

The four kits are a front end improvement, a balanced mixer improvement, a "high-power" (QRO) kit, and an rf compressor-to-clipper conversion.

Actually, the compressor-to-clipper modification is not W6TOG's work. It is produced by Magicom of Bellevue, Washington, and is included here with the others because all are related and all are available through S-F.

These kits are *not* inexpensive, ranging in price from $27.50 to $37.50. The total tab for all four is well over $100. Are they worth it? Can the average ham install them? Without reducing the value of the transceiver? Maybe... read on.

The Front-End Modification

The advertising brochure claims rather remarkable improvements in sensitivity, noise figure, and immunity to rf overload. The kit, consisting of two diodes and two transistors, retails for $34.50. The installation instructions are something less than Heathkit® quality, but with a bit of study, they are both adequate and accurate. A disclaimer in large print warns against installation by persons unfamiliar with solid-state circuitry. True, this is probably not a good first project for the beginner, but with ordinary skill and care, installation is not difficult. After all, how hard can it be to remove and install two transistors and two diodes?

Before installation, however, let's do a simple test. With the antenna input terminated to a 50-Ohm load, increase the af gain and check the noise level at the speaker. It is *loud*! With headphones, you probably won't get beyond 12 o'clock without discomfort. All of this racket is internal noise. Make a mental note of the level.

Probably the most difficult part of the installation is finding the transistors to be removed from the foil side of the rf board. The full-size photo in the TS-820 service manual was invaluable. Such a photo would be a useful addition to the installation instructions for the benefit of those who don't have the service manual. Once you find the right pads, removal and reinstallation takes only a few minutes.

The receiver realignment requires no external instruments and goes quickly once you find the right slugs to turn. Again, a photo or sketch with the instructions would be most helpful. Perhaps I'm being too fussy, but I really believe that a few photos or other pictorials might have cut installation time in half.

Does it work? Connect your 50-Ohm load to the antenna terminal, crank up the af gain, and listen to the internal noise again. Listen carefully, because there's not much noise left to hear. As for sensitivity, an improvement from 0.25 microvolts to 0.09 microvolts is claimed. I don't have the instrumentation to measure it, but there is an improvement. The original TS-820 used to run neck and neck with my SB-303 on weak-signal performance. Now, especially on 10 meters, the TS-820 hears signals that just aren't there on the SB-303.

The Balanced Mixer Mods

I was so pleased with the results of the front-end improvements that I decided to go ahead with the balanced mixer mods. This kit retails for $27.50 and consists of two more transistors and several resistors. A substantial improvement in immunity from rf overload is claimed to result. This is particularly important to me, since I live within 500 feet of another ham who runs full legal power, and I've become accustomed to the distinctive sound of my S-meter needle pounding the pin on top of the scale. We simply can't operate simultaneously on the same band.

For practical purposes, installation is just about the same as the front-end kit. The actual parts replacement takes less time than locating the parts to be removed, and, once again, a picture would be most helpful. If I had to do the job again, I surely would install both kits at once, since the rf board would have to be removed only once, and ditto the receiver realignment.

This time when you listen for internal noise, listen very, very carefully. In my installation, there is virtually none. It was so quiet I was almost afraid the radio wasn't working. On the air, weak signals just seem to pop out of an almost silent background. More recently, this advantage has been lost to a noisy power line, but certainly not through any fault of the balanced mixer mods.

I wish the rf-overload problem had gone the same route as the internal noise, but not quite so. However, the situation is very much improved. I now can hear a relatively weak signal 10-15 kHz from the local ham's transmit frequency, and this is at least as much as I expected. We still can't operate the same band at the same time, but that's because I still do the same number on his receiver that he used to do on mine.

The QRO Kit

This kit retails for $37.50, and consists of two 6293 tubes and several small components. The 6293 is a ruggedized version of the 6146 and is a direct pin-for-pin replacement. This modification consists of two separate operations. One involves raising the screen voltage, and the other changes the ALC time constant for better action.

The first part of the modification couldn't be easier. Move a wire, install two resistors, and replace the finals. A note of caution here—neutralize the new finals quickly! I turned on the radio to warm up and went to look for a non-metallic tool to make the adjustment. The new finals were so far out of neutralization that I returned just in time to see the fuse blow from all the plate current being drawn from self-oscillation. This may be an isolated case, but be careful anyway. The finals went downhill with the fuse and I thought I might have an expensive problem, but the folks at S-F solved that one by replacing the tubes at no charge. They are good people to do business with.

The ALC modifications involve finding and replacing a resistor, a diode, and a capacitor on the rf board. These components are located in a less dense section of the board than the front end and balanced mixer. Thus, the job is relatively easier, even without pictures. This is another task that could easily be worked in with the front-end and balanced mixer mods, so that only one removal of the rf board would be required.

As it came from the factory, my TS-820 delivered 100 Watts output on 160 and 80 meters, 100 Watts on 40 through 15 meters, and less than 80 Watts on 10 meters. With the QRO mod, output was increased at least 25 Watts on all bands and nearly 35 Watts on 10 meters. Still more power is available by using 220 volts ac rather than 110. This brought output to 170 Watts on 160 and 80 meters, 150 Watts on 40 through 15, and an honest 140 Watts on 10 meters. Simply changing to 220 volts ac probably would have made a noticeable improvement even without the QRO kit. Also noticeable is the much faster ALC recovery.

The Magicom

This unit is a preassembled circuit board about two inches square, which sells for $27.50. It converts the stock rf compressor to an rf clipper. While I have no reason to believe there is any connection, there is a striking similarity to the Magnum Six available a few years ago.

The Magicom board installs on the i-f board in a relatively open area near the crystal filter(s). If you have additional crystal filters installed, or have plans to do so, you may wish to consider relocating either the filters or the Magicom. Installation consists of removing two capacitors and connecting four leads from the Magicom.

The instructions warn that careful workmanship and sufficient study of the work are required. This is good advice. Parts density on the i-f board is high, and great care certainly is required. In this case, an exploded view of the foil side of the board is provided with the instructions and is worth its weight in gold. When the appropriate pads are found, installation is a snap.

Once installed, the Magicom lives up to its claims, but first a few words about my goals and expectations with respect to speech processing. I am not an

audio purist. I am a DXer. It's not nearly as important to me that the DX station enjoys the sound of my voice as it is that he can understand my call letters through a pileup. I'm perfectly willing to sacrifice tonal fidelity for penetrating intelligibility.

As it turns out, I sacrificed nothing with the Magicom. The same audiophiles who complained that my audio sounded "harsh" and "overprocessed" now report that it sounds much better. At the same time, the DXers who reported "weak" or "muffled" audio now find it to be far more penetrating.

So, is the whole thing worth it? If all your time on the air is spent rag chewing with solid-copy stations, it certainly is not. The stock TS-820 (and many other radios) will do the job very nicely without the extra expense and work. Strictly in terms of dollars per components, the price is steep. If you could identify all the components, you surely could buy them for a lot less. But remember, you're buying more than components. You're paying for many hours of someone's research and experimentation. For me, it's worth every penny.

Can the average ham install it? I think so. My technical skills are well on the low side of average. To provide a reference point, there's a local joke about the W4LVM School of (backward) Diode Installation. On the other hand, if you have difficulty recognizing a diode, maybe you should forget about it.

One distinct advantage is the absence of external signs of modification. There are no holes, nothing outboard, nothing to detract from resale value. In fact, the whole operation is easily reversible should you wish to do so. I don't ever plan to reverse it. In fact, if S-F should offer additional mods, I'll probably be one of the first in line.

For further information, contact *S-F Amateur Radio Services, 4384 Keystone Ave., Culver City CA 90230*. Reader Service number 477.

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AED SCANNERS

You have undoubtedly heard of Murphy's Law. OK, but have you heard of Orozco's postulate? I thought not! Well, simply stated, it says that the degree of dissatisfaction with one's own

rig is directly proportional to the number of visits to the local candy store. As we watch the microprocessor come of age, we realize that if a particular rig exists, then it is obsolete! Only what is on the drawing boards is state of the art. If your transceiver doesn't have two vfos, six memories, three scanning modes, and the ability to poach your morning eggs, then it just isn't up to date!

Sad, but true. You drive home, looking at your once-current mobile rig, noticing its plain face and lack of dials and lights... how could this happen so fast! You say it will only transmit and receive? How quaint...

Enter AED Electronics and their line of scanners. Don't send old Dobbin to the glue factory just yet... I purchased one of these scanner boards from a local dealer and headed home with great expectations. No creeping obsolescence for me!

Installation

On closer inspection, the board itself is not at all complicated and probably does not warrant the extra expenditure to purchase it fully assembled. Beyond that, all installation and operation instructions are both complete and easy to read. The circuit board is tailored to fit in your particular radio with no modification whatsoever. A few wiring connections to the rotary frequency-control switch and to the PLL section were all that were required. I had only to decide for myself where to put the two toggle switches that control the scanning functions. There was even a provision for older transceivers that had only the two-position power switch. About an hour later, my Midland 13-513 was ready for the time-honored smoke test. Lo and behold... no cold solders or miswired leads!

Operation

The scanner for the Midland 220 rig is very easy to operate and does its job very well indeed. There are two switches that control the operation of the microprocessor chip. The first switch either leaves the rig operating normally or puts it in the scan mode. The second one allows it to scan the MHz section selected or will stop it on the current frequency to transmit or receive. That's all there is to it. While scanning the section of the band selected, it will stop for about eight seconds on any frequency that will break the squelch, giving you time to lock it there if you wish. If you don't, it will continue its scan *ad infinitum*. On my unit, the return time to a particular frequency, barring any interruption, is about 16 seconds more than sufficient to catch the action. As warned in the instructions, you must set the frequency to zero-zero (i.e., 224.00) to have it scan normally. Yes, I tried it with a random frequency in the window, and yes, it scans... but quite erratically. So much for experimentation!

Conclusions

I feel that this unit is a particularly valuable addition to the Midland 13-513, due to the fact that fully-synthesized 220 rigs are hard to find. This scanner increases the capabilities of an already very capable radio. Frequency scanning is well suited to the 220 band because of the long periods of silence encountered when monitoring just one frequency. It lets you monitor practically the whole band and participate when and where you wish. I am finding frequencies that I never knew existed. Have you ever heard someone say, "Let's QSY to the other one," and wonder where they went? Never again. Now, let's see... how can I squeeze another vfo into this case?

For More Information

These units are available for a wide range of 2-meter and 220 transceivers, and the price range starts at $39.95. Scan rates, frequency coverage, and switch functions and configurations will vary from model to model. More information can be obtained from *AED Electronics, 750 Lucerne Rd., Suite 120, Montreal, Quebec, Canada H3R 2H6.* Reader Service number 476.

Dave Orozco WB6SMD
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AEA CK-1 MORSE MEMORY KEYER

For some time now, Advanced Electronic Applications, Inc., has been producing some unique and rather exciting products for the radio amateur. Whether the device be an autodialer, an antenna, or an electronic keyer, AEA's products have been injected with a healthy dose of careful research and solid engineering. The company's latest offering, the CK-1 Morse Memory Keyer, is certainly no exception. In a case just barely larger than a typical calculator, we are given a keyer with almost every feature that the dedicated or even not-so-dedicated CW operator could ask for. While it is perfectly possible to put the CK-1 on the air without ever opening the instruction book, you'll want to read and even reread the manual a few times in order to be able to take full advantage of the keyer's capabilities. Once you've figured everything out, you'll never want to part with it!

The first thing you notice about the CK-1 is its apparent simplicity. On top, there is a standard twelve-tone touchpad; it gives a reassuring tactile response to each entry, and an audio confirmation as well, through the tiny but adequate speaker which also is mounted on top. The only other control topside is the combination on-off switch/volume control. Be careful! When you turn the unit off, you erase everything you have programmed into the keyer's memories. Fortunately, AEA assures us that the keyer is designed to be left on continuously.

On the left side of the case is the only other switch on the keyer; this selects either the memory-send or the memory-load mode. On the opposite side of the keyer is a non-shorting, power-input jack.

AEA specifies the unit as requiring 12 V dc ± 3 volts, which is quite reasonable in light of the fact that everything but the side-

tone amp is powered through an on-board 7805 regulator chip. On the back side are found two jacks. One is a DIN plug for input from a keying paddle, and the other is a phono jack for keying a transmitter. As it comes from the factory, the CK-1 is set up for negative keying. If you have a transistorized rig that requires positive keying, don't panic. On the first page of the manual, AEA outlines a simple modification that will allow the keyer to work with your rig. The mod consists of soldering a jumper across a diode inside the keyer. I had the mod completed and the CK-1 happily keying my Icom 701 in five minutes; even the least technically minded among us should have no problems with this one!

Hooking up the paddles is equally simple. Some hams might prefer to see the more standard phone plug used for the paddle input, but space considerations inside the CK-1 don't permit that. Besides, the DIN plug *is* a rather neat arrangement; maybe the Europeans know something we don't!

Once everything is hooked up, the next step is to turn it on. On power-up, the CK-1 is set for 20 wpm with fully-automatic iambic operation, dot and dash memories, and standard weighting. Each of these functions can be selected or rejected individually at your whim, all by entering the proper code through the touchpad. The most eccentric operator can set up this keyer to his personal taste quickly, with the digital-entry method providing a precision and repeatability of adjustment that is impossible with the knobs found on more traditional keyers.

For now, let's assume that you are content to operate with the standard operating parameters, but find the speed a bit too fast for your taste. No problem. The CK-1 offers two methods of changing speeds. If 20 wpm is too fast, you press the " * " button once and then hold down the "7" button. What will greet your ears is a dihdahdihdahdihdah pattern, with each dihdah being a bit slower than the one which preceded it. When it reaches the speed you have in mind, you simply lift your finger off the keyboard and commence operation. If you want to speed up, you follow the same procedure,

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Emergency Tone Alert System

During the last part of July, 1979, tropical storm Claudette hit the Galveston-Houston area, dropping from ten to forty-five (yes, forty-five) inches of rain in various parts of the region in a very short time. Although the area was well blanketed with repeaters carrying emergency information, the rapid rise of water at night caught many hams unaware; some did not know of the emergency until water started coming into their homes. At that time, there was no way of alerting the radio amateurs once they went to bed, since most of them turned off their two-meter rigs so that the routine chatter on the frequency would not keep them awake.

Claudette made it extremely clear that a method was needed to quickly and efficiently alert area amateurs that an emergency situation existed. Two additional emergencies in rapid sequence made it imperative that we act immediately.

Our need was for a simple, economical system that could be put into effect almost immediately. Discussion on the air and at the August meeting of the Tidelands Amateur Radio Society (TARS) and the University of Texas Medical Branch (Galveston)-Emergency Communications Group (UTMB-ECG) developed criteria for a device similar to the tone-alert system of the National Weather Service (NWS), a single-tone system.

Photo A. Completed tone alert.

A system for decoding dual tones has been used in Dallas for the past two years. Of the approximately 400 Radio Amateur Civil Emergency Service (RACES) members in Dallas, one hundred have the tone alert available. The usual response to any use of the emergency tone alert is at least 50% of the hams equipped to receive it. The local authorities are very impressed with the ability of the hams to respond to emergencies. The Dallas system is the "A-Tone Decoder" using the DTMF A tone. The tone alert is initiated by Civil Defense. Initially, the alert is on the 146.28/.88-MHz repeater, but it may go to other repeaters if the area of emergency is wider than can be covered by one repeater. The choice of the A tone for this metropolitan area was based upon the high possibility for abuse of other tones. The A tone generally is not available on the pads commonly used by hams. So far, Dallas has had no false alerts, even though some non-hams have gotten access to two-meter equipment and some hams have tried to jam the

transmissions.

Tarrant County (Fort Worth), near Dallas, is interested in implementing a similar system in the near future.

The decision of TARS and UTMB-ECG was to develop a tone-alert device based upon the success of Dallas, the ideas expressed by WA3ENK,[1] the WB5PRD design, and utilizing at least a four-second signal of the dual tones of the DTMF figure 9 (which most amateurs have available in a touch-tone™ or comparable pad) as the triggering signal. Use of a relay to silence the audio circuit to an external speaker until activated by the tone was considered the simplest alert device. The four-to-five-second duration of the tone in our tone alert causes a relay to close which then turns on an external speaker or alarm bell.

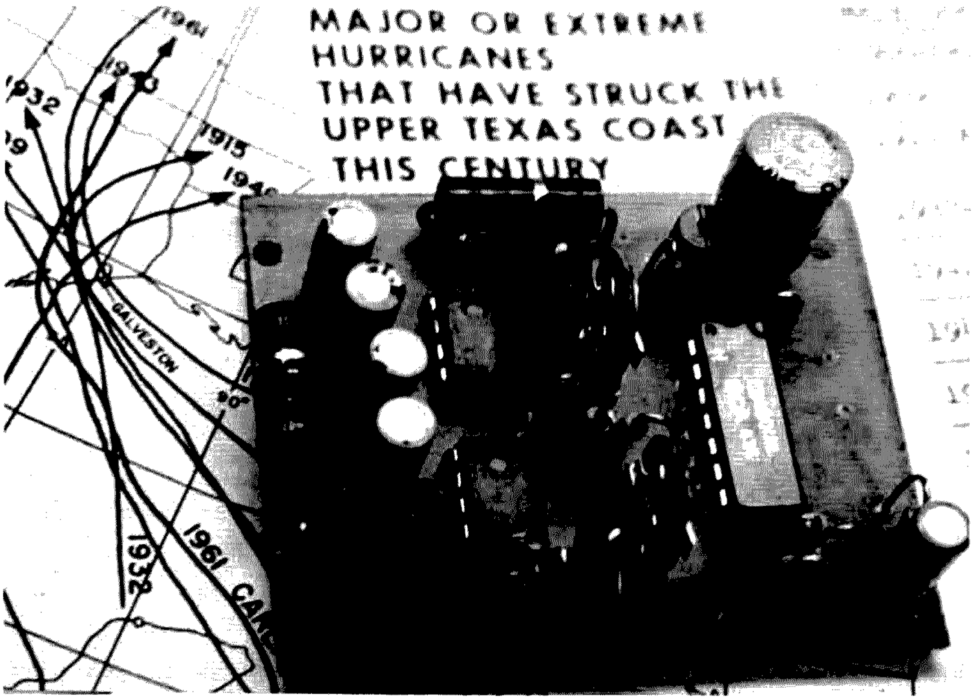

Photo B. Assembled PC board.

Twenty copies of the original WB5PRD board were ordered, and within three days the interest was so great that an additional 50 boards were ordered.

The original WB5PRD schematic was modified (but still using the original board) to fit our needs and to use the DTMF 9 tones. Local sources of parts in quantity were inadequate, so parts were ordered to provide 50 tone-alert kits. Parts were ordered from companies advertising in the several amateur radio journals. Upon checking the parts when they arrived, we found one company had shipped 30% of the parts in an inoperable condition, so these had to be replaced. By careful selection of sources, we were able to get the total cost (parts and board) down to $12.50 for each kit. (The prototype using parts bought in small quantities was built for about $18.00.) While awaiting receipt of parts, a construction and testing manual was written.

Word of what we were doing spread rapidly and inquiries came from other clubs and groups. Discussions concerning this system became quite active among several RACES and CD nets in Houston, Alvin, Clear Lake, and East Texas areas. Several groups asked if the device could be adapted to their special needs.

The concept of TARS and UTMB-ECG calls for the Emergency Operating Centers (EOCs) or a duly-authorized operator to initiate the 9 tone whenever the need arises to activate the net for emergencies. We also use the tone alert to call up our weekly repeater (147.75/.15 MHz) and simplex (145.53 MHz) nets.

As others have discovered, in the absence of phone-patch capability, hams must rely on tone alert.[2] It soon became apparent that two levels of alert would be needed: a low-level alert for personal emergencies such as car trouble, and a high-level alert for general emergencies such as hurricanes, floods, or explosions. A single-tone capability for low-level alerts can be added without additional circuitry, using a toggle switch to ground one decoder output. With the switch in the low position, the tone alert can be activated by a DTMF 7, 8, or 9. We recommend the use of the figure 7 for low-level alerts and reservation of the figure 9 for high-level alerts.

Generally, the amateurs leave the tone alert on low level when they are around the shack and switch to high level when they go to bed. Thus, their alert device would awaken them only for high-level general emergencies.

Several other groups are planning to use the 9 for their alerts. Thus, a number of hams are now using the tone alert with scanners monitoring these several repeaters. The scanners are being modified so that they will scan silently even if there is routine activity on the frequency, but if the 9 signal is given, the scanner will lock onto that frequency and activate the audio.

The Texas DX Society is considering using the tone alert on their repeater to alert members when rare DX is heard on the HF bands. They anticipate using a set of tones other than the 9 so that their signal will not activate scanners that are monitoring the repeaters for emergencies.

Another modification of the tone alert will be for use with weather radios to decode the 1050-Hz tone of the National Weather Service alerts and activate weather receivers not previously provided with tone alert. Since the NWS alert is only a single tone, such use will require only one decoder of the tone alert. The tone alert used for NWS cannot be used at the same time for the DTMF emergency tones.

Why were the 9 and 7 tones chosen? We thought that since 911 is used on the telephone to dial emergencies to fire and police, use of a 9 would be easy to remember as the alert sig-

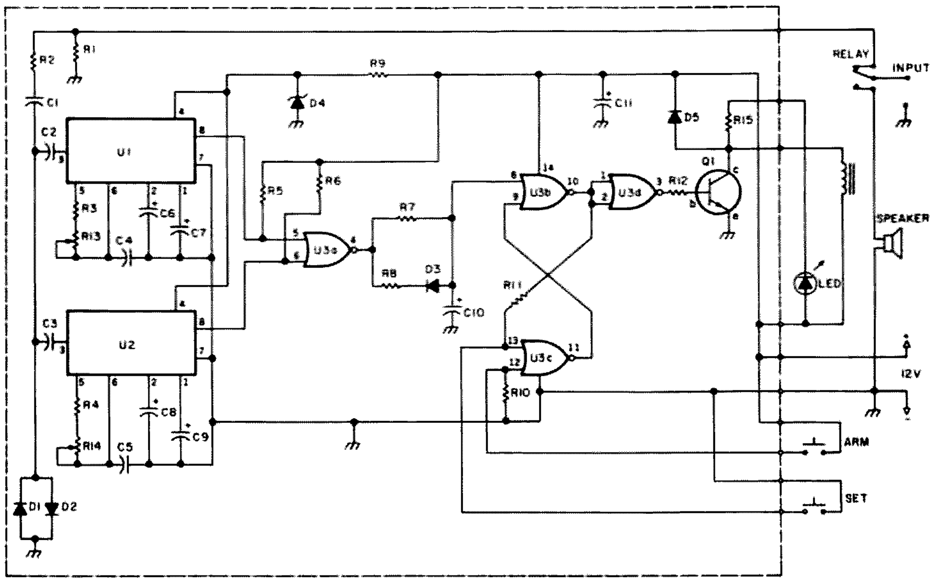

Fig. 1. Schematic diagram. (See Parts List.)

nal. The low-level alert is a good-neighbor service for individual or personal emergencies; therefore, it was considered appropriate to use the 7 or 73 for this alert tone.

Whether a large area such as the Galveston-Houston area is involved in emergencies or smaller local areas only, there is a way to alert only one or the other. If a general alert is involved, then the alerting operator goes from repeater to repeater giving the alert and announcing the emergency. If only a local area is involved, then only the repeater covering that area is alerted.

Because of the seriousness of emergencies that can occur in this region of the Gulf Coast and the potential for abuse, it was early decided to establish the following Galveston County general guidelines for use of the tone alert.

High-Level Alert

1. The tone alert will be activated only by duly-authorized operators acting on behalf of emergencies declared by Civil Defense or other official agencies, or on behalf of the repeater organization.

2. Alert will be sounded:
   a) in the event of a civil emergency;
   b) for a regularly scheduled test or drill;
   c) to call attention to bulletins of general interest during an emergency.

3. Initially, the alert will be sounded on the repeater (147.75/.15 MHz) covering the area affected by the emergency and on 145.53 MHz simplex.

4. Alert will be sounded by transmitting the digit 9 for 15 seconds. The station transmitting the tone will:
   a) identify;
   b) transmit tone for 15 seconds;
   c) call CQ or QST;
   d) state the nature of the emergency or that a test or drill is in progress;
   e) give instructions concerning action to be taken and/or frequencies to be monitored.

5. Individual testing and tune-up of the tone-alert circuit will be done on a simplex frequency other than 145.53 MHz and will not be done on repeaters. Use low power if possible when testing or tuning circuit.

6. High-level tone alert will not be used for routine personal emergencies such as flat tire, out of gas, etc.

Low-Level Alert

1. This alert may be sounded by any amateur having a personal or individual emergency for which he needs help. (It is recommended that a direct call on the repeater or simplex frequency be tried first before using the tone alert.)

2. Low-level alerts will be sounded only on the local area simplex or repeater frequency. Low-level alerts are not to be used for general alerts covering more than one repeater.

3. Alert will be sounded by transmitting the digit 7 for 15 seconds. The station transmitting the tone will:
   a) identify;
   b) transmit the 7 tone for 15 seconds;
   c) call CQ or QST;
   d) state the nature of the emergency and request the necessary assistance.

This plan has been operational since August, 1979, is gaining adherents, and the idea is spreading. Based upon our experience, we would recommend this or a similar system to other amateurs participating in emergency activities.

Circuit Description

The schematic is shown in Fig. 1. The components listed in the Parts List are standard items which are readily available. Advantages and disadvantages of the 567 PLL tone decoder have been discussed previously in the amateur literature.[3,4]

The circuit is powered from a 12-volt dc source. Zener diode D4 provides 6.2 volts dc for U1 and U2.

When the circuit is armed by bringing pin 12 of U3c to logic one briefly, audio is routed through the normally-closed contact of the relay to loading resistor R1 and to the input of the decoder circuits through R2. Germanium diodes D1 and D2 conduct at 300 mV to protect the circuit from audio overload. C2 and C3 pass the audio tones but block dc from entering U1 and U2 along with the audio signal.

U1 and U2 decode the high and low tones, respectively. R3, R13, and C4 set the center frequency of U1; R4, R14, and C5 set the center frequency of U2 (bandwidth is about 5% of the center frequency).

When a decoder locks on an incoming tone, pin 8 goes to logic zero. When both U1 and U2 are locked, pin 4 of NOR gate U3a goes to logic one. C10 then charges through R7 to provide a delay before pin 8 of U3b reaches logic one. U3d inverts the output of U3b. The sequence is now complete, the relay and LED are activated by Q1, and audio is now routed to the speaker until the circuit is again armed.

A total delay of three to four seconds is introduced between initial reception of the tone and activation of the relay to prevent false activation of the circuit.

D3 and R8 provide a discharge path for C10 when no tone is present. This prevents a buildup of charge over a period of time from intermittent false signals which might cause activation of the circuit. D5 protects Q1 from the transient voltage present when the relay is deactivated.

Momentarily closing the normally-open ARM (RESET) switch will deactivate the relay (open the audio circuit to the speaker) and will arm the decoders so that they can respond to an incoming tone signal.

Momentarily closing the normally-open SET switch will activate the relay so that audio goes to the speaker. This mode will continue until the ARM (RESET) switch is activated. (A momentary DPDT toggle switch with center off can be used in place of two separate momentary switches.)

Assembly

The circuit was assembled on a WB5PRD circuit board. (Drilled printed circuit boards are available from WB5PRD for an SASE and $4.00.) The foil side of the board is shown in Fig. 2, which is suitable for use in reproducing the board. An assembled PC board and a completed tone alert are shown in the photographs.

Parts layout is shown in Fig. 3. Assembly can be facilitated if one starts with those components at the center of the board and works outward toward the edge. Diodes, capacitors, trimpots, and quarter-Watt resistors are mounted vertically. The two one-Watt resistors are mounted horizontally. If proper care is taken as to which end of the vertically-mounted resistors is upmost, then that point of the resistor can be used as a test-point contact for testing other parts of the circuit. (See Table 1.)

The usual precautions should be observed when handling the 4001 CMOS integrated circuit. For temperature stability, C4 and C5 must be high-quality mylar™ or metallized film capacitors.

The switches and LED are installed on the front panel or speaker enclosure. The LED should be near the SET switch; the LED lights when the tone-alert unit is in the SET activation. The relay is installed off the circuit board with epoxy glue or silicone rubber. A multi-pole relay may be substituted if other devices, in addition to the speaker, are to be controlled. (Remember that when other devices such as bells or buzzers are on the relay, they will be activated when the SET switch is activated.)

The twelve-volt dc supply is connected between points marked + and − (ground). One side of the relay coil and the LED anode are connected to point K&L and the other side of the relay coil goes to K. The cathode of the LED goes to L. The ARM (RESET) switch is connected to the points marked A. The SET switch is connected to the two points marked S. Audio is connected between INPUT and ground. Points E, B, and C indicate the emitter, base, and collector of Q1.

Tune-Up

The tone alert may be adjusted for the DTMF tone 9 using either of two procedures—either a frequency counter or a voltmeter may be used. With the frequency counter method, the counter is connected to U1 at pin 5 (for a square wave) or pin 6 (for a triangle wave), and R13 is adjusted until the counter shows 1477 Hz. Take care not to load the circuit with the test equipment. Next, connect the counter to pin 5 or 6 of U2 and adjust R14 until the counter shows 852 Hz.

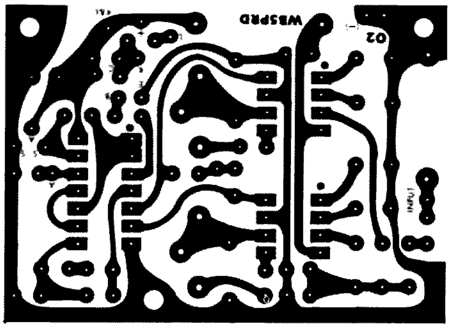

Fig. 2. PC board, foil side. This is suitable for reproducing the board for those who would like to do so.

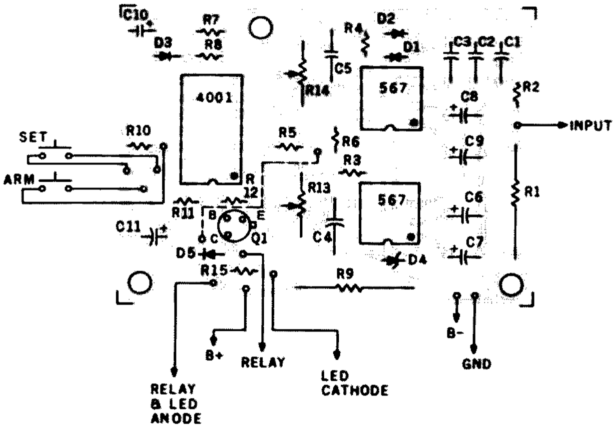

Fig. 3. Parts layout.

Alternatively, a voltmeter or logic probe may be used. Start with R13 and R14 fully counterclockwise. Apply an alert tone with the probe on pin 8 of U1 or pin 5 of U3 and slowly turn R13 clockwise. Note the position of R13 when the voltage drops and continue turning R13 clockwise until the voltage goes back up; note this point. Turn R13 counterclockwise to a point midway between the two voltage change settings. Do the same with the probe on pin 8 of U2 or pin 6 of U3 while adjusting R14.

Operation

Apply 12 volts dc to the unit. Momentarily close the SET switch; the relay should activate. Provide an audio input from the two-meter rig. The circuit will not function properly with a high noise signal or with too little audio drive. Turn the audio gain up to ensure proper drive level. The loading resistor is rated at one Watt. ARM the circuit and have another operator transmit an alert tone on a simplex frequency for fifteen seconds. The unit should activate in less than ten seconds.

Circuit Alternatives

The circuit can be tuned for tones other than the digit 9. The standard tone pairs are listed in Table 2.

Component	Connection
R3	Pin 5, U1
R4	Pin 5, U2
R5	Pin 5, U3a
R6	Pin 6, U3a
R7	Pin 8, U3b
R8	Pin 4, U3a
R11	Pin 2, U3d
R12	Pin 3, U3d

Table 1. The end of the component connected to the listed test point is placed in the up position.

Low Tone	High Tone 1209 Hz	1336 Hz	1477 Hz	1633 Hz
697 Hz	1	2	3	A
770 Hz	4	5	6	B
852 Hz	7	8	9	C
941 Hz	*	0	#	D

Table 2. DTMF tone pairs. Each digit or sign is composed of two tones. For example, 1 is composed of a 697-Hz tone and a 1209-Hz tone.

Low Tone (Hz)	R4 (kilohms)	High Tone (Hz)	R3 (kilohms)
697	11.0	1209	5.6
770	10.0	1336	5.6
852	8.2	1477	5.6
941	8.2	1633	3.9

Table 3. Alternate values for R3 and R4.

4001 Pin	Set	Armed	Tone Present	U1 and U2 Pin	Voltage
1	Low	High	—	4	6.2 V
2	Low	High	—	5	12.0 V (no alert tone)
3	High	Low	—		0.1 V (alert tone present)
4*	Low	Low	High		
5*	High	High	Low		
6*	High	High	Low		
7	---------Ground pin---------				
8*	Low	Low	High		
9	High	Low	—		
10	Low	High	—		
11	High	Low	—		
12**	Low	Low	—		
13	Low	High	—		
14	---------12 volt pin---------				

*These remain at the same state during SET and ARMed periods and change only during the presence of the alert tone. Do not replace the chip yet if any of these pins do not agree.
**This pin should go high while pressing the ARMed button.

Table 4. Logic and voltage chart.

Parts List

Resistors
R1—10 Ohms, 1 Watt
R2—1.5k Ohms, ¼ Watt
R3—5.6k Ohms, ¼ Watt
R4—8.2k Ohms, ¼ Watt
R5, 6, 11—27k Ohms, ¼ Watt
R7—560k Ohms, ¼ Watt
R8—1k Ohms, ¼ Watt
R9—220 Ohms, 1 Watt
R10—10k Ohms, ¼ Watt
R12—22k Ohms, ¼ Watt
R13, 14—5 kilohms, vertical trimpots
R15—1k Ohms, ¼ Watt
Capacitors
C1, 2, 3—0.1 μF ceramic disc, 25 V
C4, 5—0.1 μF mylar™, 16 V
C6, 8—1.0 μF electrolytic, 6 V
C7, 9—10.0 μF electrolytic, 6 V
C10—3.3 μF electrolytic, 16 V
C11—100 μF electrolytic, 16 V
Semiconductors
D1, 2—1N34A germanium (or equivalent)
D3—1N914 silicon (or equivalent)
D4—6.2 volt, 400 mW zener
D5—1N4001 (or equivalent)
Q1—2N2222 NPN transistor
U1, U2—567 dual inline, tone decoder
U3—4001 CMOS logic block
Keep CMOS wrapped in foil until ready to install.
LED—jumbo LED of choice

The corresponding alternative values for R3 and R4 are shown in Table 3.

Most of the delay between the introduction of an alert tone and relay activation is introduced by R7 and C10. These may be adjusted to provide a longer or shorter delay.

If one wishes to have both a low level of alert and a high level of alert, this can be done by adding an SPST toggle switch so that pin 5 of U3a (or pin 8 of U1) can be grounded. With pin 5 or pin 8 grounded, only a single tone (852 Hz) will activate the unit. With the switch in the closed (grounded) position, the tone alert can be activated by the digit 7 for a low-level or personal emergency, and in the switch-open position, it will take both tones of the digit 9 to activate the unit.

Weather Watch (Alert) Modifications

Only minor changes are required on this circuit to decode the NWS 1050-Hz alert tone for weather radios that do not have this feature. U1, R3, R5, R13, C4, C6, and C7 are omitted. A jumper is placed between the foils originally intended for pins 7 and 8 of U1. R14 is adjusted for 1050 Hz at pin 5 or 6 of U2. Activation methods and time will remain the same.

Troubleshooting

Step One: Most problems with performance can be traced to bad solder joints, solder bridges, incorrect parts placement, or failure to observe polarity of diodes or capacitors. All construction steps should be retraced with this firmly in mind.

Step Two: Confirm that adequate noise-free audio is actually present at the input and that the relay will work out of the circuit. Close the SET switch to activate the relay.

Step Three: Use a VTVM or FET-VOM (at least a megohm resistance) and check the voltages listed in Table 4.

Step Four: Using a piece of hookup wire, connect one end to ground and carefully touch the other end to both pins 5 and 6 of U3 with the circuit ARMed. The relay should activate in about four seconds. If it takes as long as thirty seconds to activate the relay, check R7, R8, C10, and D3. If this fails, replace U3.

Step Five: Check U1 and U2 for proper tuning.

Step Six: Ground pin 8 of U1 and send a DTMF digit 7 signal over the audio input. If this activates the relay in 4-6 seconds, then U2 is tuned and functioning. If the relay does not activate, then replace U2 and try again.

Step Seven: Ground pin 8 of U2 and send a DTMF digit 3 signal over the audio input. If this activates the relay in 4-6 seconds, then U1 is tuned and functioning. If the relay does not activate, then replace U1 and try again. ■

References

1. Rodney A. Kreuter WA3ENK, "Two Meter Tone Alert," *73 Magazine*, January, 1979.
2. Stan Horzepa WA1LOU, "FM/RPT—Tone Alert Standards," *QST*, December, 1979.
3. J. H. Everhart WA3UXH, "Toward A More Perfect Touchtone Decoder," *73 Magazine*, November, 1976.
4. Rick Swenton WA1LWV, "Tone Decoder Improvements," *73 Magazine*, February, 1979.

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WWV-to-80-Meter Converter

This simple and inexpensive frequency converter will place the WWV 10-MHz signal anywhere within the 80-meter band. Credit for the basic design goes to PM Electronics, a local firm that is now defunct.

Referring to the schematic in Fig. 1, L1-C2 are tuned to the WWV 10-MHz signal. This signal is coupled to the base of Q1 by L2. Oscillator Q2 operates at any selected crystal frequency between 6 and 6.5 MHz, and is coupled to the emitter of Q1 by C7. Q1 mixes the two frequencies. The L3-C5-C6 combination is tuned to the 3.5-to-4-MHz difference frequency which appears at the collector of Q1. Impedance matching to the 50-Ohm receiver antenna is provided by the C5-C6 capacitive divider.

Crystal frequency is determined by subtracting the desired 80-meter frequency from the WWV 10-MHz frequency. The 3750-to-3800-kHz range (6250-to-6200-kHz crystal) might be a good choice for minimum signal interference. The crystal may be obtained from Jan Crystals, 2400 Crystal Drive, Ft. Myers FL 33906. Specify type FT-243 holder and desired crystal frequency. This crystal will be .005% tolerance. Jan's 1980 catalog (#23) lists this crystal at $2.00 each with a 30-cent per crystal handling and first class mail charge. The FT-243 socket, part SSO-1, also may be obtained for an additional 30 cents.

The circuit board can be quickly and easily made by first positioning and securing the copper face of a 1-3/4" × 3-3/8" board under the circuit pattern in Fig. 2. Next, mark through the pattern at each hole location and then drill a #60 hole at each mark. The inductor pin and crystal socket holes may require pattern adjustment and larger holes. Also, check the lead spacing of your capacitors. The layout is for 1/4-inch spacing but room is available for the 3/8-inch variety.

Finally, carefully connect the related holes with 1/8-inch strips of art or masking tape. Place masking tape over the component side of the board to prevent acid from entering the holes. Thoroughly clean the copper surface after etching. Using this method, I easily etched and assembled a checkout board in one afternoon.

The inductors are wound on a 1/4-inch diameter slug-tuned coil form as shown in Photo A. These may be found in most junked TV sets and radios. As viewed from the base, coils L1 and L2 are wound counterclock-

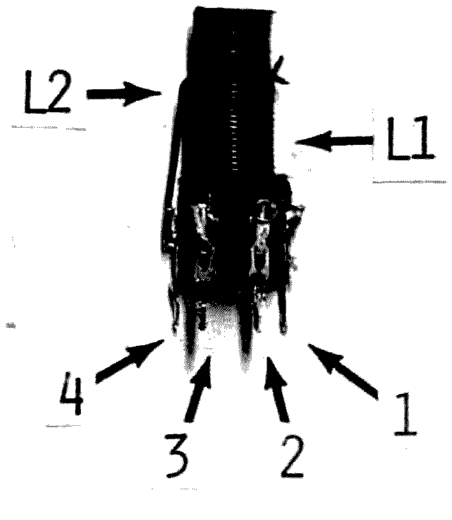

Photo A. Close-up of the L1-L2 inductor. L1 is 12 ccw turns and L2 is 4 ccw turns of #24 enameled wire. L3 is 35 cw turns of #32 enameled wire. All inductors are wound on a 1/4-inch slug-tuned coil form.

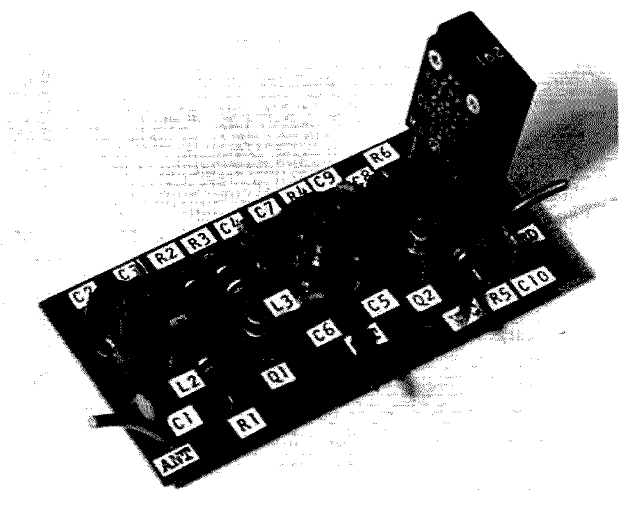

Photo B. Top view of the completed WWV-to-80-meter frequency converter.

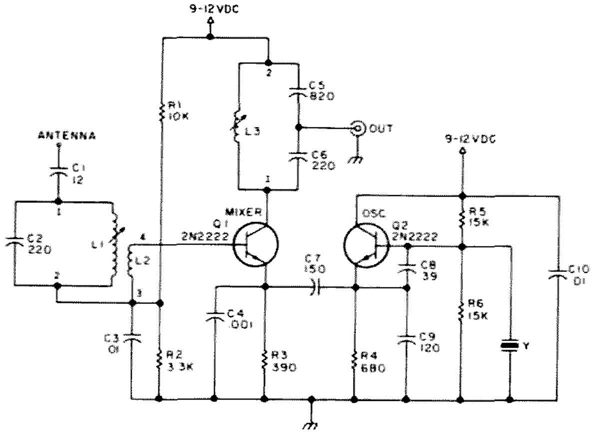

Fig. 1. Schematic diagram of the WWV converter. Resistors are 1/4 or 1/2 Watt. Capacitors C3 and C10 are Mylar™, with all others being disc ceramic.

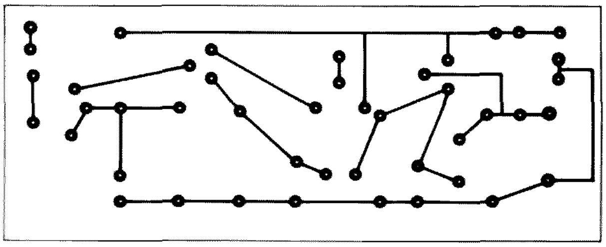

Fig. 2. Foil side of the circuit board.

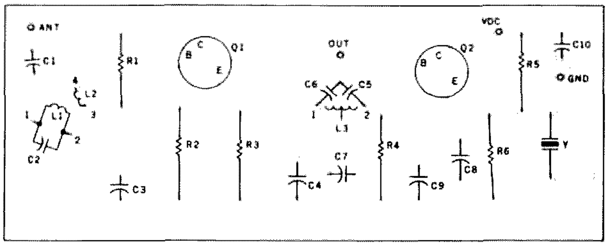

Fig. 3. Parts placement guide (foil side shown).

wise with #24 enameled wire, and L3 is wound clockwise with #32 enameled wire. All three inductors are wound with no space between turns. L2 begins at the end of L1 with no space between the end of L1 and the start of L2. Secure the coil ends with thread or tape and apply two or three coats of varnish to hold the coil in place.

Capacitors C2, C5, and C6 are soldered directly to the inductor pins. I tried several sets of transistors, both NPN and PNP types, and they all worked. Just reverse the voltage polarity for PNP types. To align, connect a short antenna and set L1 and L3 for maximum S-meter reading with a nonmetallic tool. Use shielded cable for hookup to the receiver.

My thanks to Chuck Allyn, who so kindly provided the photographs for this article. If you have a question or need parts help, an SASE will bring a prompt reply. ■

✓ Reader Service—see page 194

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Cheap and Simple

—your basic 13.8-V, 25-A power supply

The 13.8-volt ham radio transceiver has really come of age. Many of these units are great for mobile operation, but when it comes to fixed-station use, the transceivers can really come up short—primarily because of the comparatively high current values they draw on peaks.

The two-meter FM and police-scanner industries have given us a variety of 13.8-volt, low-current power supplies which in many cases can be bought more cheaply than built. However, the seemingly rarified 13.8-volt, fifteen-Amp (or higher) power supply is not that easy to come by, which really limits the possibilities with transceivers drawing anywhere from sixteen to twenty Amperes.

Scanning the catalogs became a depressing experience for me, particularly when supporting one wife, three cats, and twelve hobbies on a pilot's salary. There are a number of excellent commercial power supplies available, but you can expect to pay an absolute minimum of $100 for low-current versions and as much as $300 for a power supply beefy enough to keep my Vibroplex Presentation dancing its way through the kilos and megas. Besides all that, my idea of a power supply is something that sits in a darkened corner, is not seen, and is purely an accessory to my equipment. $100? $200? $300? For a lousy power supply?

Occasionally, a magazine article has slipped through on the subject of 13.8-volt, high-current power supplies. Unfortunately, in many cases the authors have escaped the world of simplicity and featured components and techniques that are available easily only through NASA. Hence, I drew up a priorities list so that I could readily view my criteria for such a power supply: 1) cheap, 2) simple, 3) cheap, and above all, 4) cheap. I am one of those chicken-wire and chewing-gum types whose home-brewed projects are best characterized as "functional" and are best unseen. (At least with power supplies, anyway.)

My particular need was to supply power to an Atlas 210X. While my home station is basically a salvage yard for old boat anchors, six years or so ago I pressed the Atlas into mobile service. In fact, mobile operation is all my Atlas has ever seen. Until recently it has

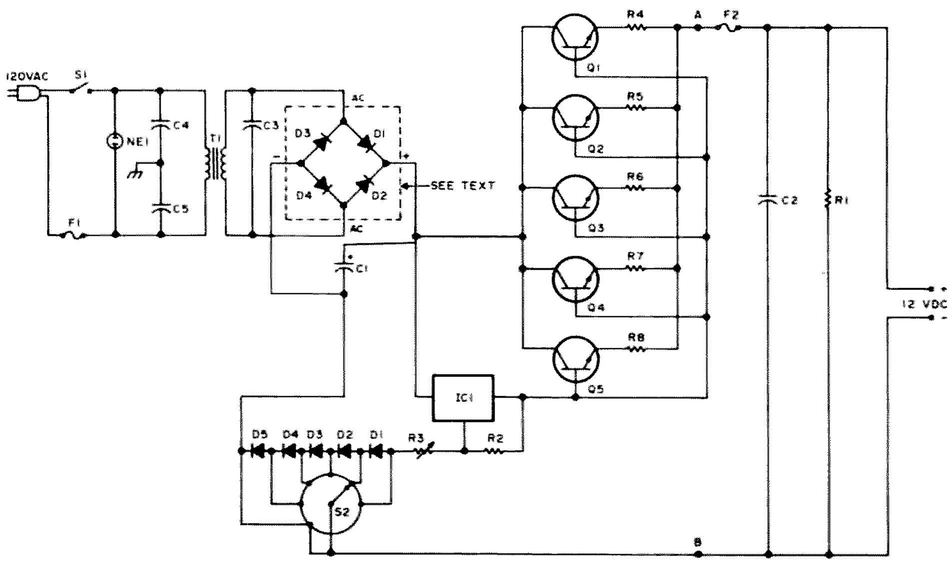

Fig. 1. Power supply schematic diagram.

never known the joy of taking a spike from the ac mains. Besides, with a dc supply, I could haul the 210X into the motel room, run coax out to the bumper mount, and dit-dah my eyeballs out.

Why not carry around a car battery and trickle charger, you ask? Too messy and cumbersome. Another option was to buy the factory-built console/power supply, but I heard rumors (only rumors) that the console/power supply left a little to be desired in the regulation department.

The Circuit

The power-supply circuit uses 2N3055 transistors. You can tailor your current capability by the number of pass transistors you use. I wanted a 25-Amp supply, so I used five 2N3055s. You can figure roughly one transistor for every 5 Amps you'll be drawing. In a 10-Amp supply, only two transistors would be used, and so on.

The 2N3055 is an NPN power device built into a TO-3 case. The 3055 is one of the more easily come by transistors and is very cheap (meeting criteria 1, 3, and 4). Because of the power these little devils are going to be dissipating, heat sinks should be employed. I used a heat sink with approximately 27 square inches of surface area with four half-inch fins, which cools nicely. Extreme heat can quickly mess up the transistor junction (not to mention a nice paint job). Before securing the transistors to the heat sink, apply some silicone thermal compound between the 3055s and the surface of the heat sink to provide a good positive heat transfer.

I have always used the rule of thumb that if you can't touch it, you can blow it. If you don't care to go heat-sink shopping, use a cooling fan. If you use a fan in addition to the heat sink, be sure the air circulates in line with the fins. Blowing air perpendicularly to the fins sets up standing waves—the aerodynamic kind—and turbulence and the cooling effect is minimal.

Transistor-mounting hardware is nice, but I didn't feel that it was necessary. I attached the transistors directly to the heat sink and then mounted the whole heat-sink assembly on a sheet of Plexiglas™ attached to four standoffs. Since the transistor case is common to the collector, I tapped a screw into one of the heat-sink fins and this became my common collector tiepoint. It is important to keep all lead lengths constant. After drilling matching holes for the base and emitter pins in the heat sink, heavy-gauge wire was soldered (carefully) to each emitter pin through a 0.25-Ohm resistor, and then a second piece of wire was attached to each base pin. I then had only to connect the rest of the circuit to either the heat sink or one of the two bus wires.

You may or may not have difficulty locating a suitable transformer capable of taking 120 V ac and squeezing it down to 17 to 24 V ac. I was lucky enough to locate an old, beat-up, ex-battery-charger transformer at a hamfest which gave me 120/17 V ac. I think you will find old battery chargers to be a good source for the transformer you will need. Remember, the transformer must be capable of carrying the current you are going to draw from your power supply. I paid $3.00 for my transformer and felt robbed; I have seen them for a dollar. Yes, you do take a risk, but remember, even if the transformer is no good, it is an excellent source of #14 AWG antenna wire (or larger)!

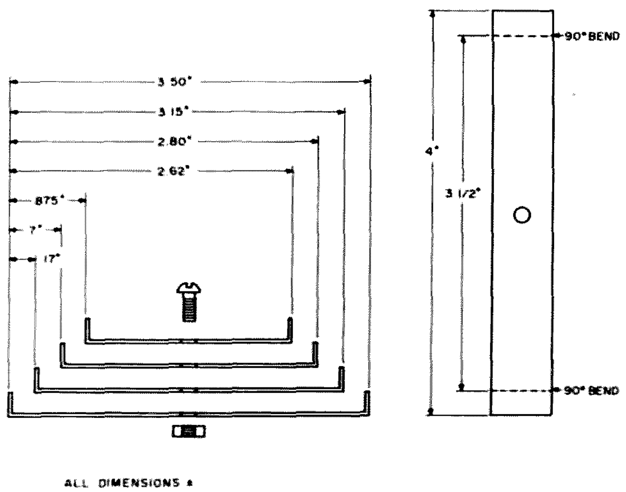

Fig. 2. Heat sink construction details.

In the rectifier circuit there are two avenues to follow. You can buy four diodes and make your bridge or you can do as I did and use one of the nifty one-inch-square epoxy bridge rectifiers. The little one-inch jobs are convenient because you don't have to mess around figuring which end is the anode and which is the cathode. Ordinarily, the epoxied bridges are simply marked AC, AC, +, and −. Can you beat that?

As always, no matter what you do for rectification, be sure your rectifier is rated for the current you will be needing. Most of the little square bridges are rated between 20 and 35 Amps. I am using a Semtech-Alpac 7905 only because I happened to have one on hand. Motorola, International Rectifier, VARO, and EDI make excellent equivalents.

Voltage regulation depends on adequate filtering and an IC known as a 7812. After much experimentation, I found that my voltage regulation (as well as hum attenuation) improved as I increased the value of filter capacitor C2. Starting out with 2000 uF, I worked my way upward to 13,000 uF. Though I now have a 37,000-uF filter capacitor in the circuit, 13,000 uF seemed to be enough. The amount of filtering achieved by going from

Parts List

C1—13,000-uF, 25-V electrolytic capacitor
C2—10-uF, 25-V electrolytic capacitor
C3—0.22-uF, 100-V tubular capacitor
C4, C5—0.01-uF, 500 V ceramic capacitor
D1-D4—25-A diodes or epoxy bridge rectifier (see text)
D1-D5—1N4004 diodes
F1—Fuse, 5 Amp
F2—Fuse, 30 Amp
Q1, Q2, Q3, Q4, Q5—2N3055 transistors
R1—120-Ohm 4-W resistor
R2—3000-Ohm, ½-W resistor
R3—500-Ohm, 1-W potentiometer
R4, R5, R6, R7, R8—0.25-Ohm, 1-W resistor
IC1—7812 voltage regulator
S1—SPST switch
S2—6-position wafer switch
T1—120/17-24-V ac power transformer (see text)
Miscellaneous: NE1 neon bulb, binding posts, line cord, 0-25-V dc voltmeter, 0-30-A ammeter, heat sinks, chassis, blower, fuseholders, and bulb socket.

13,000 to 37,000 uF is very, very slight and detectable only with a scope. Obviously one can't ignore the thought that if 13,000 uF is good, a higher value would be better, but let me caution you enthusiastic high-capacity freaks against installing 150,000-uF capacitors without limiting inrush current. I haven't experimented beyond 37,000 uF.

The 7812 voltage regulator is an IC device capable of maintaining excellent regulation as long as the input voltage falls between 14.6 and 19 volts nominally. A number of companies are producing the 7812 and it generally has some sort of prefix or suffix, but the digits remain the same.

In this circuit, the 7812 is above ground through a 200- to 500-Ohm resistor. I don't put an exact value on this because it is not that critical. Going from receive to full-output transmit on my Atlas (300 mA to peaks of 16 Amperes), the voltage drop on the power supply is 0.4 V, which ain't bad. Since I normally don't run my equipment at full bore, the drop from receive to transmit is quite small.

As was the case with the pass transistors, I mounted the 7812 on a heat sink affixed to a small piece of Plexiglas on standoffs (to simplify its isolation from the chassis). The heat sink (see Fig. 2) is made of four strips of one-inch-wide aluminum cut at varying lengths and bent up a half-inch at each end. I then placed each one "inside" a larger one until, voilà, La Heat Sink a la Cheap. To keep the strips aligned, a hole was drilled which also served to attach the 7812.

While it isn't necessary, you can build in a selectable voltage feature by connecting any number of 1N4004 diodes on a wafer-type switch. This switch goes between pin 3 of the 7812 and ground. (If this seems like a lot of hooey to you, you may disregard the above and connect pin 3 of the 7812 to ground through R3. You will see a voltage change of approximately 0.7 V with each position on the switch. With my supply, I have the capability of as much as 15 V or so, and the switch permits me to "switch down to" the proper voltage I desire (13.8 V dc).

The value of bleeder resistor R1 across the output is not critical either, but have something there for your protection.

By varying the resistance of R3, your output voltage will vary considerably. I believe a potentiometer instead of a fixed-value resistor is a better route so that more flexibility is available for future voltage needs which now might not be considered. As in my case, if you are receiving 16.8 V from your transformer, 250 Ohms is sufficient to yield the 13.8 V dc you want.

Should you be supplying your rectifier with 16 to 18 volts and not be getting a stable 13 volts or so, check to be sure that you are not losing (dropping) all of your voltage in your rectifier diodes or epoxy bridge. Some of the epoxy bridge rectifiers are poor in the area of voltage consistency. Try a different one, even of the same manufacturer. Another place to watch for voltage losses is in your wiring. The more current you draw, the higher your voltage drops may become in your transformer, rectifier, filter capacitor, or wiring. Wire which is too small may cause substantial voltage drops. I would suggest using #14 AWG wire at least.

H-u-m-m-m-m

My first test of the power supply was disastrous. Not only was the regulation terrible, but the audio was 80% hum, 20% ham. Two things lead to the elimination of hum: First (and already covered), I placed my voltage regulator above ground on the Plexiglas support; second, I connected all of my chassis ground connections to one point.

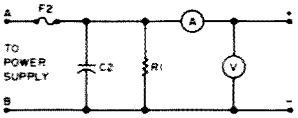

Fig. 3. Power supply metering arrangement.

As with my other home-brew endeavors, I first mounted the power supply on an open chassis. Breadboarding can save you much agony when it comes time to actually fitting the darned thing in a permanent box. Scouting around at the Dayton Hamvention, I was able to come up with a perfect cabinet (which formerly was a microvolt meter) for $1.00. When shopping for an enclosure, don't overlook old, non-working test equipment, etc.

Metering can be added easily as shown in Fig. 3. (When will the price of meters ever come down?)

The cost is going to vary depending on the state of your junk box and what kind of hamfest bargains you can locate. I spent more than I really wanted to, and that was slightly over ten dollars. You can't beat the pages of *73 Magazine* for bargains on the components used here; it was from there that I purchased all of my purchased parts.

As you build this, take your time. Do a good job. Dress all of your leads. Use red wires for + and black wires for −. Take time to consider the aesthetics of this project. Then tuck it away in a dark corner and ignore it, because it's only a stupid power supply. ■

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Direct Printing FAX

—part III: testing and operation

In this third and last part of this article, I will cover preparation, testing, and operation of the facsimile recorder.

Initial alignment will require a frequency counter, a VOM, a logic probe, and a source of video—either a live signal from the receiver, a recorded signal, or the test generator of chapter 7 in the *Weather Satellite Handbook*. In the following sequence of tests, we will gradually add ICs to the board as each stage is tested. In *all* cases the unit should be powered down prior to inserting new integrated circuits. Damage to specific chips can results if you attempt to insert them with the board powered up. Preset the controls as follows:

POWER—OFF
WHITE SET—minimum (max. CCW)
VOC ADJ—midrange
DRUM—OFF
RESET/STANDBY/PRINT—STANDBY

The following checks are associated with the particular chips added to the board as we move along. If problems are encountered at any step, you should check the board wiring around the specific chips, measure the supply voltages on the chips themselves, and try a replacement IC if it seems necessary.

1) Power up and measure the unregulated power supply voltages. You should get about 24-28 V from the LV supply and anything from 250-350 is acceptable on the HV bus. +5 and +12 volts should be obtained at the appropriate main board buses and the POWER lamp should be on.

2) Insert U3 and connect the frequency counter to pin 5 of this IC. Power up and adjust the VCO ADJ control for a reading of 2400 Hz.

3) Insert U4. The logic probe should indicate a high on the collector of Q6.

4) Insert U5 and U6. Connect the probe to pin 6 of U5 and use a test lead to momentarily ground the IC side of R21. The logic probe should indicate a relatively long pulse. Move the probe to pin 6 of U6 and again short the IC side of R21 to ground—a much shorter pulse should be indicated.

5) Insert U7. Press the PHASE switch and the PHASE ERROR lamp should come on and stay on. Use the test lead to ground the IC side of R21, and the PHASE ERROR lamp should go out.

6) Insert U8 and connect the logic probe to pin 8 of U8. With the PHASE ERROR lamp off, the probe should indicate a steady high as the IC side of R21 is grounded with the test lead. Use another clip lead to ground the transistor side of R19. Press the PHASE switch and the PHASE ERROR lamp should come on and stay on even if you ground R21. The probe should indicate a short low each time R21 is grounded. Remove the clip lead from R19—the PHASE ERROR lamp should go out the next time you ground R21 and the probe should indicate a steady logic high from that point on.

7) Insert U9, U10, U11, and U12. The following frequencies should be noted as the counter is moved to the indicated ICs:
U9 (pin 8)—2400 Hz
U10 (pin 12)—240 Hz
U11 (pin 8)—60 Hz
U12 (pin 8)—60 Hz

8) Connect the VOM across the 115-V windings of T202 and set the instrument for ac volts (120-V min.). Turn the drum switch on and advance the DRUM LEVEL control for a reading of 110-115-V ac. The drum should now be rotating away from you as you look at it from the carriage side. Momentarily pressing the MANUAL PHASE switch should cause the drum to slow slightly. It should stop if you keep the switch depressed.

9) With the drum revolving, connect the logic probe to pin 6 of U6 and a steady string of short, high pulses should be noted. If they are not present or are erratic, alter the position of the reed switch until you get a steady pulse indication. Depress and hold the PHASE switch and note the PHASE ERROR lamp. It should be on but should blink off very briefly once for each drum revolution. Release the PHASE switch and the PHASE ERROR lamp should go off at once. Turn off the DRUM switch.

10) Temporarily disconnect the TRAVERSE cable. Set the VOM to dc volts (350 min.) and connect the positive lead to the stylus probe. A reading of 240 V (±10%) should be obtained when the RESET/STANDBY/PRINT is cycled to PRINT. No voltage should be noted with the switch in the RESET or STANDBY position. Return the switch to STANDBY.

11) Connect the TRAVERSE cable and cycle the RESET/STANDBY/PRINT switch to PRINT. The carriage should begin to move away from the traverse motor. If the switch is cycled to RESET, the drive nut should begin to move back toward the traverse motor. Leave the switch in the STANDBY position and unplug the TRAVERSE cable.

12) Connect a source of video to the VIDEO INPUT jack. Unless otherwise noted, all of the following adjustments will be made during the phasing interval preceding picture transmission. This interval is a steady 2400-Hz tone, interrupted by the short phasing pulses. Insert U1 and U2.

13) Temporarily connect a speaker from the negative side of C7 to ground. Advance the WHITE SET control and you should hear an undistorted reproduction of the video signal. As the video level is increased, cycle the RESET/STANDBY/PRINT switch to PRINT and monitor the stylus voltage. (Each time you check the stylus voltage, the switch should be in the PRINT position. Keep it in STANDBY between these measurements to avoid the possibility of a shock hazard.)

14) As the WHITE SET control is advanced, the stylus voltage should gradually decrease and the meter indication should bounce up very slightly with each phasing pulse. Continue to advance the WHITE SET control and you should reach a point —between 25 and 35 volts —where the voltage will drop no lower. Retard the WHITE SET control to the point where you first reach this low-voltage threshold. If you watch the voltage during actual data transmission, it will fluctuate between the low and high voltage limits.

15) Observe the VCO LOCK lamp—it should light whenever video is applied to the input and should remain lighted throughout a frame transmission.

16) Connect the logic probe to the collector of Q6 and adjust R14 for a steady stream of logic highs during the phasing interval.

17) Turn the drum on and press the PHASE switch at the completion of the start tone. The PHASE ERROR lamp will come on and you may be able to hear a slight difference in the sound of the drum motor, indicating that it has slowed slightly. The lamp should go off sometime within about 15 seconds, depending upon the initial phase error.

At this point, all the major systems have been checked out. The last remaining step is to prepare the wire stylus and condition it. Cut one of the wires from a wire brush (one intended for use in an electric drill) and straighten it with a pair of needle-nosed pliers. The wire need not be completely straight, as some remaining curvature will assist in holding it in the stylus holder. Insert the wire into the protruding stylus tubing and trim the end so that it extends about 1/16" out of the end of the tube. Wrap a piece of fine emery paper around the drum and secure it with transparent tape. Rotate the stylus assembly such that the wire contacts the emery paper, and observe the orientation of the wire. If it is tilted slightly, it should be tilted in the direction of drum movement—that is, it should point toward the back of the drum. If it points toward the front of the drum, remove the wire and reinsert it so that it is tilted in the proper direction. Turn the drum and allow the stylus to run in contact with the rotating emery paper for a period of 30 seconds or so. The end of the wire will be quite rough initially, but you should be able to hear a considerable difference in sound as it smoothes out under the abrasive action of the paper. Remove the emery paper and prepare for the moment you have been waiting for—your first picture!

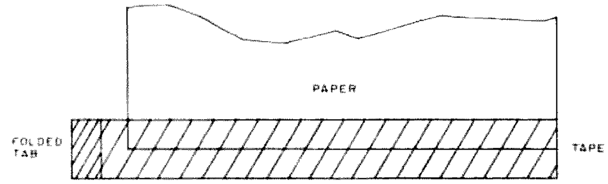


Fig. 1. Paper preparation and manipulation. The tape is placed along one edge of the paper as shown. The opposite edge is then inserted under the aluminum foil strip on the drum and the drum is rotated to wrap the paper around the drum. The edge of the paper with the tape will then completely overlap the foil strip and the tape can be smoothed down to secure the paper to the drum. Removal of the paper is accomplished by lifting the small tab at the end of the tape strip and carefully peeling the tape away from the paper surface. A strip of tape can be reused several times if handled carefully.

Operation

Three different papers have been used to date, all of which work quite well, although there are some advantages to one over the others. The preferred paper is that manufactured by Xerox® for their Telecopier™ office facsimile machines. Contact the nearest Xerox office and request reorder number 3R830. The paper is 8.5" × 11" and comes in packages of 150 and 500 sheets. The cost is lower in 500-sheet lots, and you can save still more by ordering two boxes of 500 sheets at one time.

A paper equal to the Xerox is Timefax NDK, manufactured by Fitchburg Coated Paper Products of Scranton PA. The main difficulty is getting Fitchburg to supply the paper in small lots. They have yet to prove the least bit cooperative, and the Xerox paper is much easier to obtain. If you can get the Timefax NDK, it will do an excellent job.

3M, Inc., of Minneapolis MN makes a similar paper for its line of office fax machines, and the price is in line with that of Xerox. While it will do a good job, I have found the 3M paper to be somewhat smokey in operation and it doesn't seem to yield as nice a gray scale as the Xerox paper despite the claims of the sales reps. It is quite possible that it functions best at a slightly lower maximum printing voltage, so I wouldn't say to avoid it if it is the easiest paper for you to obtain. You might try substituting a 100-V zener for D5 to bring the printing voltage down to 220-V maximum if you plan to use the 3M paper.

All of the papers come in the standard 8.5" × 11" size and must be cut down to 7" × 7" for use on the recorder. A small office paper cutter set up with wooden stops is the fastest way to cut the paper to size. With a good cutter, you can slice up to 10 sheets at a time.

Loading the Paper. The printing side of the paper is the smooth white surface —the back looks slightly mottled and is a little rougher in texture. Lay the piece of paper—printing side up—on a table and strip off a piece of transparent tape (the high-quality translucent variety is best) about 7.5" long. Fold over one end to make a little tab so that you can strip

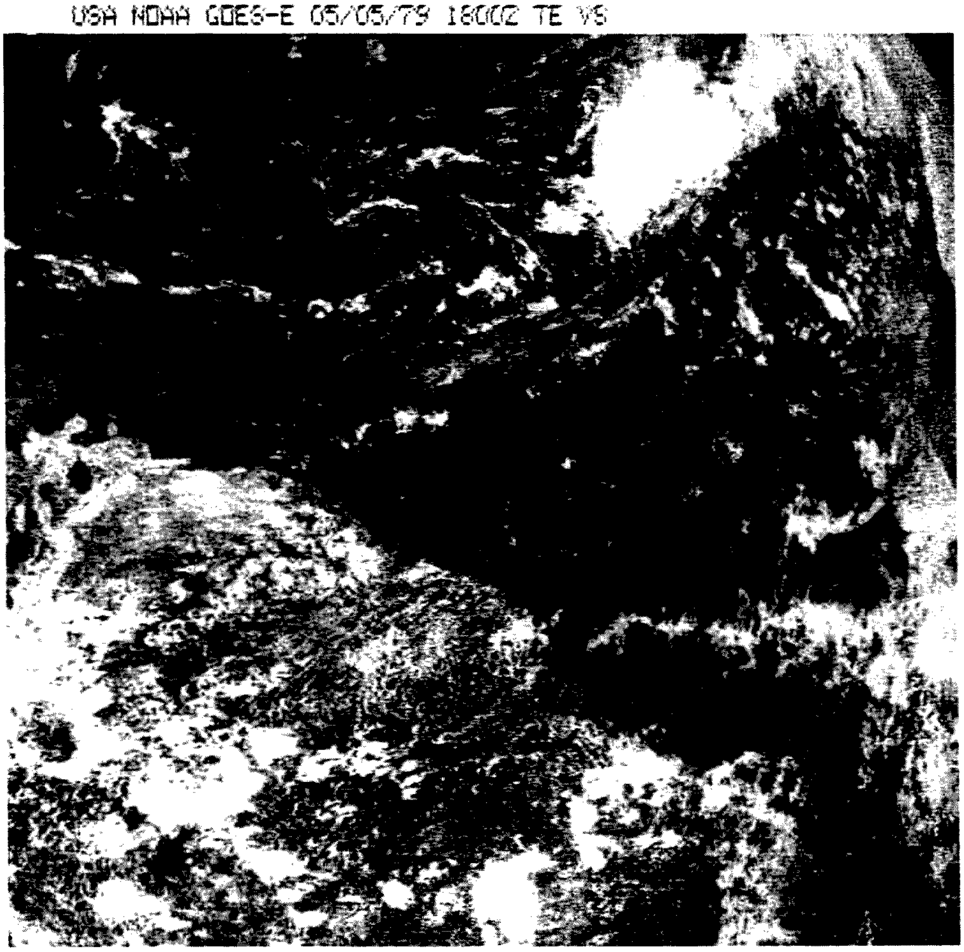


Fig. 2. An example, from a GOES E Tropical East quad, of the excellent resolution obtained with the FX-2E direct-printing recorder. These fine cloud details could be resolved with a photographic system, but extreme care in focusing the light gun would be required. The direct-printing option, because a wire stylus is used, always yields optimum resolution without the need to worry about focusing the system.

the tape off later. Lay the tape over one edge of the paper as indicated in Fig. 1.

Cycle the RESET/STANDBY/PRINT switch to RESET until the drive nut reaches the right end of the drive rod. Slide the edge of the paper opposite the tape under the folded strip of foil and, holding the paper against the drum with your fingers, rotate the drum away from you, wrapping the paper around the drum. When you get all the way around, the paper should overlap the foil strip and you can smooth down the tape to secure the paper to the drum.

Position the carriage so that the stylus rests just inside the right margin of the paper. Remove the stylus from the paper and cycle the switch to PRINT. The drive nut will move back toward the carriage. Guide the brad over the base of the carriage and cycle the switch to STANDBY when the drive nut starts to move the carriage. Rotate the stylus assembly to place the stylus back on the paper and you are ready to go.

Printing. When the GOES carrier comes on, turn on the drum. At the completion of the start tone, press the PHASE switch. Sometime within about 15 seconds of this action the PHASE ERROR lamp should go off, indicating the drum is in phase with the incoming signal. Twenty seconds after the end of the start tone, cycle the RESET/STANDBY/PRINT switch to PRINT. When the frame starts, you should be able to see the effect on the drum as the stylus moves along. When the stop tone arrives, cycle to STANDBY, stop the drum, remove the stylus, and take off your picture by carefully stripping off the strip of tape. If you put the tape carefully aside, you can use it for quite a few prints.

Optimizing. If this is your first print, it is not likely to be perfect—it probably will be too light. To optimize the WHITE SET control, start the printing during the phasing interval and carefully watch the paper as you back off the WHITE SET control. The optimum setting is where you can just see the slightest darkening of the surface at the printing stylus.

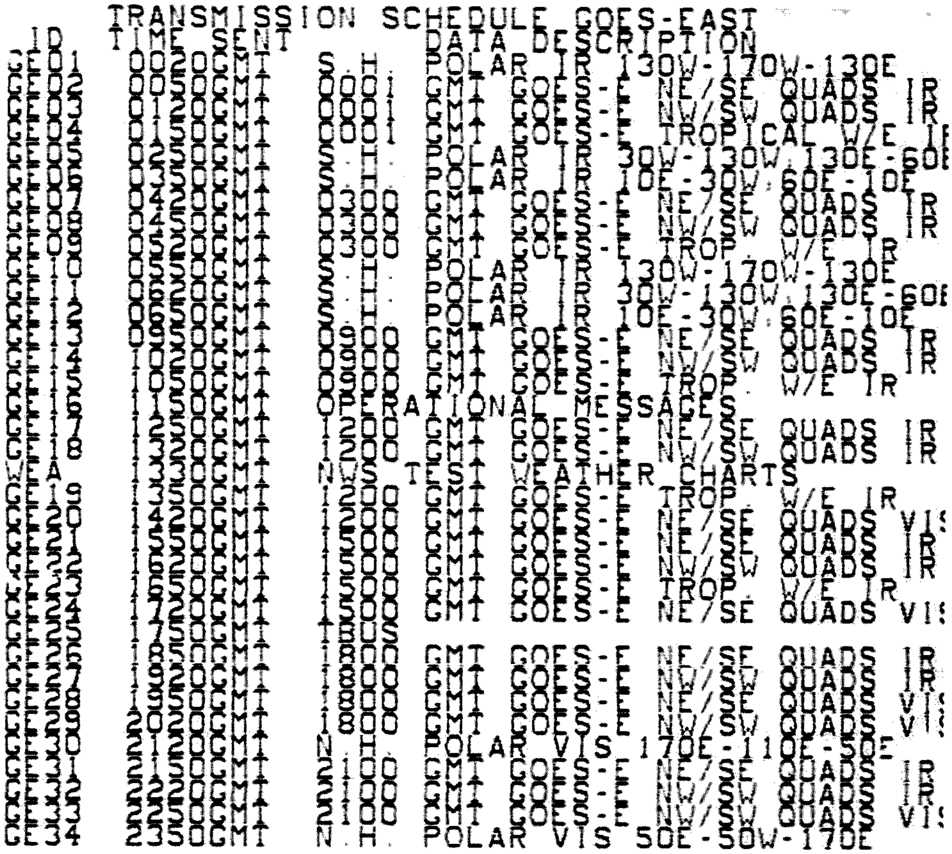
The reset procedure can be shortened somewhat by locating the proper start position for the carriage and running the drive nut up against the carriage as noted. Slide the carriage away from the nut and use india ink to mark the glass where the brad contacts it. In the future when you reset the drive nut, simply run it back to the mark you have made and then you can move the carriage up against it, knowing that the stylus is properly located.

Operation with TIROS/NOAA or METEOR Imagery

A triggered oscilloscope is used to phase the incoming picture when the FX-2E is used to display pictures from polar-orbiting spacecraft. Connect the TRIGGER jack to the scope trigger input and the VIDEO OUT jack to the scope vertical input. What you will get is a video waveform display triggered by the fax drum. With a little experience, you will be able to recognize the position of the line sync pulses on the scope display. Set the recorder up as described and when the signal is solidly out of the noise and with the drum running, simply press the MANUAL PHASE switch in short bursts until the line sync pulse is aligned with the left edge of the scope display. At this point, the RESET/STANDBY/PRINT switch can be cycled to PRINT until the carriage reaches its limit of travel.

Alternatively, if you have built the CRT monitor of chapter 4 of the *Weather Satellite Handbook*, you can use it for phasing display. Connect the video input to the monitor in parallel with that of the fax and

lift the diode connected to point B in Figure 4.6 of the *Handbook*. Connect the TRIGGER output to this point, and the monitor display will now trigger from the fax drum. In practice, it is easiest to install an EXTERNAL TRIGGER jack to the back of the monitor, connected to the TRIGGER output of the FX-2E. An SPST toggle switch (INTERNAL/EXTERNAL TRIGGER) can then be added so that you have switch-selection of either internal or external triggering. The internal position is used for normal monitor operation or when the fax drum is not running (saving wear and tear on the horizontal deflection transistors), while the external position is used to manually display and phase the fax. To use the monitor in this fashion, you should reset the fax carriage and load paper as instructed. Start the drum, and switch the monitor to EXTERNAL TRIGGER. When the signal is out of the noise, you can start the monitor sweep and operate the MANUAL PHASE switch of the FX-2E to move the line sync pulse (either visible or IR) to the left edge of the viewing area. At that point, you can start the fax printing.



```
        TRANSMISSION SCHEDULE GOES-EAST
 ID    TIME SENT        DATA DESCRIPTION
GE01   0020GMT   S.H. POLAR IR 130W-170W-130E
GE02   0050GMT   0001 GMT GOES-E NE/SE QUADS IR
GE03   0120GMT   0001 GMT GOES-E NW/SW QUADS IR
GE04   0150GMT   0001 GMT GOES-E TROPICAL W/E I
GE05   0250GMT   S.H. POLAR IR 30W-130W.130E-60E
GE06   0320GMT   S.H. POLAR IR 10E-30W.60E-10E
GE07   0420GMT   0300 GMT GOES-E NE/SE QUADS IR
GE08   0450GMT   0300 GMT GOES-E NW/SW QUADS IR
GE09   0520GMT   0300 GMT GOES-E TROP. W/E IR
GE10   0550GMT   S.H. POLAR IR 130W-170W-130E
GE11   0620GMT   S.H. POLAR IR 30W-130W.130E-60E
GE12   0650GMT   S.H. POLAR IR 10E-30W.60E-10E
GE13   0950GMT   0900 GMT GOES-E NE/SE QUADS IR
GE14   1020GMT   0900 GMT GOES-E NW/SW QUADS IR
GE15   1050GMT   0900 GMT GOES-E TROP. W/E IR
GE16   1150GMT   OPERATIONAL MESSAGES
GE17   1250GMT   1200 GMT GOES-E NE/SE QUADS IR
GE18   1320GMT   1200 GMT GOES-E NW/SW QUADS IR
WEA    1330GMT   NWS TEST WEATHER CHARTS
GE19   1350GMT   1200 GMT GOES-E TROP. W/E IR
GE20   1420GMT   1200 GMT GOES-E NE/SE QUADS VIS
GE21   1550GMT   1500 GMT GOES-E NE/SE QUADS IR
GE22   1620GMT   1500 GMT GOES-E NW/SW QUADS IR
GE23   1650GMT   1500 GMT GOES-E TROP. W/E IR
GE24   1720GMT   1500 GMT GOES-E NE/SE QUADS VIS
GE25   1750GMT   TBUS
GE26   1850GMT   1800 GMT GOES-E NE/SE QUADS IR
GE27   1920GMT   1800 GMT GOES-E NW/SW QUADS IR
GE28   1950GMT   1800 GMT GOES-E NE/SE QUADS VIS
GE29   2020GMT   1800 GMT GOES-E NW/SW QUADS VIS
GE30   2120GMT   N.H. POLAR VIS 170E-110E-50E
GE31   2150GMT   2100 GMT GOES-E NE/SE QUADS IR
GE32   2220GMT   2100 GMT GOES-E NW/SW QUADS IR
GE33   2250GMT   2100 GMT GOES-E NW/SW QUADS VIS
GE34   2350GMT   N.H. POLAR VIS 50E-50W-170E
```

Fig. 3. Direct-printing readout of a GOES E operational message, showing the excellent printing clarity which is obtained.

Operation as a Photographic Facsimile Recorder

The only electronic changes for photofax operation include the following:

1) Delete R9, R10, D5, D6, Q2, and R11.

2) Replace R8 with a 100-Ohm pot, which will serve as a BLACK SET control.

3) Add a 15-mA meter in the switched 300-V line.

4) Connect an R1130B glow modulator tube from the collector of Q1 to the 350-V bus, with the 15-mA meter in series. Rewire S201A so that the lamp is energized (connected to the 350-V line) with the switch in the PRINT position.

5) Reverse the diodes (D1-D4) in the detector, delete R7, and replace it with a 2200-Ohm resistor connected between the base of Q1 and the +12-V bus.

Refer to either the first edition of the *Weather Satellite Handbook* or the September and October, 1975, issues of *73* for construction of the light gun and its mounting to the carriage. The phase-sensor reed switch will have to be reoriented so that it closes just as the edge of the photographic paper passes the light gun lens.

With no video input, adjust R8 (BLACK SET) for a meter reading of 15 mA with S201 in the PRINT position. Full video drive (white level) should then be applied and the WHITE SET control adjusted for a reading of about 1 mA. Resin-coated enlarging papers are recommended for printing, with Kodak Kodabrome RC being preferred (normal contrast grade). Black and white level adjustment should be altered in practice to produce good prints when the paper is processed for 2 minutes in Kodak Dektol developer. Any commercial fixer may be used, and you should consult your local photographic supplier for trays, chemicals, safelights, etc. The aluminum foil strips and ground connections will not be required on the drum and can be omitted. When used in the photofax mode, the recorder must be operated in a darkroom with suitable safelight illumination to protect unexposed paper. The paper can be cut to the required 7" × 7" in the darkroom.

Although the recorder will produce superb photographic prints, I have not operated it in the photographic mode since first setting up the direct-printing version (see Figs. 2 and 3). The fax system is certainly somewhat more complicated a project than a CRT monitor, primarily due to the mechanical aspects of the project. Once finished, however, it should give you years of trouble-free service. The prototype of the photographic facsimile version has been in operation for over two years without a single problem, and there is no reason to assume that the direct-printing version will not have the same reliability. The FX-2E system is virtually ideal in that it provides for easy operation, low operating costs, immediate availability of good-sized prints, superb resolution, and photographic image quality. ■

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Unplug It, Dummy!

—safety for the traveling ham

For those recreational vehicles which have provisions for connecting to 110-volt outside power, there is always the risk of the owner forgetting to unplug the power cord before driving off. Human frailty and Murphy's Law being what they are, this is bound to happen sooner or later.

For us, the reckoning came one time when we had our camper van parked in our driveway while we were packing for a trip. We had the cord plugged into our house power for precooling the refrigerator. Getting off later than we had hoped, we took off in a hurry. When we got to our first stop, we were horrified to find the socket from our extension cord sitting in the van power receptacle. The cord had pulled right out of its socket when we drove off, meaning it was lying in our driveway with the live ends exposed. Mindful of the neighborhood children who frequently play in our driveway, we put in a frantic long-distance call to our local police, informing them of the situation and asking them to do something about the hazard. Fortunately, no further harm came of it.

To preclude any repetition of this fiasco, I installed a cord alarm in our van. It is arranged so that a door bell rings if the ignition is turned on while the cord is plugged in. You can install such an alarm in your RV for an expenditure of about $15 for parts—less than the cost of a power cord that might be ruined by a drive-off. It does the same job as a commercial alarm that sells for $50.

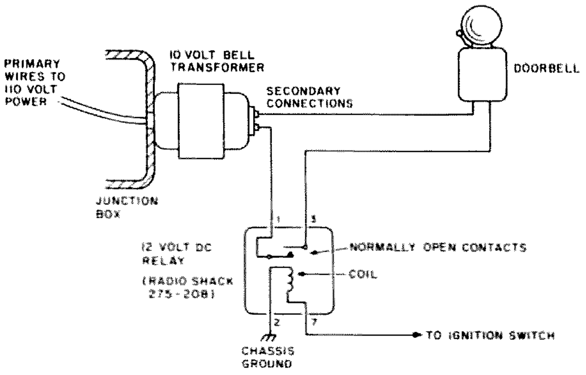

Fig. 1. Wiring diagram of the cord alarm.

You will need the following three items: (1) An ordinary door bell, installed near the driver's seat. I chose a door bell rather than a buzzer in order to have a distinctive alarm sound that would not be confused with the seat-belt warning buzzer. (2) A bell transformer of the type designed to mount in a knockout hole in a junction box. Be sure to get a 10-volt transformer rather than a 16-volt type, which is for chimes. (3) A 12-volt dc relay (Radio Shack #275-208 or equivalent).

Attach the bell transformer to an unused knockout hole in the power control center or the junction box for the outside power receptacle. (Confinement of the 110-volt wiring to the inside of such a box makes for a very safe installation.) Connect the primary wires to the 110-volt power at the point where it enters the vehicle, with no circuit breakers or other switching devices intervening so that the alarm will not fail to operate because of a breaker or switch being turned off. (Protection against short circuits in the transformer is given by the circuit breaker feeding the outlet into which the cord is plugged.)

Make a bracket for the relay socket out of sheet metal or aluminum angle and mount the relay in a convenient location. Wire up the system as shown in Fig. 1, soldering all connections to the relay socket. The transformer is connected to the bell in series with a pair of normally-open contacts on the relay. One end of the relay coil is connected to chassis ground, and the other end is connected to a circuit that is energized when the ignition is turned on. Pick a circuit that is energized only in the "ignition" position of the switch, and not the "accessory" position. For our Econoline van, a convenient connection point was the wire feeding power to the seat-belt warning system.

With these connections, turning on the ignition operates the relay and completes the circuit from the transformer to the bell so that it will ring if the transformer is powered by the cord being plugged in.

What if you remember to unplug the cord but forget to stow it? This alarm is foolproof but it is not claimed to be *damn*-foolproof! ■

Power Plus for the Omni

—improving on Ten-Tec's power supply

The Ten-Tec Omni (#252-MO) power supply is a fine unit, but there are some improvements that can be made. I am sure competition dictates just how much a manufacturer can put into a piece of equipment, but there is no reason ham operators cannot make a few usable modifications themselves. The modifications I made were relatively simple, and I now have a better and more useful power supply.

My first modification was to install a chassis-mounted ac receptacle to be powered whenever the power switch is turned on. This provides a switched source for a cooling fan. By doing this, my cooling fan is on any time that my power supply is on and I cannot forget to turn it on (see Fig. 1).

My next undertaking was to install an overvoltage protection (crowbar) circuit. This is a must to protect expensive gear from being zapped should a pass transistor become shorted and allow excessive high voltage to reach places it should not! The crowbar circuit described in the August issue of *73 Magazine* (page 90) by K9MLD was used. (See Fig. 2). All of the components were mounted on a three-lug terminal strip with the exception of the 25-Amp SCR, which was mounted on a bracket of its own. Space is no problem. I used a 2N685 SCR which must be isolated from ground, as the stud is the positive terminal. Fuse installation is very simple. With a fuse holder mounted on the back cover of the power supply near the top edge, the red wire from the pass transistor can be cut near the center and connected to the fuse holder without disconnecting either end of the wire.

With this circuit connected to the 13.8 positive voltage line, should the SCR be gated by an overvoltage signal, the SCR will short the 13.8 positive voltage line to ground and blow the fuse, thereby positively disconnecting the output of the power supply. Should you have a variable power source available, the trimpot can be adjusted to gate the SCR at 15 V and marked at that position. After installation in the power supply, the trimpot can be turned to test for proper operation, and when testing is completed, returned to the marked (15-V) position. During checkout, the current limiter (not the fuse) was shutting down the power supply inadvertently. This apparently was being caused by rf getting on the gate of the SCR, causing the SCR to conduct. The installation of the two .01 caps corrected this problem (see Fig. 2).

There was no reason to have two 12-volt power supplies in my shack (one for my Omni and the other for other equipment such as the 2m rig), so I set out to eliminate the home-brew job and use the Ten-Tec #252MO for everything.

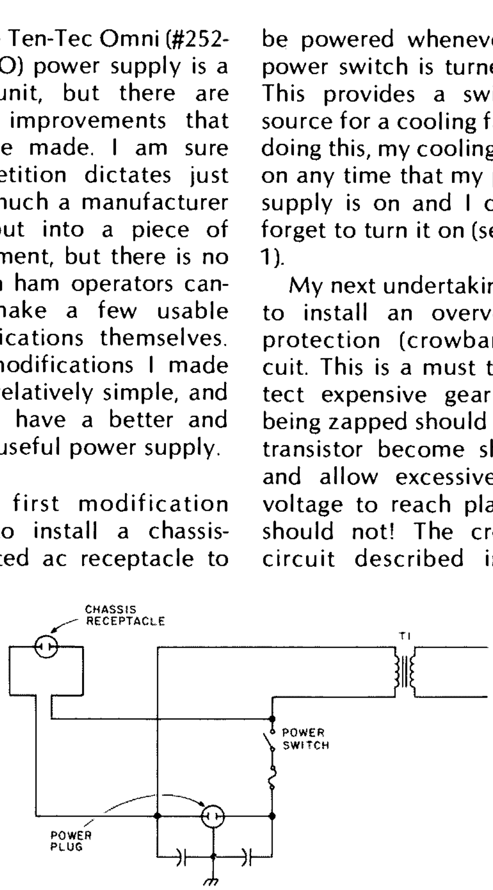

Fig. 1.

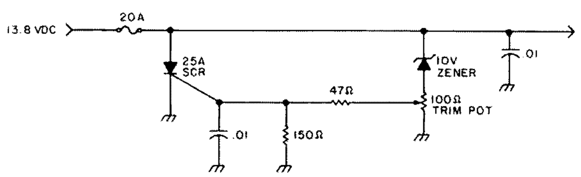

Fig. 2.

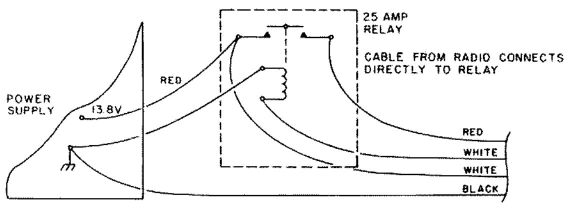

Fig. 3.

The manufacturer designed it to be turned on by the power switch on the Omni in series with the on/off switch on the front of the power supply. The power supply could not be turned on and used without the Omni being turned on as well. A simple rearrangement of the 115-V ac wiring in the power supply bypassed the switch on the radio and allowed the power supply to be turned on by the switch on the power supply only (see Fig. 1).

To control the 13.8 V dc to the Omni, a 25-Amp Potter & Brumfield #PR5DY relay was installed, as suggested in the owner's manual. The relay coil is controlled by the switch on the Omni through the two center wires of the cable between the power supply and the radio. Now my Ten-Tec power supply can be turned on without turning the Omni on (see Fig. 3).

Note: To facilitate mounting the relay, the two auxiliary phono jacks and their associated wiring were removed and discarded, and two banana plug type jacks were installed in the front panel, with wiring capable of handling the total output of the power supply. This makes 13.8 V dc readily available for anything in the shack with current limiting and overvoltage protection.

So, Ten-Tec owners, if you are of the mind to do a little improving of your equipment, the details are left to your discretion, imagination, and ingenuity. I might add that the #252M and #252MO are identical electrically, so these modifications apply to both. The peace of mind that comes from having the overvoltage protection is reward enough, not to mention the good feeling of knowing that I did it myself! 73. ■

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Oddball Offsets for the KDK-2015R

—make a good rig better

Did you ever wish you could program any offset into the 2015R? If so, read on. Here is a cheap ($0-$5, depending on your junk box) modification which will do just that, without drilling any holes or installing any extra switches. The KDK has all you need and even has the correct labels on one of the switches. The offset frequency can be programmed into the memory in the normal manner, and the KDK will display transmit and receive frequencies when the PTT switch is operated. It does not interfere with the normal function of the memory scanner, either.

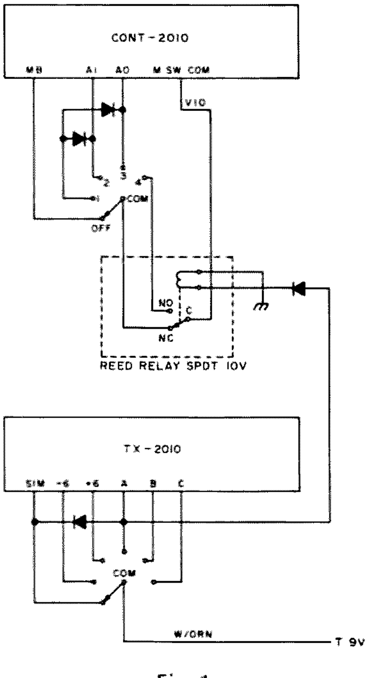


Fig. 1.

All of the tools that are needed to do the job are a small soldering iron, a Phillips screwdriver, dikes, and perhaps a pair of tweezers or hemostats. The only materials needed are an SPDT reed relay with a 10-V coil, two diodes, some hookup wire, and solder.

Study the diagram (Fig. 1) so that you will understand the hookup and proceed as follows:

1. Remove the four screws from the case and remove both halves.

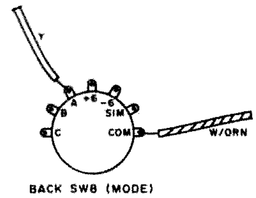


Fig. 2.

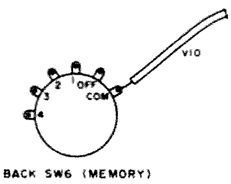


Fig. 3.

2. Turn the rig on its back with the antenna connection facing you.

3. Locate SW8 (Fig. 2) and lift the yellow wire from tab "A". Insulate the end with spaghetti.

4. Solder a diode between the tab marked "A" and the tab marked "SIM"; observe polarity.

5. Solder a piece of hookup wire to the tab marked "A". The length of the hookup wires will depend on the make of switch you use and where you locate it. This is all of the work to be done on SW8.

6. Locate SW6 (Fig. 3) and lift the violet wire from the tab marked "COM".

7. Solder a piece of hookup wire to the violet wire and cover the splice with spaghetti.

8. Solder a piece of hookup wire to the tab marked "4". This is a tight place; be careful not to melt any wires.

9. Select the place to install the reed relay. I put mine on the rear side of the CONT-2010 board on the

left-hand end in front of L6 and L7 on the PLL-2010 board, with the connections pointing up. It can be fixed in place with Silastic™.

10. Place a solder lug under the front-left corner screw on the PLL-2010 board.

11. Solder a piece of hookup wire to the solder lug.

12. Solder the other end of this wire to one side of the relay coil.

13. Solder a diode to the other end of the relay coil. Observe polarity.

14. Solder a wire from SW8, tab "A" (step 5) to this diode.

15. Solder the extension of the violet wire (step 7) to the common terminal of the relay.

16. Solder a piece of hookup wire to SW6, tab "COM" (step 6) and solder the other end to the NC contact of the relay.

17. Solder the wire from SW6, tab 4 (step 8) to the NO contact of the relay. This completes the modification. Be sure that none of the connections will touch the case. Check your wiring and install the case halves.

To operate, program the transmit frequency into the number 4 memory in the normal manner. Set the receive frequency on the vfo. Place the mode switch in the "A" position. Place the memory switch in the OFF position.

Now for the moment of truth. Press the mike button and, presto, the transmit frequency programmed into the number 4 memory is displayed. Release the button and the receive frequency in the vfo is displayed.

This modification works well, costs about the same as one offset crystal, takes about an hour of your time, and is fairly easy to do. Have fun! ■

✓ Reader Service—see page 194

The Strange Predicament of Walter Hann

—OE8WHK did the right thing— and suffered the consequences

Walter Hann OE8WHK, prosecuted after rendering life-saving communications assistance.

Robert B. Grove WA4PYQ
Grove Enterprises, Inc.
Rt. 1, Box 156
Brasstown NC 28902

It was a foggy Monday, August 13, 1979, when Walter Hann OE8WHK switched on his Bearcat 101 scanner. Immediately, the scanner locked onto a local police channel and Hann learned of a frantic rescue attempt being conducted in the picturesque Austrian Alps a few miles from his home.

But the communications was by no means routine. A local ham radio operator, OE8PPK, was unwittingly causing interference on a nearby amateur frequency, preventing the police from making radio contact with the rescue helicopter hovering nearby, desperately searching for the injured victim.

Walter Hann grabbed the microphone of his two-meter Icom IC-215 and immediately called OE8PPK to urge him to QRT so that the rescue mission could proceed. The other ham dutifully complied, thanking Hann over the air for alerting him.

This initial episode was the very essence of amateur radio at its best: A ham radio operator, aware of a life-saving attempt being threatened by a communications problem, takes immediate action to solve the interference problem. Unfortunately, the story did not end there, for in Austria it is illegal to possess a radio capable of monitoring police calls.

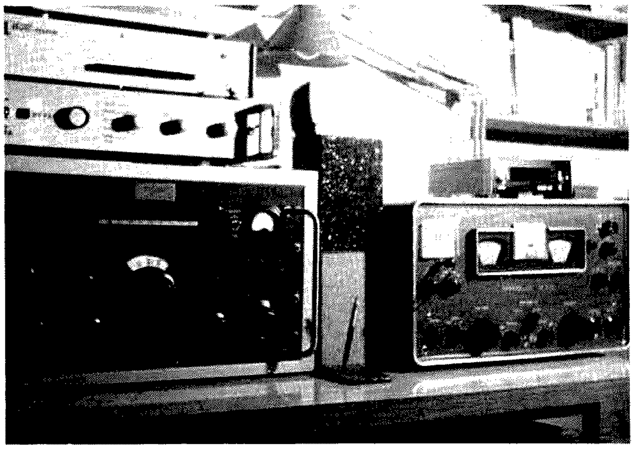
The interfering transmissions of OE8PPK had been tape-recorded by the police for follow-up, and now they heard Walter Hann's name and callsign being announced by the involuntary intruder.

Because Hann is an employee of the Austrian government, identification came quickly. Officials rapidly made the 20-km journey from Klagenfurt to St. Veit/Glan, Hann's QTH, and there confronted his wife.

Although Hann was no longer at home, the PTT officials demanded access to the ham shack where they siezed the Bearcat and made note of all other equipment owned by Hann.

The next day Hann was summoned to Klagenfurt for a three-hour interrogation. His inquisitors wanted to know where he got the equipment, how it cleared customs, who else had such equipment, and other details about his monitoring hobby.

Since Hann is employed by the government, he was dealt with harshly. He was forced to forfeit the Bearcat receiver and pay a steep



A small segment of Walter Hann's listening post.

fine. But that wasn't all. In November, two Customs investigators came to his office and conducted a lengthy hearing. How did the BC-101 get into Austria? How much did he pay? Who else owns similar equipment? How was his ham equipment brought into the country?

Hann owned a Drake R-4B, an SPR-4, and an FS-4 synthesizer, a Barlow-Wadley SCR-30, a HAL RVD-1002 RTTY demodulator, a Collins 51J3 receiver, and many other pieces of gear. The officious officials pointed out that unless Hann could produce legal proof of customs clearance, they would conclude that all the equipment had been smuggled into Austria.

Since Customs officials could not determine that Hann had used the equipment in the commission of an illegal act, he was not imprisoned. But he has been assessed heavy fees for additional duties, fined for the act of listening to a private communication, and is now awaiting additional disciplinary action because of his government position with the Austrian Finance Administration (Customs). This action will probably be both verbal and punitive, and Hann expects his salary to be cut.

Investigators then intruded into Hann's private papers, looking for evidence of illegal activities, confiscating a letter from an American collegue who offered to send him a Bearcat 250 scanner.

In the United States, any citizen is permitted by law (Section 605, 1934 Communications Act) to monitor for his own personal interest any radio communication of any nature, just as long as he does not disclose the contents to another person or use the information for his own personal gain.

Post- und Telegraphendirektion für Kärnten in Klagenfurt als
Fernmeldebehörde I. Instanz
9020 Klagenfurt, Sterneckstraße 19

Zustellung zu eigenen Handen

(Behörde)

GZ. 24915-3/79 Klagenfurt, am 29. August 1979

An Herrn Walter HANN, Finanzbeamter,

Neubaugasse 23

9300 St.Veit a.d.Glan

Beschuldigten-Ladungsbescheid

Es wird Ihnen zur Last gelegt, in der Zeit von 2. Juni 1979 bis 13. August 1979 in St.Veit an der Glan eine Funkempfangsanlage, welche zum Empfang von nicht für die Allgemeinheit bestimmten Aussendungen geeignet ist, ohne fernmeldebehördliche Bewilligung verwahrt, errichtet und betrieben

und dadurch ~~eine~~ Verwaltungsübertretungen nach § 26 des Fernmeldegesetzes, BGBl. Nr. 170/1949, begangen zu haben.

Gemäß § 40 Abs. 2 und § 41 des Verwaltungsstrafgesetzes werden Sie aufgefordert, unter Mitnahme dieses Ladungsbescheides und

zur Vernehmung — mündlichen Verhandlung —

am Mittwoch, den 12.9. 1979, 9.00 Uhr

bei diesem Amte, II. Stock, Zimmer Nr. 132

~~beim Amtstag in~~ persönlich zu erscheinen oder einen mit der Sachlage vertrauten und schriftlich bevollmächtigten eigenberechtigten Vertreter zu entsenden. Die Vollmacht ist stempelpflichtig.

Gleichzeitig werden Sie aufgefordert, die Ihrer Verteidigung dienlichen Beweismittel mitzubringen ~~oder~~ diesem Amte so zeitlich anzuzeigen, daß sie zur Vernehmung herbeigeschafft werden können.

Im Falle ungerechtfertigten Ausbleibens

wird gemäß § 41 Abs. 3 des Verwaltungsstrafgesetzes das Strafverfahren ohne Ihre Anhörung durchgeführt werden.

~~haben Sie gemäß § 19 Abs. 3 des Allgemeinen Verwaltungsverfahrensgesetzes Ihre zwangsweise Vorführung zu gewärtigen.~~

Gegen diesen Bescheid ist zufolge § 19 Abs. 4 des Allgemeinen Verwaltungsverfahrensgesetzes kein Rechtsmittel zulässig.

Für den Präsidenten:

(Unterschrift)

Formular 30 zu § 41 VStG. (Beschuldigten-Ladungsbescheid für Behörden, die zugleich Vollstreckungsbehörden sind.)

VwV. 1—2011. BMZl. 79.349-4/66. — Österreichische Staatsdruckerei. L0010959

Official summons served by the Austrian PTT.

But an unsettling spectre has appeared on the horizon. A number of new interpretations, prospective amendments, and even an entire rewrite of the Communications Act threaten to undermine the American privilege of listening in.

The catalyst for these actions has been the common-carrier television industry, disturbed because of the prospect of home TV viewers picking up satellite programs direct without having to pay subscriber fees. Law enforcement agencies are also concerned about the use of scanners to evade apprehension. Several bills are now on the floor of Congress intended to limit our constitutional right to listen.

Will it be the conscientious amateur community who will protest the implementation of these restrictions on our rights? Only you can answer that question. ■

Put "the Rep" in Your Repeater

—an automatic autopatch dialer

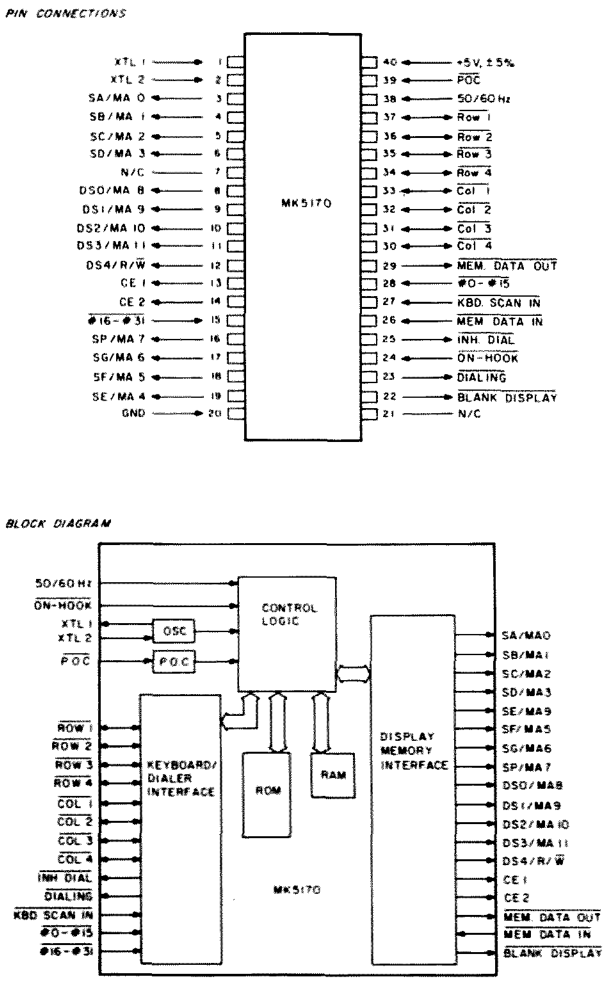


Fig. 1. Pin connections and block diagram.

O.C. Stafford K4ALS
3702 Holts Chapel Rd.
Greensboro NC 27401

Continuing changes and interpretations of FCC rules indicate that autopatch facilities attached to amateur repeater stations must be monitored to prevent the abuse of the autopatch.

Because of these requirements and other restrictions, numbers of clubs have discontinued the use of their autopatch facilities or else now have a very limited operation. Some clubs have disintegrated over the issue of autopatches. One solution, however, is to use a control operator to monitor the calls.

One of the big problems facing owners of repeaters equipped with autopatch is the ability to control the numbers being dialed. Another problem is that some people make calls which are not really legal or are not in the best interests of ham radio. Now you can control what gets dialed, with the Rep.

The circuit described in this article makes use of the repertory dialer chip, the MK5170, made by Mostek. The chip is a 3870 microcomputer that has been programmed to act as a repertory dialer. The pin connections diagram is shown in Fig. 1. The unit can be programmed with only approved phone numbers for later dialing.

The chip can be addressed by a touchtone™ pad in a minimum-hardware configuration. It will store up to 100 phone numbers which can be loaded and retrieved with a two-digit access code. The circuit diagram for the 100-number system is shown in Fig. 2. If a system with 24 numbers or fewer is needed, the memory circuit of Fig. 3 can be used.

I have tried to include enough hardware and logic on the board to make the circuit easier to interface with systems other than the Buffington phone patch and control system which has been described in past issues of *73 Magazine*.[2] That system will be used to show how the unit can be interfaced.

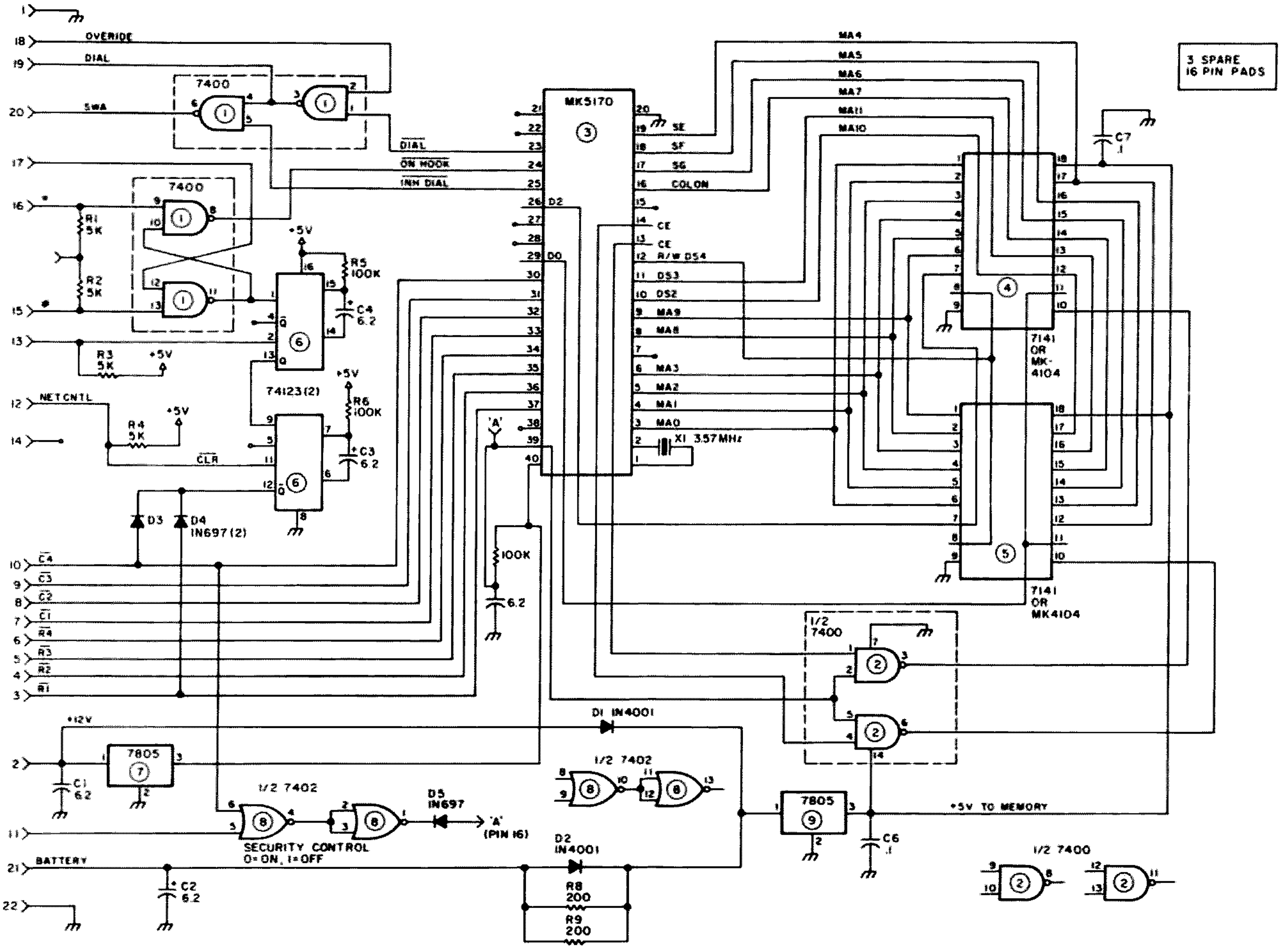


Fig. 2. Circuit diagram for the 100-number system.

There are three control pins which define the mode of operation: Pin 23 indicates that a dialing cycle is in progress by going low, pin 24 (if low) indicates that the phone is on hook, and pin 25 goes low during data entry and is used to inhibit the dialer circuit.

Fig. 4 shows how the unit is connected to the autopatch and control system described by Buffington. The unit operates in the Dial mode when accessed by a user and in the Enter mode when accessed by a control station. Fig. 5 shows the actual hardware hookup. Fig. 6 shows the switch circuit that is used to route data between the decoder, the dialer, and the Rep.

To access the Rep, the user must use the following sequence:

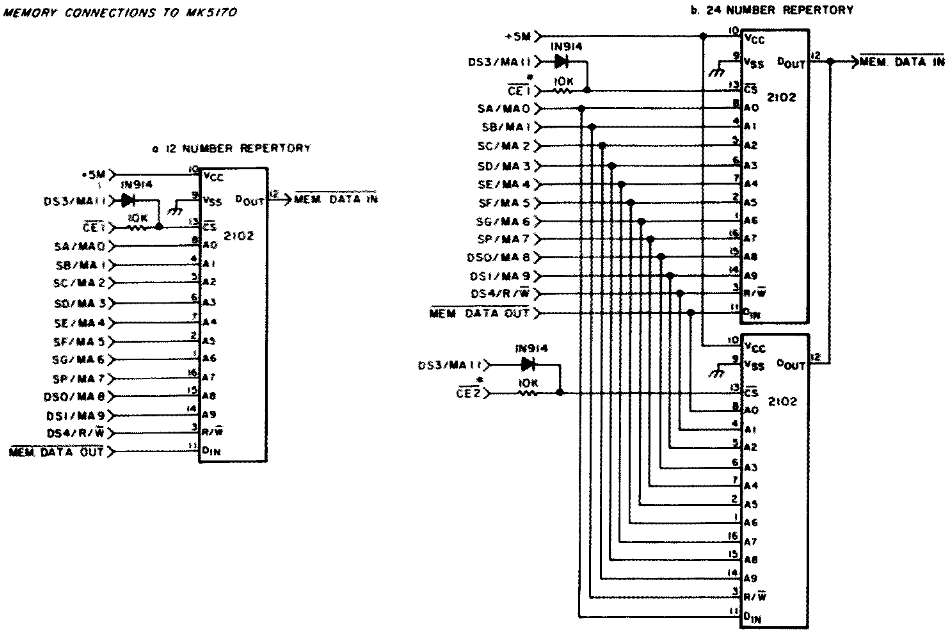
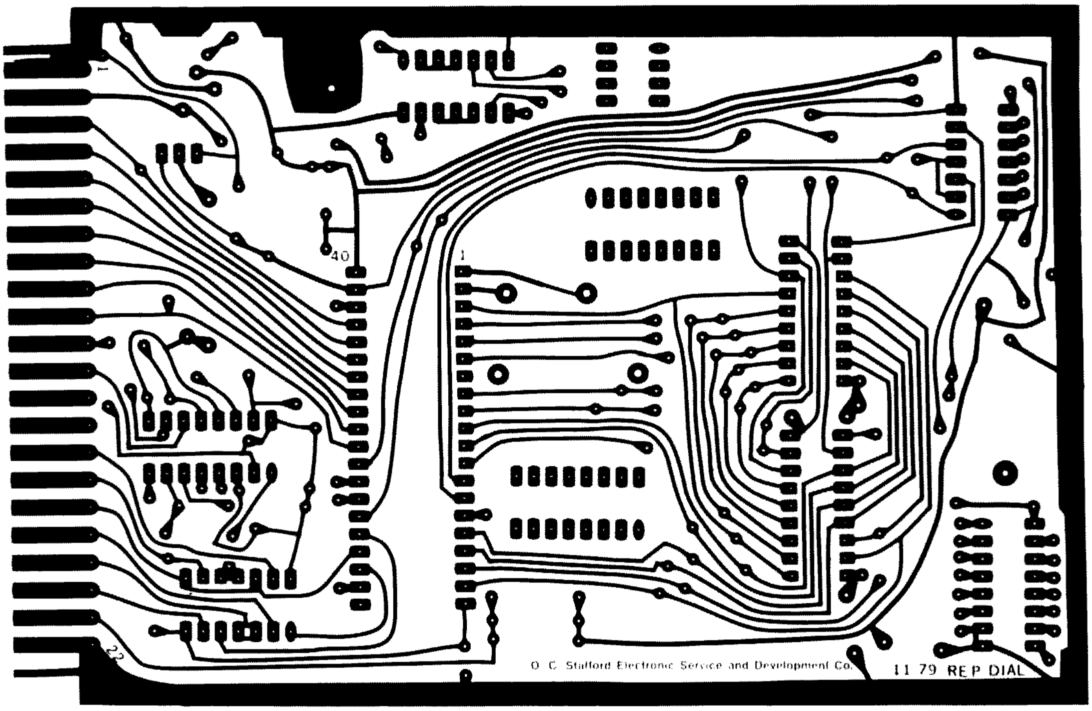
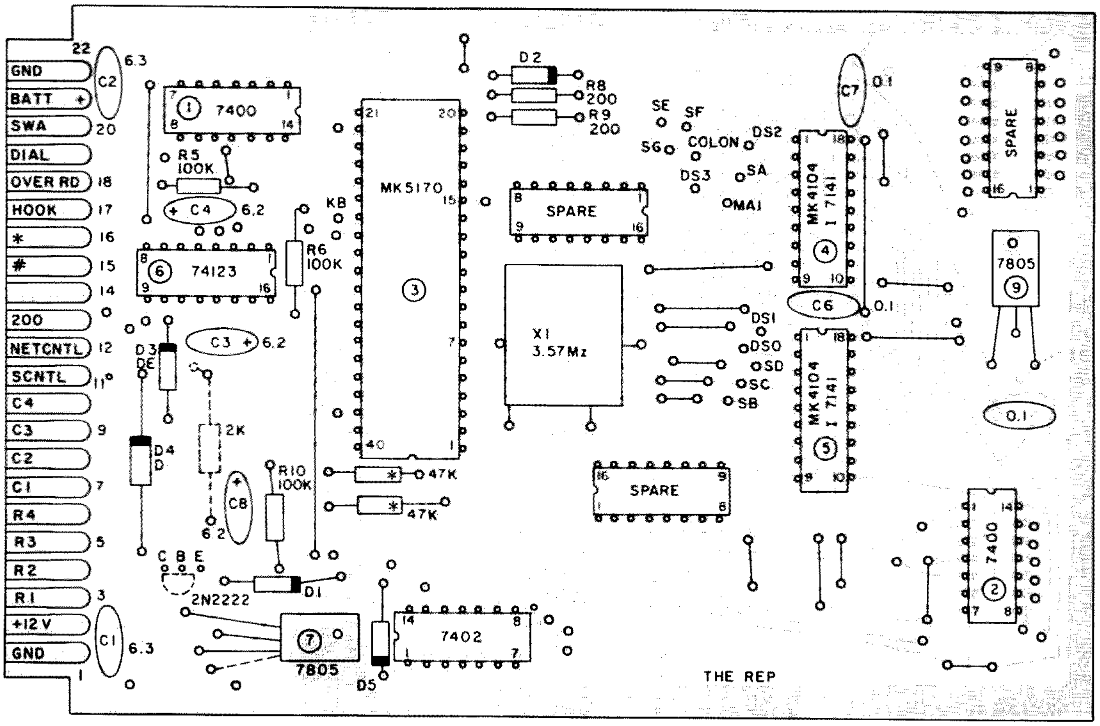


Fig. 3. Memory circuit for a 24-number (or fewer) system. It can be built on header chip and attached to the 18-pin socket.



PC board for the repertory dialer.



Component layout for repertory dialer.

1. Identify and state your intention to make a call. (This is good operating procedure any way you look at it.)

2. Enter *. This causes the demux circuit to lock out for 20 seconds, connects the dialer to the phone line, starts the three-minute timer, and readies the Rep to look for two numeric digits.

3. Wait for the dial tone, then enter the two digits.

4. The phone number associated with the two digits will be retrieved, and pin 20 will go low while pin 12 goes high, causing the decoder circuit to disconnect and the dialer to be connected to the Rep. The number is then transmitted to the dialer from the Rep. It takes 980 milliseconds for a seven-digit number to be transferred to the dialer with a 3.57-MHz clock.

5. Once the call is completed, send # to knock the patch down and reset the Rep.

The system has some built-in security. A 4×4 touchtone pad is used to access the unit for loading. The pad is shown in Fig. 7. The security function will not allow the user to get into the Enter mode when the phone is off hook. The Enter is sent when the security lock is on; the Rep simply resets. The lock and unlock sequence code should be known only to the control station, and is controlled by the demux/sequence circuit.

The demux and sequence boards are needed if the phone numbers are to be loaded from a remote location, as shown in Fig. 5.

The control station uses the sequence circuit to unlock the system for programming. Programming is accomplished using the following sequence:

1. The control station generates a # to make sure the phone is on hook.

2. Send a sequence code to latch pin 12 low and pin 11 high in order to lock out the security function.

3. Press the Enter button.

4. Key in two numeric digits for the address code of the phone number.

5. Press the Clear key to clear the area where the number will be loaded.

6. Key in the phone number.

7. Press the Store key.

8. If more numbers are to be loaded, go to step 5, or unlatch pins 12 and 11. Provision for battery back-up is provided on the board. A 9-volt nicad should be used with this circuit. When the main power fails, the chip enable lines go high. This causes a drop in current to the chip. The trickle charge circuit will not allow the nicads to overcharge.

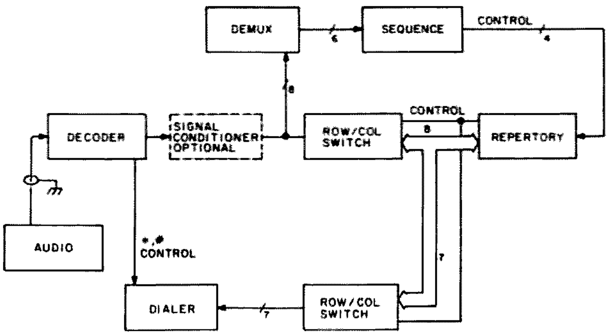


Fig. 4. Repertory connection to phone patch.

The override circuit is used to defeat the Rep and connect the decoder to the dialer for manual dialing. The control station, through a sequencer, makes pins 18 and 12 go low. The patch is brought up with *, and after the dial tone is heard, the dialing can start.

System security is achieved by locking out any column 4 signal by grounding pin 11 using a sequence circuit. If a column 4 signal is received, the Rep goes off hook and the next two digits simply cause the circuit to get a number, but not dial it, since the patch is not on and the unit is in the dial mode, so no damage can be done.

Most repeater groups

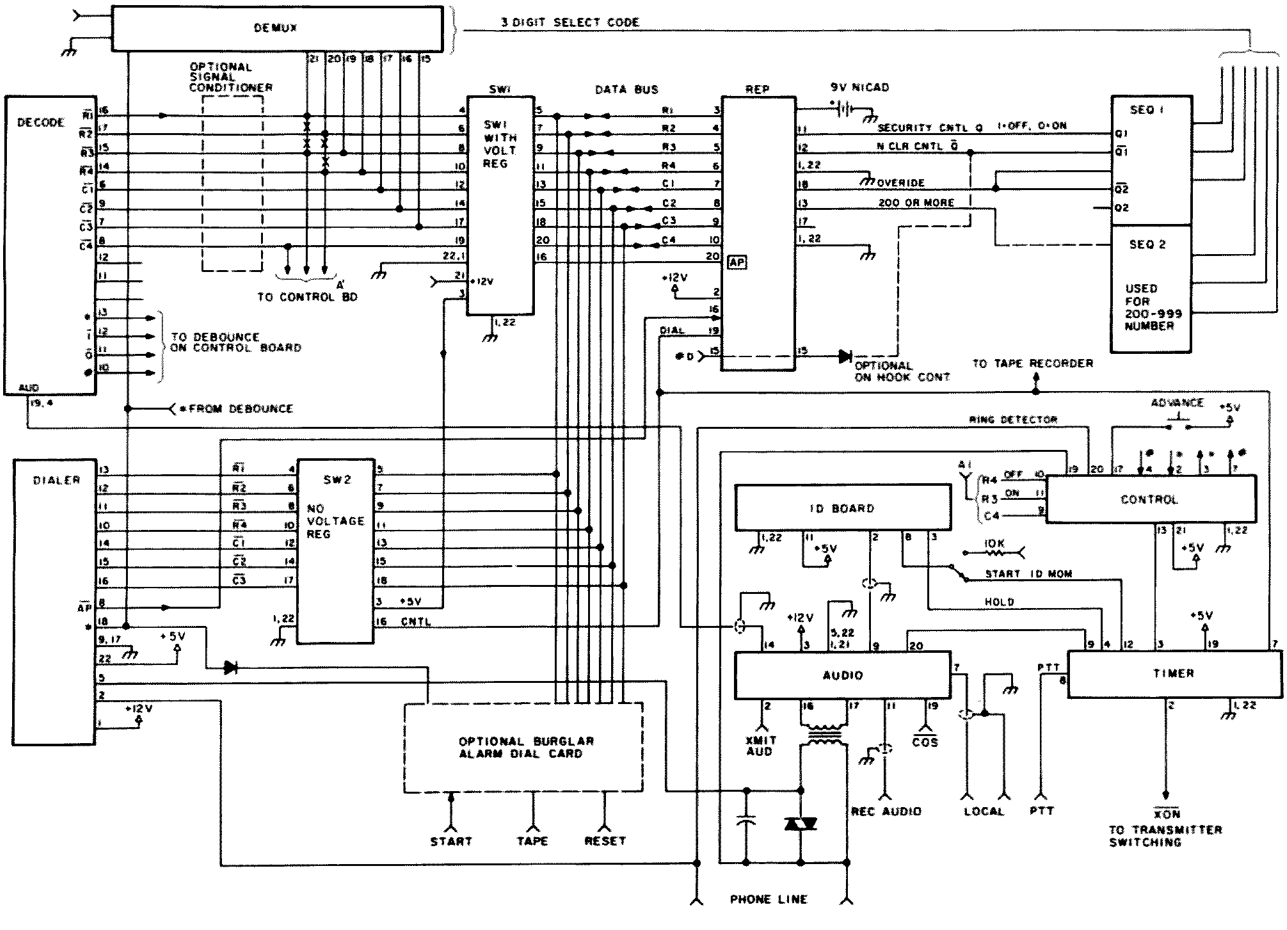
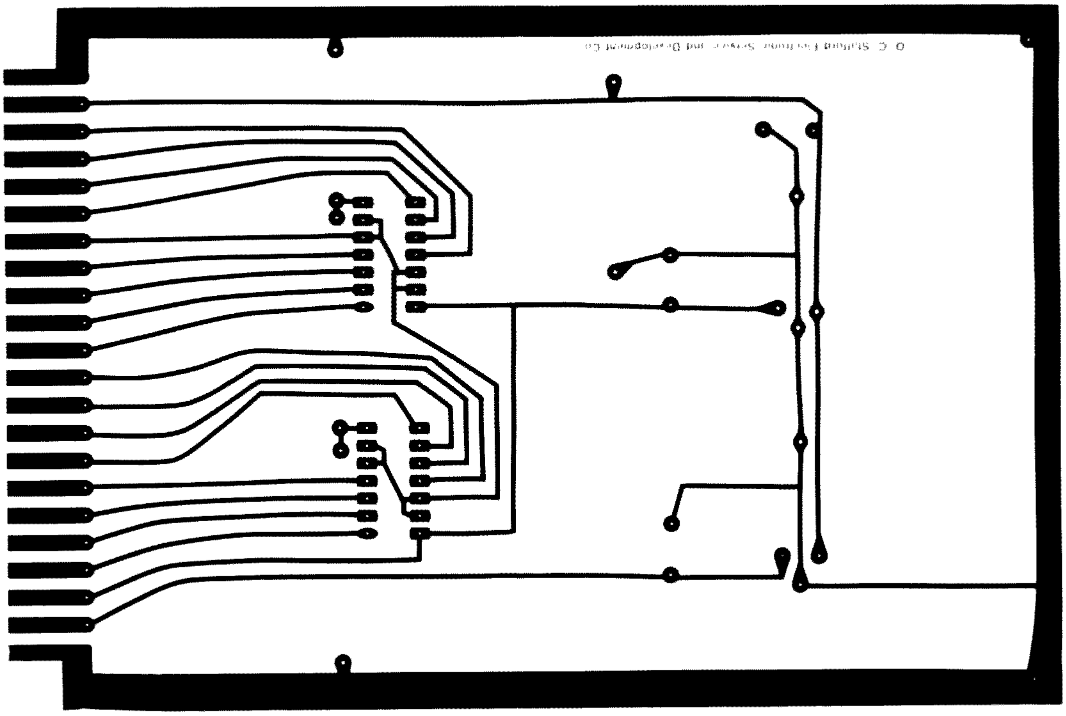
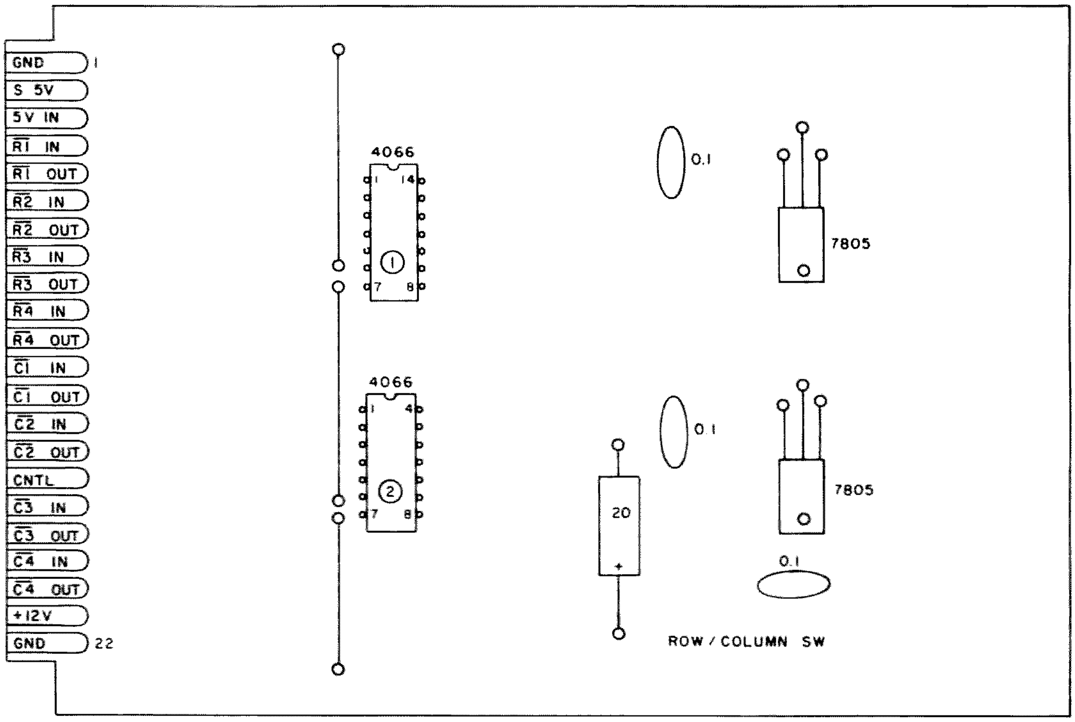


Fig. 5. Basic repeater control system with repertory dialer.



PC board for the row/column switch and regulator.



Component layout for the row/column switch and regulator board.

have fewer than 100 members. One use of the Rep could be to direct calls to speci^l numbers for assistance. For example: If the first two digits of all the exchanges in your area are used as access codes to a common number, then that number would be reached whenever the patch is accessed. This could be helpful if a visitor tries to access the patch with a regular phone number but no access code.

What if your group has more than 100 members and everybody needs a number? No problem. The system can be expanded to select additional 100-number banks. The expansion circuit for a 200-number system is shown in Fig. 8.

To go above 100 numbers requires adding a bank-select digit. The delay gen-

Parts List

Row/Column Switch Board

Quad switches, 4066	2
Voltage regulator, 7805	1
Capacitor, 0.1-uF, tantalum	1
Card edge connector, 22-pin	1
14-pin IC socket	2

Printed circuit board: drilled $7.50, undrilled $5.80.

Rep Board

Capacitor, 6.2-uF, tantalum	5
Capacitor, 0.1-uF, tantalum	2
Resistor, 100k, 1/4 W	3
Resistor, 5.1k, 1/4 W	4
Resistor, 200k, 1/4 W	2
Voltage regulator, 7805	2
Diode, 1N4001	2
Diode, 1N697	3
Crystal, 3.57 MHz	1
Dialer, MK5170	1
Dual one-shot, 74123	1
Quad NAND gate, 7400	2
Quad NOR gate, 7402	2
RAM memory, MK4104	2
16-pin IC socket	1
14-pin IC socket	3
18-pin IC socket	2
40-pin IC socket	1
Card edge connector, 22-pin	1

The above items make up the parts kit, for $100.00. Printed circuit board: $12.50 drilled, $9.50 undrilled. Parts and boards are available from O.C. Stafford Electronic S and D Co., 427 South Benbow Road, Greensboro NC 27401, phone: (919)-274-9917.

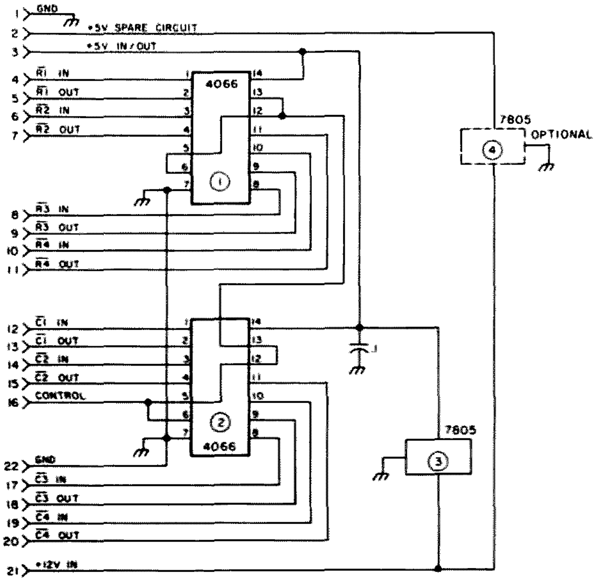


Fig. 6. Row/column switch and regulator board.

erated by the first section of IC6 is increased to 5 seconds. During this five-second interval, the bank-select digit is keyed right after the * and before the five seconds have elapsed.

The input to the row/column lines on the Rep board is not effective during this time because the MK5170 is held in a reset condition and the bank-select switch is on, allowing the digit to be decoded and clock one of the flip-flops. When the call is completed, the bank

BASIC SYSTEM KEYBOARD CONFIGURATION

1	ABC 2	DEF 3	ENTER / DIAL	ROW 1
GHI 4	JKL 5	MNO 6	STORE	ROW 2
PRS 7	TUV 8	WXY 9	INF. PAUSE	ROW 3
*	OPER. 0	#	CLEAR	ROW 4
COL 1	COL 2	COL 3	COL 4	

Fig. 7. Touchtone pad.

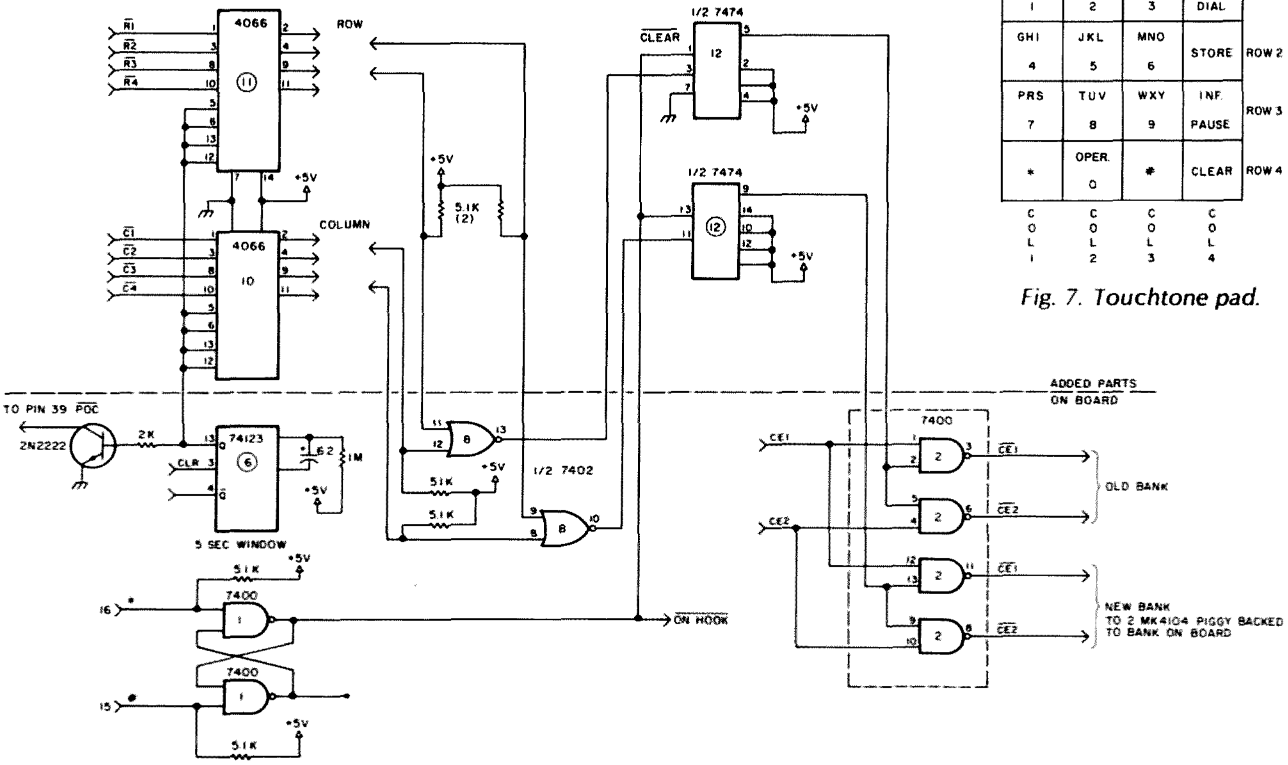


Fig. 8. Expansion circuit for a 200-number system.

flip-flops are reset through diode D6.

In loading a number, the control station pulses pin 13 to get the 5-second window for the bank select. The procedure for loading a number is then used to complete the process.

The spare IC pads on the circuit card can be used to add the 200-number system. The extra memory chips are piggybacked onto the existing chips with chip enables connected to the appropriate bank-select pins. I suggest you use wire-wrap techniques to build the addition, if you need it. Using this type of logic, the circuit can be expanded to handle 999 numbers! If you need that many, you will have to buffer the address lines and add a memory board.

The original control system used R1, R2, and C4 to control the transmitter. This function should be changed to a sequence circuit. The R1/C4 combination could cause the Rep to go into the Enter data mode.

R3 and R4 can be used in place of R1 and R2 and the operation of the Rep will not be affected.

It is hoped that the ideas presented in this circuit will help to alleviate some of the problems associated with autopatches. At the least, it can reduce the hazard of dialing while driving.

I will appreciate any and all comments on this circuit. If you have any questions about how the circuit operates and would like answers, send me a letter along with a self-addressed, stamped envelope. ■

References

1. Mostek Repertory Dialer Data Sheet.
2. *73 Magazine* for April, 1977, June, 1977, March, 1978, May, 1978, and May, 1979.

Quick and Dirty Line Noise Suppressor

Robert B. Grove WA4PYQ
Rt. 1, Box 156
Brasstown NC 28902

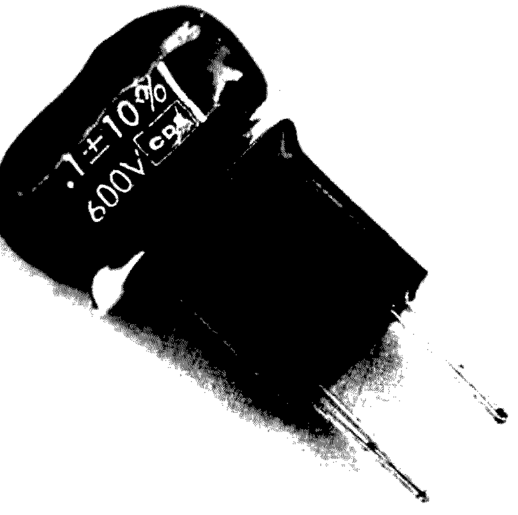


Photo A.

One of the most irritating sources of electrical noise, characterized by sharp clicks heard through the speaker of a receiver, is contact noise. The make/break cycles of appliances, aquarium heaters, flashing Christmas tree lights, and other noisy electrical contacts can wreak havoc with radio reception.

Fortunately, there are several options which may be elected to minimize these ear-splitting distractions. Perhaps the simplest is the installation of a 0.1-uF capacitor across the contacts themselves.

Since it is often difficult to find direct access to the offending contacts, an alternate solution is found by bypassing the plug with the capacitor. Probably the simplest way to do this is by rigging a plug-in interference filter as shown in the photo.

For standard 120 lines, select a mylar™ capacitor with a 600-volt rating. Insulate the exposed capacitor leads and connect them directly to the terminal screws of any convenient plug. Insert the plug-in filter into the same outlet as used to power the offending contact device.

The bypass capacitor acts as a smoothing filter for the sharp voltage-spike transients generated by the sparking contact. While it is true that the capacitor might actually resonate an unusually long line cord to enhance the noise at some frequency, in actual practice this is extremely unlikely to happen within the passband of most receiving installations. ■

Cal Ritchey
116 Lexington Drive
Mars PA 16046

Over the Hump and into History

—the last flight of #42-107270

November 30, 1943: In a C-87 airplane (number 42-107270) somewhere over the Himalaya Mountains of Asia, radio operator Kenneth Spencer, a 19-year-old corporal from Rockville Center, Long Island, anxiously twisted the dials of his HF command sets, trying to raise one of the ground stations he knew should be down below.

In the cockpit, Lt. Robert Crozier of Waco, Texas, the pilot, and Flight Officer Harold McCallum of Quincy, Massachusetts, the copilot, sat straining their eyes in an attempt to see anything other than the black storm clouds at 24,000 feet.

Aft of the radio shack, Sergeant William Perram of Tulsa, Oklahoma, kept a sharp eye on his dwindling fuel supplies, while the fifth man in the plane, PFC John Huffman of Straughn, Indiana, wondered what was happening.

Though listed on the manifest as assistant engineer, Huffman didn't belong in the plane. Three days earlier, he'd made his first flight east over the Hump from Jorhat Airbase in the Assam Valley of northeast India, to Kunming, an American base 550 miles away in China. At Kunming, he'd been grounded because of a head cold and was deadheading home. He was on the manifest in order to draw special flight pay. Huffman had no access to the inter-crew phone system and relied on shouted explanations of what was happening.

What was happening was that they couldn't find their way back to Jorhat.

Earlier in the day, the C-87 (which was a modification of the B-24 bomber known as the *Liberator*, built by consolidated Aircraft Corporation of San Diego and identical to the B-24 except for the removal of machine guns, turrets, bomb-handling equipment, and related controls, and the addition of a floor in the cargo compartment and a row of windows on either side of the fuselage), had made a quiet flight from Jorhat to Kunming carrying a load of 55-gallon drums of fuel destined to be used by bombers and fighters striking at the Japanese further east and south in China and Burma. They had dropped the fuel at Kunming and been given a partial load of garden produce to go to Yunannyi, about 45 minutes west of Kunming and almost directly on the western flight plan. They had left Yunannyi at about 6 pm, anticipating a routine flight back to Jorhat.

But no flight over the Hump was ever truly routine. By the end of the war, more than 400 planes and 850 men were lost flying the 50-mile-wide corridor, which became known as Aluminum Valley because of the wrecked planes littering the mountain slopes. In clear weather, pilots navigated from one collection of wreckage to the next. In November and December, 1943, there were 38 and 28 *major* accidents, respectively, over the Hump. Between June and December 1943, 168 men were killed making the trip. Some were shot down by marauding Japanese Zeroes up out of Burma, while others were killed when their planes flew into a mountain during the unpredictable storms which sometimes had winds measured at 200 mph. Despite weather as severe as any in the world, the planes flew 24 hours a day, stopping only to change crews, load and refuel, and receive required maintenance.

In September, 1943, Colonel Thomas Hardin was given command of Hump operations; one of his first orders was that "Effective immediately, there will be no weather over the Hump." In the face of extreme icing conditions, high winds, zero visibility, and attacks by Japanese planes, the crews and their aircraft kept flying.

Although the C-87 had a range of about 3000 miles and a ceiling of about 30,000 feet with its four Pratt & Whitney 1200 horsepower engines, it was often hampered by maintenance problems. Parts came from the US via the longest supply route in military history. Temperature ranges from 100 plus degrees at sea level in the Assam Valley to below zero at altitude, coupled with high humidity on the ground, caused rapid rusting and breakdown. The communications equipment was as susceptible to trouble as any other part of the aircraft, and the HF gear was often affected by severe electrical storms over the Hump, caused when warm air from the Bay of Bengal met cold air sweep-

ing down across the steppes of north central Asia.

The plane was equipped with up-to-date specialized navigational gear, but some of it was useless because no Hump base had the counterpart equipment.

The C-87 had the same radio gear as its parent B-24, except that the C-87 had fewer interphone crew stations due to elimination of the bombardier and gunner stations on the plane. If the interphone was operating correctly, all crew stations could hear the radio compass signal, the liaison and command radios, and other crewmen.

The command radio equipment in 1943 was high-frequency type (in 1944 upgraded to UHF) and, according to the B-24 manual, was used for plane-to-plane communications, though in practice it was used for all normal traffic, air-to-air or air-to-ground, because all crew members could either receive or transmit via the command set. The command gear included two transmitters mounted on racks on the deck over the wing, along with three receivers. A modulator unit, an antenna-switching relay, a transmitter-control box, a receiver-control unit, a dynamotor, a terminal strip, and two receiver dynamotors completed the rig. The command radio, like most other equipment on the plane, operated on 24 V dc.

The two transmitters had frequency ranges between 5300-7000 kilocycles (kc) and 7000-9100 kc. The three receivers covered frequencies of 190-550 kc, 3000-6000 kc, and 6000-9100 kc.

The liaison equipment was of medium power. Its transmitter had seven removable tuning units supplied with it. The tuners could be inserted by the operator to change frequencies in flight. The tuners handled 200-500 kc, 1500-3000 kc, 3000-4500 kc, 4500-6200 kc, 6200-7700 kc, 7700-10,000 kc, and 10,000-12,500 kc. An antenna-tuning unit, a frequency meter, a receiver in frequency range from 1500-18,000 kc, a dynamotor, a transmitting key, an antenna-transfer switch, and a 200-foot trailing antenna made up the liaison unit. (According to the B-24 manual, the liaison radio could be controlled by the radio operator, pilot, or copilot. Harold McCallum, copilot of #42-107270, says the C-87 liaison gear could be controlled only by the radio operator and was not normally used because of this limitation.)

The radio compass was a 15-tube superheterodyne receiver using 24-28 V dc for operation of the relays. The radio circuits ran on 110 volts ac at 400 cycles; the 110 juice was supplied by inverters under the flight deck, which also supplied power for autosyn instruments and the interior lighting. The loop was electrically driven and could be controlled from either of two remote boxes.

Marker beacon equipment operated on ultra-high-frequency signals at 75 megacycles (mc) and could receive signals from instrument landing systems (ILS), fan stations, cone-of-silence stations, and any other station equipped with horizontally-polarized 75-mc wave systems. According to McCallum, there were no ILS systems in the China-Burma-India (CBI) Theatre, although Chabua had a cone-of-silence system. Planes entering the range received either A or N signals in Morse code, depending on their relation to the range. On the correct approach, no signal was received.

There were six antennas on the B-24/C-87. The command antenna was a single wire from the top of the fuselage above the wing to

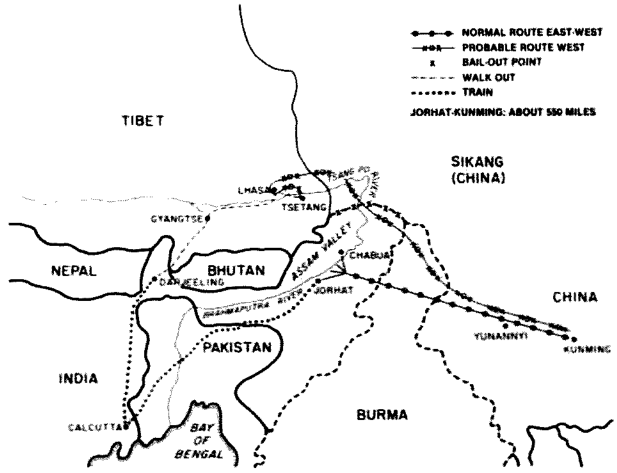


Fig. 1. Map of the area.

the top of the left vertical stabilizer (the B-24/C-87 had a twin-tail unit), while the liaison fixed-antenna wire ran to the right vertical stabilizer. The radio compass had two antennas: a vertical whip and a loop, both mounted topside over the wing. The marker beacon antenna was under the plane between the landing gear, and the liaison trailing antenna was a single wire wound on an electrically-operated reel located in the forward compartment under the flight deck and controlled by the radio operator.

According to official briefing information given to crews flying out of the Assam Valley in 1943 and 1944, there were at least four ground stations in operation. Tezpur, Jorhat, Chabua, and Ridge Station were all located along the Brahmaputra River within about 200 miles. Tezpur, Jorhat, and Chabua offered ground-to-air transmission facilities on 4220 and 5588 kc (A-3 emission) or 4595 and 8200 kc (A-1 emission). A-1 was continuous wave (CW). A-2 was tone, A-3 was voice. Receiving was done on 4495 and 5588 kc (A-3) or on 4595 and 8200 kc (A-1). Ridge Station transmitted and received on 5588 kc (A-3).

Chabua and Jorhat had homing beacons of 1000-Watt power-emitting tone signals. The Jorhat tower used 1200 kc, Chabua 1070 kc. Tezpur homed the planes on 295 kc with a 1200-Watt source, while Ridge Station brought the birds in on 390 kc from 50 Watts. All bases with direction-finding equipment in the theatre operated receiving-only on 2000-8000 kc, with all three types of emission.

Since the homing facilities and the DF equipment were operated on request only, at least part of the reason for the plight of the Crozier-McCallum C-87 could have been a result of the inability of the crew to call for operation of the equipment.

Even though the plane was equipped with then-modern gear, Spencer, the radio operator, was unable to get accurate bearings. The radio equipment may not be entirely to blame, however. It is known that in 1942 one or more Japanese stations located in Burma succeeded in giving false bearings to several planes flying the Hump. Some planes and crews were lost before the deception was discovered and steps taken to counteract the problem. Weeks later, McCallum and other members of the C-87 were told that the bearings

they received that night might also have been of Japanese origin, though it has never been proven.

In 1944, McCallum wrote an account of the flight that night:

"[After leaving Yunannyi] we flew for some time on the same heading, over an overcast and just flying ETAs (estimated time of arrival). We then changed our heading and were still climbing, finally topping it at 24,000 feet.

"When we had estimated that we were within range of our station [Jorhat], we started concentrating on our radio compasses, which began to reciprocate and were not coming in. Next came our try at the radio range, which was throwing As and Ns at us.

"We went on flying over the overcast and trying to see [ground] lights when we hit a break in the clouds.

"Just to be on the safe side, we decided to have a QDM [bearing] shot... Spencer told them to shoot a bearing and gave them a long call. They came back and told us to fly 278 degrees. This was done via Chabua and Jorhat. We decided this couldn't be right, and Spencer relayed the [Crozier's] question if it was 'reciprocal' or 'to fly.' The answer came back 'to fly.' We flew this for a while trying to get contact and see if there were any lights below. Fifteen minutes went by and another bearing was shot.

"...they gave us the same heading, 'to fly.' We told them they must be wrong... the total flying time on this heading was 40 minutes. Another bearing was shot and this time it was 'to fly' 268. And then another which was the same."

What nobody realized was that the plane had been blown off-course by winds later estimated to be from the south at about 100 mph. By the time they were given the 268 heading, they were probably many miles north of their supposed course.

Suddenly Crozier turned to McCallum. "Mac, does that look like a mountain out there?" "It sure is, and I've got one over here!" Crozier twisted the plane into a sharp bank and one of the mountain peaks flashed by, barely feet away.

Thirty-seven years later, McCallum still remembered: "If we'd had our landing gear down, we'd have left tracks in the snow."

Because of the storm, they were still flying at about 24,000 feet—far higher than normal on the route over the Hump in good weather—and those mountains had loomed higher than the plane. For the first time they realized they were really lost, and McCallum quietly tightened his parachute harness as much as possible without leaving the cockpit.

Spencer called the ground station again; the distant operator asked to have the plane's landing lights turned on. "You're over Chabua, we've sighted you, watch for a green flare," Spencer was told. (McCallum thinks the message was a harmonic with another airfield in the area; harmonics were "quite common at night with HF equipment.") Everybody who could get to a window tried to spot the flare, but instead they saw flickering lights through a break in the cloud cover.

Crozier took the plane down and circled the lights, looking for the Chabua field. It wasn't Chabua below, nor Jorhat, nor any of the other bases in the area—the men couldn't recognize anything except that they were over some city of fair size. They took the plane back to about 20,000 feet and flew for a few minutes while Crozier and McCallum talked over the situation. Fuel was becoming critically low: Planes flying the Hump were given only enough fuel to make their destination and return, with about 45 minutes extra flight time.

They were already long overdue at Jorhat, and even as they talked, Number Two engine sputtered and died. Perram was sent back to make a fuel transfer from one of the other tanks, but before he could begin, another engine coughed, smoothed out, coughed again, and quit. Crozier, as commander of the aircraft, made the decision: They would have to bail out.

Parachute jumps were especially dangerous over the Hump route even in daylight, and night jumps were even more so. In daylight, a jumper had some chance of choosing his landing spot. At night he might land in a tree or be impaled on a clump of bamboo, land in a river and drown, or simply plummet straight to the ground beneath an unopened 'chute—parachutes were just as prone to the weather problems as other equipment. Still, there was little choice for the five men. It was jump and have an even chance at survival on the ground, or stay with the plane to almost certain death.

McCallum trimmed the plane level while Crozier took the rest of the crew to the cargo compartment and prepared to jump, but not before Spencer sent out a distress call and screwed down the sending key. When McCallum left the cockpit for the last time, the altimeter read 17,500 feet, all engines were dead, and the plane was dropping rapidly—a C-87 wasn't known for its gliding ability.

In the rear, McCallum found all four men still trying to get the door off—it had opened about two feet and jammed. McCallum and Crozier wrestled it further open until it fell away from the plane. Crozier, Spencer, and probably Perram exited first (Huffman says Perram and McCallum were still aboard when he left; McCallum says the order was Crozier, Spencer, Perram, Huffman, and McCallum).

McCallum started to the door, realized Huffman didn't have his harness straps properly hooked, and went back to help. They got the harness on, though it wasn't tight enough and there was little time to adjust it. Just as Huffman snapped the final hook, the plane lurched as if going into a spin. McCallum knew that once the plane began spinning, centrifugal force might pin them inside all the way to the ground. He hustled Huffman out the door and followed immediately.

McCallum and Huffman both agree that the scene was one of urgency without panic. They also agree that the time from cockpit to bail-out was about one minute.

McCallum hit the airstream and pulled his ripcord, expecting a long ride to the ground, since the crew still thought they were somewhere over India, or perhaps Burma.

He felt the shock of the 'chute opening, and seconds later hit the ground and was knocked unconscious for an indeterminate period of time. When he came to, his watch had stopped at 10:45 p.m. It was dark, but there was enough light to see that he was sitting on the edge of a precipice.

When the sun came up the next morning, McCallum found himself on the side of a mountain, which the crew later decided was more than 16,500 feet high.

As McCallum took stock of his situation and

checked his equipment, he took the Form 58, the sheet signed by the parachute packer, from the 'chute bag —it was common for surviving jumpers to personally thank the rigger. He didn't have to wait long to do that—it was his own name at the bottom. As Assistant Parachute Officer at Jorhat, McCallum packed one 'chute a month as practice. This month, the 'chute he'd packed had been the one he jumped with.

Within an hour or two, McCallum, Crozier, and Spencer had located each other by shouting. Crozier and Spencer were together 1000 or 1500 feet lower than McCallum and perhaps a quarter of a mile away.

Huffman and Perram couldn't be seen. Huffman had landed in a hole and was dangling by his harness; he could hear the other three, but couldn't yell loudly enough to attract their attention. Despite a badly injured left arm—possibly a broken collarbone—he later managed to pull himself out of the hole, but by then, McCallum, Crozier, and Spencer were gone.

Perram had landed on the far side of the peak; during the next few days, he suffered frostbitten feet, but eventually recovered with no damage.

By the fourth day, both Huffman and Perram had been brought to Tsetang. Both men had been found by Tibetans who already knew of the presence of the other three men in Tsetang.

McCallum, who had been studying Hindustani in his free time, was able to talk to one man in the village —everyone else spoke a strange language he'd never heard before. The three Americans were unpleasantly surprised and shocked to learn they had landed in Tibet, several hundred miles to the northeast of Jorhat. There were no American bases—in fact, no Americans at all—in Tibet. The nearest American base was to the south in India, on the other side of the Himalayas.

By the evening of December 2, 1943, Crozier, McCallum, and Spencer were resting in a nearby village called Tsetang which they had found by following a mule caravan.

For two weeks the men waited in Tsetang while the village elders sent messengers back and forth to Lhasa, the capital city, for instructions on how to deal with the Americans. Tibet was a country isolated not only by physical features, but also by national policy. Almost certainly, no more than five Americans had ever visited the country, though both the British and the Chinese maintained small trade missions in Lhasa, both of which aided the flyers in their subsequent journey through Tibet.

Finally word arrived that they were to go to Lhasa, a three-day trip by horse or mule.

At Lhasa they were stoned by an angry crowd of Tibetans. The Americans couldn't understand why; up to this point, all the Tibetans had been friendly. It wasn't until they arrived at Deyki Lingka, home of Mr. and Mrs. George Sherriff of the British Trade Mission, that George Sherriff explained the problem: When the plane had circled the lights of the strange city weeks earlier, they had been over Lhasa, the Holy City of Tibetan Buddhism and the home of the Dalai Lama, the supreme God to the Tibetans. It was a mortal sin, according to the Tibetans, for anyone to place himself physically above the Dalai Lama, whose home was the Potala, a palace of 1000 rooms looming high above Lhasa. The Americans, unknowingly, had been guilty of a religious transgression.

Because of this sin, fanatical monks were agitating the Tibetan populace in Lhasa, and the Tibetan government insisted it could not be responsible for the safety of the Americans in Lhasa. After only three days in Lhasa (spent inside Deyki Lingka for safety), they were escorted to the edge of Lhasa by a crowd of Chinese officials and Mr. and Mrs. Sherriff, as well as other members of the British Mission.

On their first day in Lhasa, Reggie Fox AC4YN, an expatriate Englishman who later married a Tibetan woman, sent a radio message to China informing authorities that all five men were safe. (McCallum has the telegram received by his mother after the plane was lost, reporting him missing, and another a few weeks later after Fox's message was received.)

Fox's station, AC4YN, was a powerful one, and Fox was able to work as far as Indiana, USA, with the equipment, which probably was powered by a small hydroelectric plant on a river about eight miles from Lhasa. (In the mid-'30s, a Tibetan named Rangang, an engineer educated in England, seems to have almost single-handedly built the power plant, which may have been under contract from General Electric Corporation. Another source says the unit was diesel, but since fuel would have had to be carried in over the mountains by mule, the hydro unit seems more reasonable. There were no autos or trucks, or, in fact, wheeled vehicles of any kind, in Lhasa—except for two circa 1920 autos which no longer ran.)

On the edge of Lhasa, the Americans said good-bye to their newly-met British friends and to the Chinese, and guided by two Tibetan soldiers and a Tibetan cook who spoke some Hindustani, set out for India. On the journey, McCallum served as the group's interpreter, through the cook.

Fifty-two days after bailing out of the plane, the five men were back in Jorhat, by way of Darjeeling and Calcutta. Theirs is believed to have been the second-longest walk-out of any downed crew in World War II—the longest was 93 days.

In 1980, four of the crewmen were still living. Crozier lives in Texas; Spencer went back to Long Island. Huffman is retired and lives in the state of Washington McCallum, who makes his living as a corporate chief pilot, lives in Pennsylvania. William Perram was killed on his first flight after returning from Tibet.

George Sherriff died at his home in Ascreavie, Scotland, in 1967. His wife, Betty, died in 1979. Reggie Fox, still in Tibet in 1948, has dropped from sight.

As for the airplane, #42-107270, she had crashed not far from Tsetang. While the men waited in Tsetang for instructions from Lhasa, they were taken out to the wreckage. The aircraft came down at the edge of the Tsangpo River, which becomes the Brahmaputra in India and flows through Jorhat.

As the men watched, hordes of Tibetans savaged the hulk of the plane for usable metal. One man tried to carry away part of the radio gear but found it too heavy to manage. He seized an axe, hacked the unit in half, and proudly carted away the pieces.

Like many another wreck further south in India or Burma, the skeleton of #42-107270 may still rest along a river bank in a distant country which few Americans have ever seen. ■

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Rx and Cx

—easy-to-build substitution boxes

I finally got tired of trying to read the ohmmeter, hold the test leads in place, and turn the potentiometer to find a resistance value that would keep my experimental circuit from going up in smoke.

What I needed was a resistor substitution box. Well, I got out some paper and a pencil and went to work. The circuit shown in Fig. 1 is the result.

By using 28 resistors and switches in the 1-2-3-3 arrangement, I now have at my fingertips—in one-Ohm steps—resistance values of 1 to 9,999,999 Ohms.

Construction of this unit is simple. The resistors are mounted across the switches' terminals. By opening a switch, *that* resistor is connected in circuit.

The switches are arranged in rows of seven across and four down (See Fig. 1). Then the resistor/switch combinations are connected in series. I used slide switches in my unit (I happened to have them on hand).

The rectangular openings were cut out with a nibbling tool and the switches were mounted to the box panel with pop rivets.

With the use of 1% resistors, there is a possible error of ±100k (that's with all resistors in circuit for a total of 9,999,999 Ohms).

With this circuit, there is a possible monetary advantage over conventional resistance substitution boxes which usually require sixty-three resistors and seven ten-position switches to cover the same range.

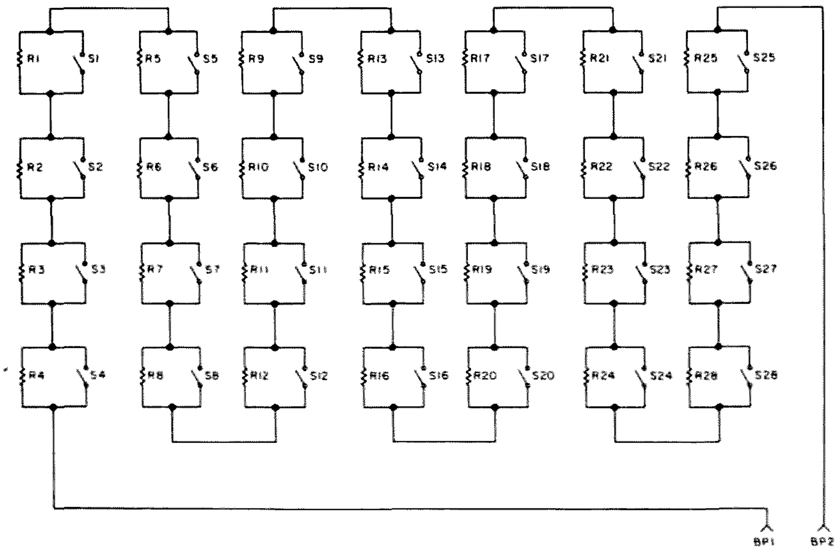

Fig. 1. Schematic for resistor substitution box.

A Capacitor Substitution Box

A ham shack without a capacitor substitution box?

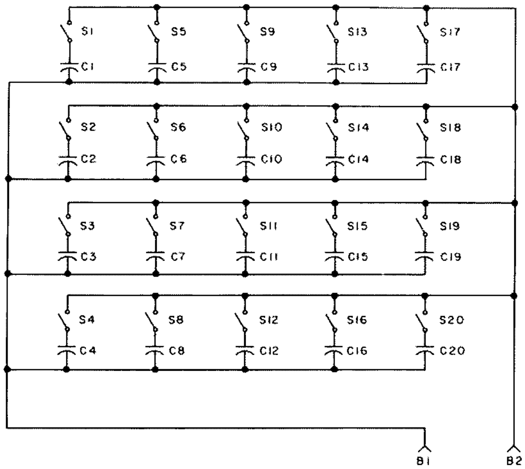

Fig. 2. Schematic for capacitor substitution box.

I don't believe it. Well, I've been wrong before, so, if yours happens to be without one, build this one.

This capacitor substitution box has a range of from 10 pF to within 10 pF of 1 uF, in 10-pF steps. That amounts to 99,999 possible values. This is done with only twenty capacitors and switches. Construction of this unit is simple and straightforward. The capacitors are connected between a common line (B1) and one terminal on each switch. The other terminals on the switches are wired to B2. The switches are arranged in rows of four down and five across (Fig. 2). I used mica (5%) and polystyrene (2%) capacitors in my unit.

Of course, the tighter the tolerance on the capacitors, the more accurate the unit. ■

Resistor Substitution Box Parts List

R1	1 Ohm
R2	2 Ohm
R3-R4	3 Ohm
R5	10 Ohm
R6	20 Ohm
R7-R8	30 Ohm
R9	100 Ohm
R10	200 Ohm
R11-R12	300 Ohm
R13	1k Ohm
R14	2k Ohm
R15-R16	3k Ohm
R17	10k Ohm
R18	20k Ohm
R19-R20	30k Ohm
R21	100k Ohm
R22	200k Ohm
R23-R24	300k Ohm
R25	1 Megohm
R26	2 megohm
R27-R28	3 megohm

S1 through S28—SPST slide or toggle switches
BPl, BP2—5-way binding posts
Misc.—wire, cabinet, rub-on letters and numbers

Capacitor Substitution Box Parts List

C1	10 pF
C2	20 pF
C3	30 pF
C4	30 pF
C5	100 pF
C6	200 pF
C7	300 pF
C8	300 pF
C9	0.001 uF
C10	0.002 uF
C11	0.003 uF
C12	0.003 uF
C13	0.01 uF
C14	0.02 uF
C15	0.03 uF
C16	0.03 uF
C17	0.1 uF
C18	0.2 uF
C19	0.3 uF
C20	0.3 uF

S1 through S20—SPST switches (slide or toggle type)
B1, B2—5-way binding posts
Misc.—wire, cabinet, rub-on letters and numbers

Don't Be Sunk by Heat Sinks

—a painless introduction to heat-transfer physics

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Application

Find the right heat sink for an LM309K voltage regulator IC. The maximum input voltage is 10 volts, the output voltage is to be held at a constant 5 volts, and the maximum current to be drawn from the supply is 1 Amp.

Step 1: Write down the formula:
$R\theta_{SA}(max) = (T_J - T_A)/P_D - R\theta_{JC} - R\theta_{CS}$.

Step 2: Calculate P_D:
$P_D = (Vin - Vout) \times I(max)$
$P_D = (10\ V - 5\ V) \times 1\ A = 5$ Watts

Step 3: Find $T_J(max)$ and derate by 50° C. The data sheet gives us a figure of 125° C for the absolute maximum operating junction temperature; derating that figure by 50° C gives us 75° C for $T_J(max)$.

Step 4: Find $T_A(max)$. The maximum ambient temperature is 25° C, 5° C above room temperature of 20° C.

Step 5: Find $R\theta_{JC}$. Keep in mind that the LM309K is an IC, not a transistor. The data sheet reveals a figure of 3.0° C/W for $R\theta_{JC}$. For transistors, Table 1 is fairly accurate, but for ICs, watch out!

Step 6: Find $R\theta_{CS}$. Since the case is ground on the LM309K used as a fixed 5-volt regulator, we will not need an insulating washer. To improve the heat transfer between the device and the heat sink, we will use some heat-sink compound. From Table 2 we obtain a value of 0.1° C/W for $R\theta_{JC}$.

Step 7: Plug the values into the formula:
$R\theta_{SA}(max) = (75°\ C - 25°\ C)/5\ W - 3.0°\ C/W - 0.1°\ C/W = 6.9°\ C/W$.

Step 8: Pick a suitable heat sink. Choose the next lower value for a TO-3 type case. The RCA-SK KH3423 looks suitable with a $R\theta_{SA}$ value of 5° C/W.

For years I have been resorting to B.F.I. (Brute Force and Ignorance) when designing transistor projects. Mainly, this meant using the biggest heat sink I could afford or watching my project go up in smoke. After the loss of a few precious power transistors, I set out to find out all about proper heat sinking. The principle behind picking the right heat sink is rather simple.

In this article, we will explore heat-transfer physics, interfaces, and practical heat-sink choices. First, let's look at how heat sinks work.

Theory

Heat-transfer physics is a scary-sounding phrase for something that some hams don't think they know about, although they know of something similar: basic electricity. Fig. 1 shows the analogy between thermal resistance and ohmic resistance.

In electrical circuits, whenever there is a difference of voltage between

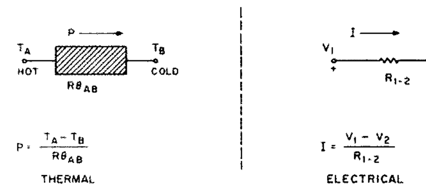

Fig. 1. The electrical analog of heat transfer.

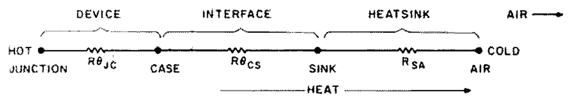

Fig. 2. The electrical analog of heat transfer from the junction of the semiconductor to ambient air ($R\theta_{JA} = R\theta_{JC} + R\theta_{CS} + R\theta_{SA}$).

two points, or nodes, current is said to flow from the more positive node to the more negative node. The amount of current that flows is inversely proportional to the resistance between the two nodes.

Similarly, in thermal circuits, whenever there is a difference of temperature between two bodies (T_A and T_B) or between two portions of one body, heat (P) is said to flow in a direction from higher to lower temperature. This heat flow is expressed in Watts. The amount of heat which flows when a given change in temperature is applied will be found to vary with what is called the thermal resistance of the material ($R\theta$). The lower the thermal resistance of the material, the greater the heat it transfers. Thermal resistance can be expressed in terms of degrees centigrade per Watt (°C/W).

Applying the Theory to Heat Sinks

In semiconductors, heat is produced at the junction of the differently-doped silicon materials. To escape the semiconductor, heat travels from the junction through the case, the interface, and the heat sink into the ambient air. The heat sink dissipates the heat into the surrounding air by means of radiation and convection. The whole system can be represented by the electrical equivalent circuit shown in Fig. 2.

The total thermal resistance from junction to air is the sum of individual thermal resistances: junction to case ($R\theta_{JC}$), case to sink ($R\theta_{CS}$), and sink to air ($R\theta_{SA}$). Applying the analogy found previously, we can say that $P_D(max) = [T_J(max) - T_A(max)]/R\theta_{JA}(max)$, where P_D is the maximum power dissipated by the device in Watts, T_J is the maximum junction temperature in °C, T_A is the maximum ambient temperature in °C, and $R\theta_{JA}$ is the maximum thermal resistance from junction to ambient air in °C/W. With a little algebra, we can combine the two formulas found above and get a very useful equation for finding the correct heat sink. In this equation, $R\theta_{SA}(max) = [(T_J - T_A)/P_D] - R\theta_{JC} - R\theta_{CS}$.

Although manufacturers list maximum junction temperatures of 150°-200° C, it is a good design practice to operate the device at a much lower temperature. To ensure plenty of leeway and extend the useful life of the device, use a maximum junction temperature of 50° C less than the manufacturer's listed maximum junction temperature.

There are several ways of obtaining the maximum power dissipated by the device. A simple way of calculating the power dissipated is: $P_D(max) = P_{input} \times (1 - eff)$.

Another way of calculating the power dissipated is: $P_D(max) = I(max) \times E(max)$.

In some cases, the actual power dissipated may be less than these values, but keep in mind this is a worst-case figure.

The thermal resistance from the junction to case ($R\theta_{JC}$) depends mostly on the type of case that the device is packaged in. Although it is best to obtain the value from the data sheet for the transistor or semiconductor device, Table 1 shows some typical values if the data sheet is unavailable.

The thermal resistance from case to sink ($R\theta_{CS}$) depends on a handful of factors: the type of washer used (if any), the tightness of the transistor or semiconductor device against the heat sink, and whether or not silicone thermal paste or heat-sink compound is used. Some approximate values are shown in Table 2.

It should be fairly obvious why thermal joint compound is important. These zinc oxide and silicone oil mixtures reduce the high thermal resistance of the air gap between the case and the heat sink. But be sure to use it sparingly; the paste has a large thermal resistance and it is important to keep the layer as thin as possible.

Case	$R\theta_{JC}$
TO-3	1.5
TO-5	30.0
TO-18	150.0
TO-36	0.7
TO-39	35.0
TO-66	7.0
TO-92	125.0
TO-220	4.0

Table 1. Typical values for $R\theta_{JC}$ for common case styles.

Washer	Paste	No Paste
none	0.1	0.2
beryllia	0.2	0.4
alumina	0.3	0.5
mica	0.4	0.8

Table 2. Approximate values for $R\theta_{CS}$.

A list of commonly available heat sinks and their thermal resistances ($R\theta_{SA}$) is shown in Table 3. The thermal resistance of heat sinks can be improved or lowered by improving the heat-sink-to-air interface. When the ambient air moves, it more readily accepts heat; thus, some benefits can be gained from a fan blowing across the fins of the heat sink. Also, a change in color can decrease the thermal resistance of a heat sink. A thin coat of flat black paint (such as barbecue black) sprayed over a shiny aluminum heat sink lowers the thermal resistance by about 25%. For a real application, see box.

Conclusion

Although calculations in finding the right heat sink can be much more complicated, this article was written to simplify heat transfer physics as much as possible for the amateur or radio experimenter. Hopefully, the reader will be able to pick the right heat sink for the right job with the guidelines presented here. ■

For More Information:

International Electronic Research Corp.
135 West Magnolia Blvd.
Burbank CA 91502

Thermalloy, Inc.
PO Box 340839
Dallas TX 75234

Wakefield Engineering
60 Audubon Road
Wakefield MA 01880

Brand	Stock	$R\theta_{SA}$	Fits these cases
Calectro	J4-866	23*	TO-220
	J4-878	11	TO-3
	J4-880	2.25	(2) TO-3,TO-36,TO-66, and TO-220
Radio Shack	276-1361	2.25*	(2) TO-3,TO-36,TO-66, and TO-220
	276-1363	20*	TO-220
	276-1364	13*	TO-3
RCA-SK	KH3413	80	TO-1,TO-18,TO-72,TO-104, and TO-92
	KH3415	52	TO-5 and TO-39
	KH3417	20	TO-220
	KH3421	15	TO-66
	KH3423	5	TO-3
Thermalloy	6011	60	14 and 16 pin DIP ICs
	6087	25	40 pin DIP ICs
	6038	10	TO-220
	6017	8	TO-66
	6013	8	TO-3
	6157	0.9	Circuit board or external mounting
Wakefield	502	1.3	TO-36
Engineering	641	3.5	TO-3

*The $R\theta_{SA}$ values for these heat sinks were found experimentally by the author.

Table 3. Typical values for $R\theta_{SA}$.

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Tracker — The Ultimate OSCAR Finder

After a few weeks of "sensory overload" playing games with our new 16K Level II TRS-80 systems, both Dennis and I realized that there was a huge untapped potential inside that rather innocent-looking case. What better way to tap it than to harness the power of the computer to make our hobby a lot more fun by allowing us to operate more and calculate less?

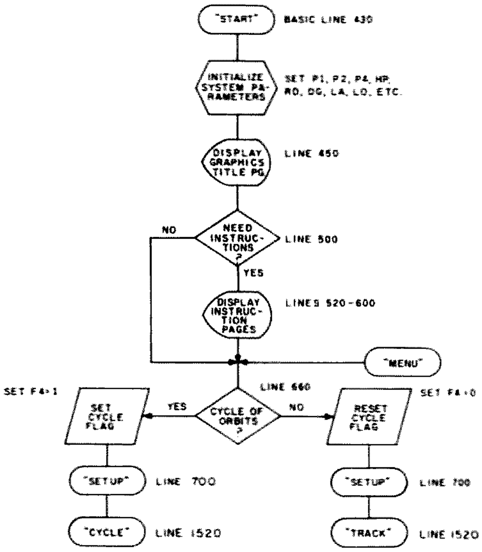
Having both cut our teeth on KIM-1™ systems, and having built them up to the degree of having BASIC programs running on them, we decided that translating some of those programs over to the TRS-80 would be a good way to familiarize ourselves with its capabilities.

The first of the translations undertaken was the program we wrote to track the OSCAR satellites. Considering that both of us are AMSAT members and OSCAR enthusiasts, it seemed like the logical thing to do. Besides, anything that we could use around the shack was bound to be more fun than another game.

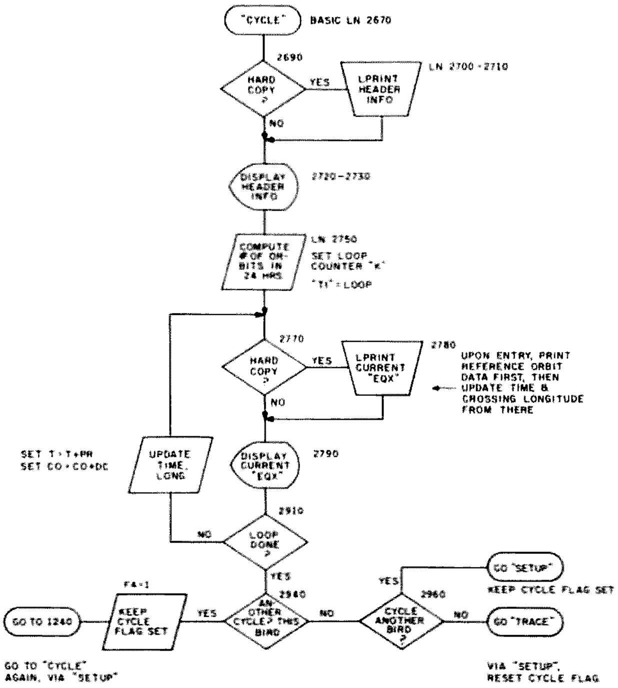
Satellite Tracker is Born

"Tracker" is the fruit of that labor. This program will allow you to use your Level II TRS-80 to track OSCAR 7 and 8 (or any satellite in a polar orbit). Using only the Reference Orbit information published monthly in *73 Magazine*, *QST*, or ARRL bulletins, Tracker will compute the orbits for the day, the time and longitude of each pass (its EQX), and azimuth and elevation data for your steerable beam arrays.

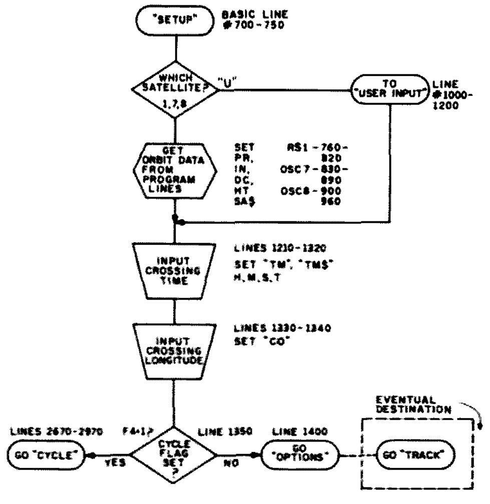
In addition, some slick features have been added that weren't in the original KIM-1 program. For instance, you may now enter a second station's latitude and longitude and Tracker will compute a "Mutual Visibility Window" indicating when the stations will have simultaneous access on any given pass (great for those DX orbits). Line printer routines for hard copy have also been added and will support non-Radio Shack printers as well as the parallel-port Cen-



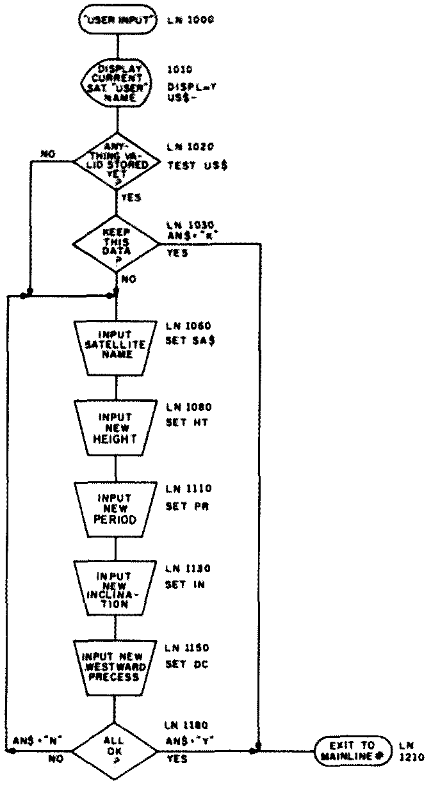
Flowchart 1. Main selection logic.



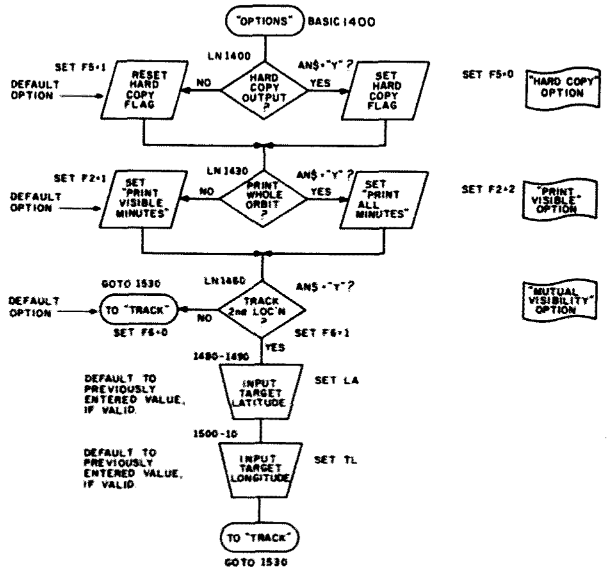
Flowchart 2. Orbit Cycle logic.



Flowchart 3. Setup logic.



Flowchart 4. User Input Routine logic.



Flowchart 5. Options logic.

```
DO YOU WANT A DAY'S CYCLE OF ORBITS (Y/N)?        Y

FOR WHICH SATELLITE?
ENTER 1 FOR RS-1; 7 FOR OSCAR 7; 8 FOR OSCAR 8
ENTER 'U' TO  ACCESS USER INPUT ROUTINE?          8

ORBITAL DATA FOR OSCAR 8 NOW AVAILABLE

FOR OSCAR 8, ENTER REFERENCE ORBIT'S:
TIME OF NORTHBOUND EQUATOR CROSSING 'EQX' (HHMM.SS)? 0035.15
LONGITUDE AT 'EQX' (DECIMAL DEGREES)?                64.5

*** SET OUTPUT OPTIONS ***

PRINT DATA ON LINE PRINTER (Y/N) 'ENTER'=NO  ?  Y

---------- HARD COPY REQUEST CONFIRMED
PRINTER OFF-LINE..CANCEL HARD COPY (Y/N)?         N

HIT 'ENTER' WHEN PRINTER READY?
```

Fig. 1(a). Typical Orbit Cycle request for OSCAR 8, requesting printout.

DAY'S ORBITS FOR OSCAR 8

REF#	TIME (UTC)	LONGITUDE AT 'EQX'
REF	00:35.15	64.5
1	02:18.28	90.3
2	04:01.41	116.1
3	05:44.54	141.9
4	07:28.07	167.7
5	09:11.21	193.5
6	10:54.34	219.3
7	12:37.47	245.2
8	14:21.0	271.0
9	16:04.13	296.8
10	17:47.27	322.6
11	19:30.40	348.4
12	21:13.53	14.2
13	22:57.06	40.0
14	00:40.19	65.8

Fig. 1(b). Printout resulting from request shown in Fig. 1(a).

tronics types. Automatic "sequential tracking" will allow you to track any number of orbits in a row from only one EQX or you may enter the specific orbits you wish to be tracked from the keyboard. Tracker has been extensively tested and should be completely crash-proof (but Murphy always can pay a surprise visit).

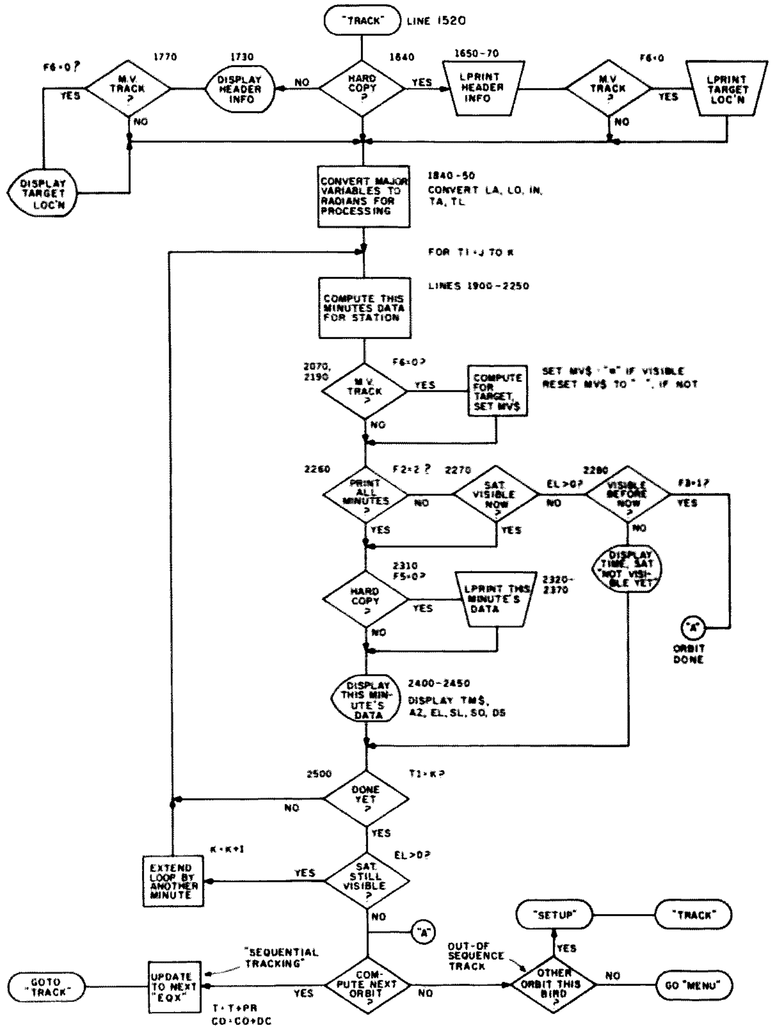
What You Need to Make It Work for You

Tracker will run on any Level II TRS-80 system, either cassette- or disk-based, having at least 16K of RAM. Hard copy is available for those of you who have a line printer, but you don't need one to run the program. Because of the length of the program (12K, more or less) and the use of Level II's built-in trig functions, Level I systems or Level II systems with less than 16K are not suitable.

For you die-hards who insist on typing in everything, the program listing is reproduced here for your convenience, but the rest of you take heart. If you feel that 12K of Level II BASIC is a bit long to type in and debug (and we agree wholeheartedly), cassette tapes are available.

Using Tracker with OSCAR

Using Tracker may look complicated at first glance, but it really isn't. Rather than enter into a detailed description of the program's execution right off, I'll just cover the major sections and how they function. Flowcharts will be



Flowchart 6. Orbit Track logic.

```
COMPUTE ANOTHER CYCLE FOR OSCAR 8 (Y/N) 'ENTER'=NO  ? N

COMPUTE A CYCLE FOR A DIFFERENT SATELLITE (Y/N) 'ENTER'=NO  ? N

WHICH SATELLITE TO TRACK?
ENTER 1 FOR RS-1; 7 FOR OSCAR 7; 8 FOR OSCAR 8
ENTER 'U' TO  ACCESS USER INPUT ROUTINE? 8

ORBITAL DATA FOR OSCAR 8 NOW AVAILABLE

TO TRACK OSCAR 8 ENTER:
TIME OF NORTHBOUND EQUATOR CROSSING 'EQX' (HHMM.SS)? 0035.15

LONGITUDE AT 'EQX' (DECIMAL DEGREES)? 64.5

LATITUDE OF YOUR STATION (DECIMAL DEGREES)? 42.375

LONGITUDE OF YOUR STATION (DECIMAL DEGREES)? 83.75

*** SET OUTPUT OPTIONS ***

PRINT DATA ON LINE PRINTER (Y/N) 'ENTER'=NO  ? N
----------  'NO HARD COPY' CONFIRMED

DO YOU WISH TO SEE THE WHOLE ORBIT (Y/N) 'ENTER'=NO  ? N
----------  'PRINT VISIBLE MINUTES ONLY'  CONFIRMED

TRACK FOR MUTUAL VISIBILITY (Y/N) 'ENTER'=NO  ? N
----------  'NO  M.V.TRACK'
```

Fig. 2. Typical Orbit Track run, tracking OSCAR 8 reference orbit from Fig. 1. Options requested are: NO HARD COPY, PRINT VISIBLE ONLY, NO M.V. TRACK.

used to assist you in understanding the logic of the program. A reference chart has been provided, listing the functions by line numbers for those of you who might want to modify it (although I really can't think of anything we have left out).

Tracker in Action

To compute and track all orbits of either of the polar OSCARs (or other polar satellites) for any given day, the only information you will need is the time and longitude (EQX) of the reference orbit for that day. This data is available in most of the monthly amateur publications and also is available from AMSAT Orbit Calendars and in daily bulletin transmissions over W1AW.

To make things easier, the main logic has been divided into two sections: Orbit Cycle Compute and Orbit Track. The functions and differences of these two routines are described in the following sections. To select Orbit Cycle or Orbit Track, Tracker will prompt:

DO YOU WANT A DAY'S CYCLE OF ORBITS (Y/N)?

A YES or Y answer will select Orbit Cycle and a NO or N will select Orbit Track routine. Flowchart 1 details the main selection logic.

Orbit Cycle

Given the EQX of a reference orbit (the first orbit after GMT midnight, generally), Orbit Cycle—which is *not* a moon bike—will compute and display the EQX data for every orbit of that satellite in the 24-hour period following the reference orbit. This data will be used later in Orbit Track, so you might want to jot down the orbits that look good to you. This routine is provided mostly as a convenience for those who need to generate a list of the day's orbit times. Flowchart 2 details the Orbit Cycle logic, and Flowchart 3 details the logic used to select a satellite for cycle or track, called Setup. Fig. 1 shows a typical Orbit Cycle printout.

Orbit Track

The Orbit Track routine is the main body of the program. Orbit Track will take EQX data entered from the keyboard by you (and probably computed by Orbit Cycle) along with orbital parameters for the satellite of interest and the location of your station and will compute and display, on a minute-by-minute basis, the visibility of the satellite. It also will produce azimuth and elevation headings from your station location, the latitude and longitude of the sub-satellite point (the point on the Earth's surface directly under the satellite), and the direct distance from you to the satellite, in kilometers.

Phew . . . Wanna try doing all that on your little four-banger and still get ready for that 6:20 pm pass while the XYL is screaming *"DINNER'S READY"* and the kids want to know when you can fix that broken bike? You get the picture!

You may make a selection from the pre-programmed satellites (OSCAR 7, OSCAR 8, or RS-1), or Tracker will accept your own orbital parameters to facilitate tracking other polar orbiting satellites, like the NOAA weather birds. This is accomplished by the "User Input Routine" (see

SATELLITE TRACKING DATA FOR OSCAR 8
FOR LAT: 42.375 LONG: 83.75
ORBIT BEGINS 00:35.15 (UTC), AT LONG: 64.5

TIME(UTC)	AZ	EL	S-LAT	S-LONG	DIST.(KM)
00:40.15	148.7	0.7	17.2	68.8	3441.5
00:41.15	147.3	4.5	20.6	69.8	3054.9
00:42.15	145.4	8.8	24.0	70.7	2672.7
00:43.15	142.8	14.0	27.4	71.7	2299.0
00:44.15	139.0	20.4	30.9	72.7	1940.3
00:45.15	132.9	28.5	34.3	73.8	1608.9
00:46.15	122.1	38.8	37.7	75.0	1327.0
00:47.15	100.4	50.1	41.1	76.3	1133.6
00:48.15	62.6	54.6	44.5	77.6	1078.3
00:49.15	29.2	46.8	47.9	79.1	1181.0
00:50.15	11.8	35.4	51.2	80.8	1407.1
00:51.15	2.9	25.7	54.6	82.7	1707.6
00:52.15	357.7	18.2	57.9	84.0	2049.3
00:53.15	354.4	12.3	61.2	87.5	2413.7
00:54.15	352.2	7.4	64.4	90.6	2790.8
00:55.15	350.6	3.2	67.6	94.5	3174.8

Fig. 3. Printout that would result from options requested in Fig. 2, had hard copy been selected.

SATELLITE TRACKING DATA FOR OSCAR 8
FOR LAT: 42.375 LONG: 83.75
ORBIT BEGINS 00:35.15 (UTC), AT LONG: 64.5

TIME(UTC)	AZ	EL	S-LAT	S-LONG	DIST.(KM)
00:36.15	152.1	-11.4	3.4	65.4	4990.0
00:37.15	151.4	-8.7	6.9	66.2	4605.3
00:38.15	150.7	-5.8	10.3	67.1	4218.3
00:39.15	149.8	-2.7	13.7	67.9	3829.9
00:40.15	148.7	0.7	17.2	68.8	3441.5
00:41.15	147.3	4.5	20.6	69.8	3054.9
00:42.15	145.4	8.8	24.0	70.7	2672.7
00:43.15	142.8	14.0	27.4	71.7	2299.0
00:44.15	139.0	20.4	30.9	72.7	1940.3
00:45.15	132.9	28.5	34.3	73.8	1608.9
00:46.15	122.1	38.8	37.7	75.0	1327.0
00:47.15	100.4	50.1	41.1	76.3	1133.6
00:48.15	62.6	54.6	44.5	77.6	1078.3
00:49.15	29.2	46.8	47.9	79.1	1181.0
00:50.15	11.8	35.4	51.2	80.8	1407.1
00:51.15	2.9	25.7	54.6	82.7	1707.6
00:52.15	357.7	18.2	57.0	84.9	2049.3
00:53.15	354.4	12.3	61.2	87.5	2413.7
00:54.15	352.2	7.4	64.4	90.6	2790.8
00:55.15	350.6	3.2	67.6	94.5	3174.8
00:56.15	349.4	-0.4	70.6	99.5	3562.3
00:57.15	348.5	-3.7	73.5	106.1	3951.1
00:58.15	347.8	-6.7	76.1	115.2	4339.4
00:59.15	347.3	-9.5	78.3	127.8	4726.0
01:00.15	346.8	-12.2	79.7	144.8	5110.1
01:01.15	346.5	-14.7	80.1	164.9	5490.9
01:02.15	346.3	-17.2	79.3	184.2	5867.5
01:03.15	346.1	-19.5	77.5	199.5	6239.6
01:04.15	345.9	-21.8	75.1	210.6	6606.5
01:05.15	345.8	-24.1	72.4	218.6	6967.8
01:06.15	345.8	-26.3	69.4	224.5	7322.9
01:07.15	345.7	-28.4	66.3	229.0	7671.6
01:08.15	345.7	-30.5	63.1	232.6	8013.3
01:09.15	345.8	-32.6	59.9	235.5	8347.7
01:10.15	345.8	-34.7	56.6	237.9	8674.5
01:71.15	345.9	-36.7	53.3	240.0	8993.2
01:12.15	346.0	-38.8	49.9	241.8	9303.6
01:13.15	346.2	-40.8	46.6	243.4	9605.3
01:14.15	346.3	-42.8	43.2	244.8	9898.0
01:75.15	346.5	-44.8	39.8	246.1	10181.4
01:76.15	346.7	-46.7	36.4	247.4	10455.2
01:77.15	346.9	-48.7	33.0	248.5	10719.3
01:18.15	347.1	-50.6	29.5	249.6	10973.1
01:19.15	347.4	-52.6	26.1	250.6	11216.7
01:20.15	347.7	-54.5	22.7	251.6	11449.6
01:21.15	348.0	-56.4	19.3	252.5	11671.8
01:22.15	348.4	-58.4	15.8	253.4	11882.8
01:23.15	348.8	-60.3	12.4	254.3	12082.7
01:24.15	349.2	-62.2	9.0	255.2	12271.1
01:25.15	349.7	-64.1	5.5	256.0	12447.9
01:26.15	350.3	-66.0	2.1	256.9	12612.9

Fig. 4. Printout for same input as Fig. 2, but selecting PRINT ALL MINUTES.

SATELLITE TRACKING DATA FOR OSCAR 8
FOR LAT: 42.375 LONG: 83.75
ORBIT BEGINS 00:35.15 (UTC), AT LONG: 64.5
* = WINDOW OPEN TO LAT: 45.25 LONG: 110.375

TIME(UTC)	AZ	EL	S-LAT	S-LONG	DIST.(KM)
00:40.15	148.7	0.7	17.2	68.8	3441.5
00:41.15	147.3	4.5	20.6	69.8	3054.9
00:42.15	145.4	8.8	24.0	70.7	2672.7
00:43.15	142.8	14.0	27.4	71.7	2299.0
00:44.15	139.0	20.4	30.9	72.7	1940.3
00:45.15	132.9	28.5	34.3	73.8	1608.9
00:46.15*	122.1	38.8	37.7	75.0	1327.0
00:47.15*	100.4	50.1	41.1	76.3	1133.6
00:48.15*	62.6	54.6	44.5	77.6	1078.3
00:49.15*	29.2	46.8	47.9	79.1	1181.0
00:50.15*	11.8	35.4	51.2	80.8	1407.1
00:51.15*	2.9	25.7	54.6	82.7	1707.6
00:52.15*	357.7	18.2	57.9	84.9	2049.3
00:53.15*	354.4	12.3	61.2	87.5	2413.7
00:54.15*	352.2	7.4	64.4	90.6	2790.8
00:55.15*	350.6	3.2	67.6	94.5	3174.8

Fig. 5. Printout for same input as Fig. 2, but tracking for a second station located at Lat 42.25, Long 110.375. Asterisks next to TIME(UTC) mean cross-communication is possible during those minutes.

```
DO YOU WANT A DAY'S CYCLE OF ORBITS (Y/N)? Y
FOR WHICH SATELLITE?
ENTER 1 FOR RS-1; 7 FOR OSCAR 7; 8 FOR OSCAR 8
ENTER 'U' TO  ACCESS USER INPUT ROUTINE? 7

ORBITAL DATA FOR OSCAR 7 NOW AVAILABLE

FOR OSCAR 7, ENTER REFERENCE ORBIT'S:
TIME OF NORTHBOUND EQUATOR CROSSING 'EQX' (HHMM.SS)? 2424.10

** INPUT ERROR **
FOR OSCAR 7, ENTER REFERENCE ORBIT'S:
TIME OF NORTHBOUND EQUATOR CROSSING 'EQX' (HHMM.SS)? 0024.65

** INPUT ERROR **
FOR OSCAR 7, ENTER REFERENCE ORBIT'S:
TIME OF NORTHBOUND EQUATOR CROSSING 'EQX' (HHMM.SS)? 0024.10
LONGITUDE AT 'EQX' (DECIMAL DEGREES)? 400

** INPUT ERROR **
LONGITUDE AT 'EQX' (DECIMAL DEGREES)? -24

** INPUT ERROR **
LONGITUDE AT 'EQX' (DECIMAL DEGREES)? 80

*** SET OUTPUT OPTIONS ***

PRINT DATA ON LINE PRINTER (Y/N) 'ENTER'=NO  ? Y
----------  HARD COPY REQUEST CONFIRMED
PRINTER OFF-LINE..CANCEL HARD COPY (Y/N)? N
HIT 'ENTER' WHEN PRINTER READY?
```

Fig. 6(a). Input run for Cycle showing error messages that alert user to incorrect entries.

```
LATITUDE OF YOUR STATION (DECIMAL DEGREES)? 400.25

** INPUT ERROR **
 LATITUDE MUST BE BETWEEN -90 & 90 DEGREES

LATITUDE OF YOUR STATION (DECIMAL DEGREES)? 40.025

LONGITUDE OF YOUR STATION (DECIMAL DEGREES)? 830.75

** INPUT ERROR **
 LONGITUDE MUST BE BETWEEN 0 & 360 DEGREES

LONGITUDE OF YOUR STATION (DECIMAL DEGREES)? 83.075

*** SET OUTPUT OPTIONS ***

PRINT DATA ON LINE PRINTER (Y/N) 'ENTER'=NO  ? Y
----------  HARD COPY REQUEST CONFIRMED
DO YOU WISH TO SEE THE WHOLE ORBIT (Y/N) 'ENTER'=NO  ? N
----------  'PRINT VISIBLE MINUTES ONLY'  CONFIRMED
TRACK FOR MUTUAL VISIBILITY (Y/N) 'ENTER'=NO  ? N
----------  'NO M.V.TRACK'
PRINTER OFF-LINE..CANCEL HARD COPY (Y/N)? NO
HIT 'ENTER' WHEN PRINTER READY?
```

Fig. 6(b). Input run showing error messages for incorrect entry of station coordinates. Actual latitude cannot exceed 89.99 degrees, plus or minus, without causing program error. Longitude is required to be positive.

```
DO YOU WANT A DAY'S CYCLE OF ORBITS (Y/N)? N
WHICH SATELLITE TO TRACK?
ENTER 1 FOR RS-1; 7 FOR OSCAR 7; 8 FOR OSCAR 8
ENTER 'U' TO  ACCESS USER INPUT ROUTINE? U
                    ==================
                    USER INPUT ROUTINE
                    ==================

DATA NOW ON FILE FOR: ** NO CURRENT ENTRY **
PLEASE ENTER THE FOLLOWING:
NAME OF THIS SATELLITE? SAMPLE1
HEIGHT OF SATELLITE (IN KM)? 20
THAT'S PRETTY LOW...BETTER DUCK!!
HEIGHT OF SATELLITE (IN KM)? 1400
PERIOD OF SATELLITE (IN DECIMAL MINUTES)? 20
INCLINATION OF ORBIT (IN DECIMAL DEGREES)? 99.9
WESTWARD PROGRESS OF ORBIT (IN DECIMAL DEGREES)? 370.25
THAT'S VERY LARGE..ARE YOU SURE??
WESTWARD PROGRESS OF ORBIT (IN DECIMAL DEGREES)? 37.025
IS THIS DATA ALL CORRECT? N


PLEASE ENTER THE FOLLOWING:
NAME OF THIS SATELLITE? SAMPLE1
HEIGHT OF SATELLITE (IN KM)? 1400
PERIOD OF SATELLITE (IN DECIMAL MINUTES)? 200.5
INCLINATION OF ORBIT (IN DECIMAL DEGREES)? 99.9
WESTWARD PROGRESS OF ORBIT (IN DECIMAL DEGREES)? 37.025
IS THIS DATA ALL CORRECT? Y

ORBITAL DATA FOR SAMPLE1 NOW AVAILABLE

TO TRACK SAMPLE1 ENTER:
TIME OF NORTHBOUND EQUATOR CROSSING 'EQX' (HHMM.SS)? 0010.0
LONGITUDE AT 'EQX' (DECIMAL DEGREES)? 80
```

Fig. 7. "User Input Routine" entries showing error inquiries and corrections double-check at end of run. Program then continues to Track or Cycle as selected.

Program listing.

```
100 REM ***********************************************************
110 REM ****                                                  ****
120 REM ****     SATELLITE TRACKING PROGRAM                   ****
130 REM ****                                                  ****
140 REM ****     COPYRIGHT (C) 1979 BY:                       ****
150 BEN ****     GNOME COMPUTERWORKS,          FOR:           ****
160 REN ****     DENNIS MITCHELL, K8UR.........AND            ****
170 REM ****     BRUCE NAZARIAN, WD8DRK......AUTHORS          ****
180 REM ****                                                  ****
100 REN ****     THIS PROGRAM WILL COMPUTE ORBITS AND         ****
200 REM ****     ANTENNA AZ-EL CO-ORDINATES FOR THE           ****
210 REM ****     USER'S LOCATION. DATA FOR OSCAR 7,           ****
220 REM ****     OSCAR 8 AND RS-1 IS PRE-PROGRAMMED.          ****
230 REM ****     DATA FOR OTHER SATELLITES MAY BE             ****
240 REM ****     ENTERED BY THE USER FOR COMPUTING            ****
250 REM ****     ORBITS FOR FUTURE LAUNCHED SPACECRAFT.       ****
260 REM ****                                                  ****
270 REM ****     OPERATION IS EASY-- THIS PROGRAM IS          ****
280 REM ****     VERY USER-ORIENTED AND WILL TALK YOU         ****
290 REN ****     THROUGH MOST EVERY STEP NECESSARY FOR        ****
300 REN ****     SUCCESSFUL COMPUTING..                       ****
310 REM ****                                                  ****
320 REN ****     FOR FURTHER INFORMATION OR CLARIFICATION     ****
330 REN ****     CONTACT:                                     ****
340 REN ****             BRUCE NAZARIAN, WD8DRK               ****
350 REN ****           % GNOME COMPUTERWORKS                  ****
360 REM ****             P.O.BOX 8063                         ****
370 REN ****             ANN ARBOR, MICH  48107               ****
380 REM ****             (313)  995-2398                      ****
390 REN ****     16K FREE MEMORY = 2124   <VERSION 4.1>       ****
400 REN ****                                                  ****
410 REN ***********************************************************
420 REN
430 REN          PRINT TITLE PAGE  (WITH ANIMATION)
440 REN
450 CLS
452 S$="OPENCLOSE"
455 FOR I=0TO100:PRINT@RND(1916/2),"*";:NEXT
460 FORI1=1TO2:
    PRINT@400,"              ";:FORI=1TO200:NEXTI:
    PRINT@400," SATELLITE ";:FORI=1TO200:NEXTI:
    NEXTI1
470 FORI1=1TO2:
    PRINT@550,"              ";:FORI=1TO200:NEXTI:
    PRINT@550," TRACKER ";:FORI=1TO200:NEXTI:
    NEXTI1
480 PRINT@960,"AN OSCAR USER'S AID";:
    PRINT@992,"(C) 1979 GNOME COMPUTERWORKS";
490 J=846:
    FORI=0TO13:C=J-(62*I)+I:PRINT@C,S$;:
    FORI1=0TO100:NEXTI1:PRINT@C,"  ";:NEXTI
492 REN J=846:FOR I=0TO12:C=J-(62*I)+I:PRINT@C,S$;:FORI1=0TO100:NEXTI1:
PRINT@C,"  ";:NEXT I
500 FORI=0TO1000:NEXT:CLS:PRINT@512,"";
510 INPUT"DO YOU NEED INSTRUCTIONS (Y/N)";AN$
515 IF LEFT$(AN$,1)<>"Y"THEN600
520 REM          PRINT OUT INSTRUCTIONS
530 CLS:PRINT"
        THIS PROGRAM WILL ASSIST YOU IN TRACKING THE PATHS OF
SATELLITES IN CIRCULAR OR NEAR-CIRCULAR ORBITS. OSCAR 7 & 8
ARE EXAMPLES OF THIS TYPE OF SATELLITE, AND ARE THE PRIMARY
FOCUS OF THIS PROGRAM.";
540 PRINT"  HOWEVER, ANY SATELLITE IN A SUITABLE
ORBIT WHOSE PARAMETERS ARE KNOWN MAY BE TRACKED BY INSERTING
THOSE PARAMETERS INTO THE PROGRAM THROUGH THE 'USER INPUT'
ROUTINE"
550 PRINT"
        TO ACTIVATE THIS 'USER INPUT' ROUTINE, TYPE 'U' IN
RESPONSE TO THE SATELLITE MENU:

        'ENTER 1 FOR RS-1; 7 FOR OSCAR 7; 8 FOR OSCAR 8;
         ENTER 'U' FOR ACCESS TO USER INPUT ROUTINE.'"
560 PRINT@960,"(HIT 'ENTER' TO CONTINUE)";:INPUT AN$
570 CLS:PRINT"
        THE 'USER INPUT' ROUTINE WILL NOW PROMPT YOU FOR THE
NAME OF YOUR SATELLITE, AND THE VARIOUS ORBIT PARAMETERS.
WHEN ALL NECESSARY PARAMETERS HAVE BEEN INPUT, THE COMPUTER WILL THEN PROMPT
FOR A REFERENCE ORBIT."
580 PRINT"
        THE PROGRAM WILL THEN OFFER THE STANDARD OPTIONS, AND
WILL CYCLE THROUGH ITS FUNCTIONS.

        'TRACKER' WILL TALK YOU THROUGH ALL OF THE STEPS YOU
NEED TO EXECUTE FOR ANY GIVEN TRACKING  OR ORBIT COMPUTING."
590 PRINT@960,"";:INPUT"(HIT 'ENTER' WHEN READY TO BEGIN)";AN$
600 REM
610 REM         BEGIN PROGRAM RUN HERE
620 CLEAR400
630 CLS:PI=3.14159265:P2=2*PI:PY=180:I$="#####.#":CR$=CHR$(13):
    US$="** NO CURRENT ENTRY **":RD=PI/PY:DG=PY/PI:HP=PI/2:
    PD$=STRING$(18,"="):P9=.999999:N9=-.999999:P1=.000001:
    RA$=STRING$(10,"-")+"> "
640 LA=-100:LO=-1:REM FORCE ERROR MESSAGE IF NO INPUT
650 CLS:PRINT@512,"";
660 INPUT"DO YOU WANT A DAY'S CYCLE OF ORBITS (Y/N)";AN$
670 IF LEFT$(AN$,1)="Y",F4=1:GOTO700
680 IF LEFT$(AN$,1)="N",F4=0 ELSE GOTO 660
690 REM
700 IF F4=1 PRINT"FOR WHICH SATELLITE?" ELSE
     CLS:PRINT"WHICH SATELLITE TO TRACK?"
710 PRINT"ENTER 1 FOR RS-1; 7 FOR OSCAR 7; 8 FOR OSCAR 8";CR$;:
    INPUT"ENTER 'U' TO  ACCESS USER INPUT ROUTINE";AN$
720 IF AN$="1"THEN 760
730 IF AN$="7"THEN 830
740 IF AN$="8"THEN 900
750 IF AN$="U"THEN 980ELSE 700
760 REN ****  RS-I DATA  ****
770 PR=120.389433
780 DC=30.227
790 HT=1706
800 IN=82.5556
810 SA$="RS-1"
820 GOTO 1210
830 REM ****  OSCAR 7 DATA  ****
840 PR=114.944836
850 DC=28.737620
860 HT=1460
870 IN=101.59660
880 SA$="OSCAR 7"
890 GOTO 1210
900 REM *****  OSCAR 8 DATA  ****
910 PR=103.22726
920 DC=25.807932
930 HT=986
940 IN=99.9
950 SA$="OSCAR 8"
960 GOTO 1210
970 REM
980 REM         ENTER HERE IF NOT USING AO-7,AO-8,RS-1
998 REM
1000 CLS:PRINTTAB(20)PD$;CR$;TAB(20)"USER INPUT ROUTINE";CR$;TAB(20);PD$;CR$;
1010 PRINT:PRINT"DATA NOW ON FILE FOR: ";US$
1020 IF LEFT$(US$,1)="*" THEN PRINT"PLEASE ENTER THE FOLLOWING:"     :GOTO 1060
1030 INPUT"TYPE 'K' TO KEEP, 'N' TO ENTER NEW DATA";AN$
1040 IF AN$=""THEN 1030
1050 IF LEFT$(AN$,1)="K" THEN 1210
1060 INPUT"NAME OF THIS SATELLITE";US$
1070 IF US$=""THEN 1060
1080 INPUT"HEIGHT OF SATELLITE (IN KM)";HT
1090 IF HT<=0 THEN PRINT:GOTO 1080
1100 IF HT<200PRINT"THAT'S PRETTY LOW...BETTER DUCK!!":GOTO1080
1110 INPUT"PERIOD OF SATELLITE (IN DECIMAL MINUTES)";PR
1120 IF PR<=0 THEN PRINT:GOTO 1110
1130 INPUT"INCLINATION OF ORBIT (IN DECIMAL DEGREES)";IN
1140 IF IN<=0 THEN PRINT:GOTO 1130
1150 INPUT"WESTWARD PROGRESS OF ORBIT (IN DECIMAL DEGREES)";DC
1160 IF DC<=0 THEN PRINT:GOTO 1150
1170 IFDC>=360PRINT"THAT'S VERY LARGE..ARE YOU SURE??":GOTO1150
1180 AN$="":INPUT"IS THIS DATA ALL CORRECT";AN$
1190 IF LEFT$(AN$,1)<>"Y" THEN US$="*":PRINTCR$:GOTO1020
1200 SA$=US$:CLS
1210 REM
       RESUME MAINLINE HERE
1220 TA=-91:TL=-1:REM SET TARGET ERROR VALUES
1230 PRINTCR$;"ORBITAL DATA FOR ";SA$;" NOW AVAILABLE";CR$
1240 IF F4=1 PRINT"FOR ";SA$;", ENTER REFERENCE ORBIT'S:" ELSE
     PRINT "TO TRACK ";SA$;" ENTER:"
1250 TM=-1:INPUT
     "TIME OF NORTHBOUND EQUATOR CROSSING 'EQX' (HHMM.SS)";TM
1260 IF TM>=2400 OR TM<0 THEN GOSUB3250:GOTO1240
1270 IF TM-INT(TM)>=.60 THEN GOSUB3250:GOTO1240
1280 B=FIX(TM/100):      REM H=HOURS
1290 N=FIX(TM-B*100):    REM M=MINUTES
1300 S=TM-FIX(TM) :      REM S=SECONDS
1310 T=B*60+M+(S/.6):    REM CONVERT FROM HHMM.SS TO DECIMAL
1320 ST=T:REM SAVE START TIME FOR LATER USE
1330 CO=-1:INPUT"LONGITUDE AT 'EQX' (DECIMAL DEGREES)";CO
1340 IF CO>=360 OR CO<0 THEN GOSUB3250:GOTO1330
1350 ON F4 GOTO 1400
1355 L4=-91
1360 PRINTCR$;"LATITUDE OF YOUR STATION (DECIMAL DEGREES)";:
     IF LA>-90 THEN PRINT"
<HIT 'ENTER' TO RETAIN VALUE:";LA;" >";
1365 INPUT L4:IF L4=-91 AND LA>-90 THEN L4=LA:GOTO 1375
1370 IF L4>=90 OR L4<=-90 GOSUB3250:PRINT
     "<LATITUDE MUST BE BETWEEN -90 & 90 DEGREES>":GOTO 1360
1375 LA=L4:L4=-1
1380 PRINTCR$;"LONGITUDE OF YOUR STATION (DECIMAL DEGREES)";:
     IF LO>-1 PRINT"
<HIT 'ENTER' TO RETAIN VALUE: ";LO;">";
1385 INPUT L4:IF L4=-1 AND LO>-1 THEN L4=LO:GOTO 1395
1390 IF L4>=360 OR L4<0 GOSUB3250:PRINT
     "<LONGITUDE MUST BE BETWEEN 0 & 360 DEGREES>":GOTO 1380
1395 LO=L4
1400 PRINT CR$;"*** SET OUTPUT OPTIONS ***";CR$:
     AN$="":INPUT"PRINT DATA ON LINE PRINTER (Y/N)
<'ENTER'=NO> ";AN$:
     IF LEFT$(AN$,1)="Y" THEN F5=0 ELSE F5=1
1410 IF P5=0 PRINTRA$;"HARD COPY REQUEST CONFIRMED" ELSE PRINT
     RA$;"'NO HARD COPY' CONFIRMED"
1420 ON F4 GOTO 1530
1430 AN$="":INPUT"DO YOU WISH TO SEE THE WHOLE ORBIT (Y/N)
<'ENTER'=NO> ";AN$
1440 IF LEFT$(AN$,1)="Y" THEN F2=2 ELSE F2=1
1450 IF F2=1 PRINTRA$;"'PRINT VISIBLE MINUTES ONLY'  CONFIRMED" ELSEPRINTRA$;
"'PRINT ALL MINUTES' CONFIRMED"
1460 AN$="":INPUT"TRACK FOR MUTUAL VISIBILITY (Y/N)
<'ENTER'=NO> ";AN$
1470 IF LEFT$(AN$,1)<>"Y",F6=1:PRINTRA$;"'NO  M.V.TRACK'":
     GOTO 1530 ELSE F6=0
```

Flowchart 4). Once entered, these user orbit parameters will be retained during the program run until you change them. Fig. 2 shows a typical input run.

After you have selected your bird, Orbit Track will prompt for entry of the EQX data and for selection of the various options described below. (See Flowchart 5 for Options logic). After setting your option choices, the orbit track commences.

Orbit Tracking Options

In Orbit Track there are several options that may be set or reset for each orbit computed. Flowchart 6 shows Orbit Track logic. These include listing the computed data on the line printer (hard copy), suppressing the display of data for minutes when the satellite is not visible from your station location (PRINT VISIBLE MINUTES ONLY), and tracking the orbit for simultaneous access from a second station location (M.V.TRACK). Each of these options has a default mode, which the computer will select if you respond with just an ENTER after the prompt for that option. All of the options may be set or reset before each orbit tracking operation, so you won't be stuck with a selection you don't want.

In the PRINT VISIBLE MINUTES ONLY mode, Tracker will print a single line indicating the current time and (satellite name) NOT VISIBLE until the satellite comes into the range of your station location. It then will output all data normally. When it has computed that the satellite has dropped below your horizon, it will end the tracking routine for that orbit and ask if you wish to track the next orbit of the same satellite. This is the "Sequential Tracking" feature. Fig. 3 shows the abbreviated

```
1480 T4=-91:PRINT"TARGET LOCATION LATITUDE (DEC. DEGREES)";:
     IF TA>-91 PRINT"
<HIT 'ENTER' TO KEEP  VALUE:";TA;" >";
1485 INPUT T4:IF T4=-91 AND TA>-90 THEN T4=TA:GOTO 1500
1490 IF T4>=90 OR T4<=-90 THEN 1400ELSE TA=T4
1500 T4=-1:PRINT"TARGET LOCATION LONGITUDE (DEC. DEGREES)";:
     IF TL>-1 PRINT"
<HIT 'ENTER' TO KEEP VALUE:";TL;" >";
1505 INPUT T4:IF T4=-I AND TL>-1 THEN T4=TL:GOTO 7520
1510 IF T4>=360 OR T4<0 THEN 1500 ELSE TL=T4
1520 REM
      INPUT CONTINUES HERE

1538 FORJ=0TO500:NEXT:CLS
1540 J=1:IF LA>=0 THEN K=FIX(PR/2) ELSE K=FIX(PR):
     REM SET LOOP POINTERS
1550 ON F5 GOTO 1610
1568 AN$="":IF PEEK(14312)<128 THEN1600ELSEINPUT"PRINTER OFF-LINE..CANCEL
HARD COPY (Y/N)";AN$
1570 IF LEFT$(AN$,1)="Y",F5=1:GOTO1600
1580 IF LEFT$(AN$,1)="N",F5=0:GOTO1600
1590 GOTO1560
1600 IF F5=0,INPUT"HIT 'ENTER' WHEN PRINTER READY";AN$
1610 L2=LA:O2=LO:I2=IN:L3=TA:O3=TL
1620 ON F4 GOTO 2670:REM PRINT DAY'S ORBITS
1630 GOSUB3020
1640 ON F5 GOTO 1700
1650 LPRINTTAB(10)"SATELLITE TRACKING DATA FOR ";SA$
1660 LPRINTTAB(10)"FOR LAT:";LA;"LONG:";LO
1670 LPRINTTAB(10)"ORBIT BEGINS ";TM$;" (UTC), AT LONG:";:
     LPRINTUSING"###.#";CO
1680 IF F6=0,LPRINTTAB(10)"* = WINDOW OPEN TO LAT:";TA;" LONG:";TL
1690 LPRINT" ":LPRINT"TIME(UTC)";TAB(16)"AZ";TAB(26)"EL";TAB(35)     "S-LAT";
TAB(44)"S-LONG";TAB(54)"DIST.(KM)";CR$
1700 REM
             PRINT THE HEADER


1718 REN
1720 CLS
1730 PRINTTAB(10)"SATELLITE TRACKING DATA FOR ";SA$
1740 PRINTTAB(10)"FOR LAT:";:PRINTUSINGI$;LA;
1745 PRINT"  LONG:";:PRINTUSINGI$;LO
1750 PRINTTAB(10)"ORBIT BEGINS ";TM$;" (UTC), LONG:";
1760 PRINTUSINGI$;CO
1770 ON F6 GOTO 1790
1780 PRINTTAB(10)"* = WINDOW OPEN TO LAT:";TA;" LONG:";TL
1790 PRINTTAB(10)"<USE  'CLEAR'  KEY TO  ABORT LISTING>":
     GOSUB3240:REM PRINT HEADER LINE
1800 IF F2=1 THEN PRINT "THIS WILL TAKE A SECOND...HANG ON";CHR$(29);
1810 REM
1820 REM         CONVERT TO RADIANS
1830 'IFLA>=90THEN LA=89.99ELSE LA=LA:IF LA>=-90 THEN LA=-89.99ELSE LA=LA
1840 LA=LA*RD:LO=LO*RD:IN=IN*RD
1850 TA=TA*RD:TL=TL*RD
1860 R=6378.1*(1-(.00335*(SIN(LA)[2))):REM
1870 F=R+HT:F3=0:LC=0
1880 T=T+(J-1)
1890 :            FOR TI=J TO K
1900 REM                      SOLVE FOR SAT. LATITUDE
1910 X=SIN(P2*TI/PR)*SIN(IN):REM
1920 IF X>=1  THEN X=P9
1930 IF X<=-1 THEN X=N9
1940 IF X=0 THEN X=P1
1950 SL=ATN(X/SQR(-X*X+1)):REM ARCSIN (X)
1960 REM                      SOLVE FOR SAT. LONGITUDE
1970 Y=COS(P2*TI/PR)/COS(SL):REN
1980 IF Y>=1 THEN Y=P9
1990 IF Y<=-1 THEN Y=N9
2000 SO=-ATN(Y/SQR(-Y*Y+1))+HP:REM ARCCOS (Y)
2010 SO=SO+((TI/4)*RD)+(CO*RD):REM
2020 IF SO>=P2 THEN SO=SO-P2
2030 REM - SOLVE FOR ANGLE BETWEEN SAT,CNTR OF EARTH,OBSERVER;
2040 Z=(SIN(LA)*SIN(SL))+(COS(LA)*COS(SL)*COS(SO-LO)):REM
2050 IFZ>=1,Z=P9 ELSE IFZ<=-1,Z=N9
2060 OO=-ATN(Z/SQR(-Z*Z+1))+HP:REN ARCCOS (Z)
2070 ON F6 GOTO2110:REN MUTUAL VIS FLAG =0 FOR CALC, 1 FOR NO.
2080 ZT=(SIN(TA)*SIN(SL))+(COS(TA)*COS(SL)*COS(SO-TL)):REM
2090 IFZT>=1,ZT=P9 ELSE IF ZT<=-1,ZT=N9
2100 OT=-ATN(ZT/SQR(-ZT*ZT+1))+HP:REM ARCCOS (ZT)
2110 REM                      SOLVE FOR AZIMUTH TO SATELLITE
2120 W=(SIN(SL)-SIN(LA)*COS(OO))/(SIN(OO)*COS(LA)):REM
2130 IFW>=1,W=P9 ELSE IFW<=-1,W=N9
2140 AZ=-ATN(W/SQR(-W*W+1))+HP:REM ARCCOS (W)
2150 XX=SIN(SO-LO):IF XX>=0 THEN AZ=P2-AZ
2160 REM                      SOLVE FOR ELEVATION TO SATELLITE
2170 EL=ATN((COS(OO)-(R/F))/SIN(OO)):REM
2180 IF EL>0 THEN F3=1
2190 ON F6 GOTO 2220
2200 ET=ATN((COS(OT)-(R/F))/SIN(OT)):REN
2210 IF F3=1 AND ET>0 THEN MV$="*" ELSE MV$=" "
2220 REM                      SOLVE FOR DISTANCE TO SATELLITE
2230 DS=SQR((F*F)+(R*R)-2*F*(R*COS(OO))):REN
2240 T=T+1:GOSUB3020
2250 IF INKEY$=CHR$(31) PRINT CR$;"*** ORBIT TRACK ABORTED ***";CR$:LA=L2:LO=O2:
IN=I2:TA=L3:TL=O3:GOTO1240:REN RESTORE VALUES
2260 ON F2 GOTO 2270,2310
2270 IF EL<0 AND F3=0 THEN PRINTTM$;TAB(14)SA$;" NOT WITHIN RANGE";
CHR$(29);:GOTO 2500
2280 IF BL<0 AND F3=1 THEN IF LA>=0 THEN 2530
2290 IF EL<0 AND F3=1 AND LA<0 THEN F3=0:GOTO 2260
2300 REM
         PRINT ONE MINUTE'S DATA

2310 ON F5 GOTO 2380
2320 LPRINTTM$;MV0;
2330 LPRINTTAB(12)USINGI$;AZ*DG;
2340 LPRINTTAB(22)USINGI$;EL*DG;
2350 LPRINTTAB(33)USINGI$;SL*DG;
2360 LPRINTTAB(43)USINGI$;SO*DG;
2370 LPRINTTAB(54)USINGI$;DS
2380 REM
2390 REN
2400 PRINT TM$;MV$;
2410 PRINTTAB(12)USING I$;AZ*DG;
2420 PRINTTA0(22)USING I$;EL*DG;
2430 PRINTTAB(33)USING I$;SL*DG;
2440 PRINTTAB(43)USING I$;SO*DG;
2450 PRINTTAB(54)USING I$;DS
2460 IF F5=0 THEN 2500
2470 LC=LC+1:IP LC>=12 THEN LC=0: GOSUB 3240
2480 REN
2490 REN
2500 :            NEXT TI
2510 IFEL>=0,J=T1:K=TI+1:FORTI=JTOK:GOTO1910
2520 IF EL<0 AND F3=0,PRINT CR$;SA$;" NOT VISIBLE THIS ORBIT"
    :IF F5=0 LPRINT SA$;" NOT VISIBLE THIS ORBIT"
2530 LA=L2:LO=O2:IN=I2:TA=L3:TL=O3
2540 PRINT"COMPUTE NEXT ORBIT OF ";SA$;
2550 AN$="":INPUT AN$:IF LEFT$(AN$,1) <> "Y" THEN 2630
2560 REM
2570 REM         ADD PR TO TINE FOR NEXT ORBIT TIME
2580 REN
2590 T=INT((ST+PR)*100)/100:IF T>=1440,T=T-1440
2600 CO=CO+DC:ST=T
2610 IF CO>360 THEN CO=CO-360
2620 GOTO 1400
2630 AN$="":PRINT"ANOTHER ORBIT FOR ";SA$;:INPUTAN$
2640 IF LEFT$(AN$,1)="Y" THEN CLS:GOTO 1230
2650 GOTO 650:REM RESTART MAINLINE, SAVE LA,LO
2660 REM
2670 REM         ROUTINE TO PRINT DAY'S ORBITS
2680 REM
2690 CLS:ON F5 GOTO 2720
2700 LPRINTTAB(10);"DAY'S ORBITS FOR ";SA$;CR$
2710 LPRINT"REF+";TAB(14)"TINE (UTC)";TAB(30)
     "LONGITUDE AT 'EQX'";CR$
2720 PRINTTAB(10)"DAY'S ORBITS FOR ";SA$
2730 PRINT"REF+";TAB(14);"TIME(UTC)";
2740 PRINT TAB(30);"LONGITUDE AT EQX"
2750 K=INT(1440/PR+.5)
2760 GOSUB 3020
2770 ON F5 GOTO 2790
2780 LPRINT"REF";TAB(14);TM$;TAB(35);CO
2790 PRINT"REF";TAB(14);TM$;TAB(35);CO
2800 FOR TI=1 TO K
2810 T=INT((T+PR)*100)/100
2820 IF T>=1440 THEN T=T-1440
2830 REN 8150 CORRECTS FOR 24HR WRAP-AROUND (24HRS=1440 MINS)
2840 GOSUB 3020
2850 CO=CO+DC
2860 IF CO>360 THEN CO=CO-360
2870 ON F5 GOTO 2890
2880 LPRINTTI;TAB(14);TN$;TAB(35);:LPRINTUSING"###.#";CO
2890 PRINT TI;TAB(14);TN$;TAB(35);:PRINTUSING"###.#";CO;
2900 IF TI<>K THEN PRINT
2910 NEXT TI
2920 PRINT@244,"HIT";:PRINT@372,"'ENTER'";:PRINT@500,"WHEN";:
     PRINT@620,"READY";:INPUT AN$
2930 CLS
2940 PRINT"COMPUTE ANOTHER CYCLE FOR ";SA$;" (Y/N)
<'ENTER'=NO> ";:INPUTAN$
2950 IF LEFT$(AN$,1)="Y"THEN 1240
2960 AN$="":INPUT
     "COMPUTE A CYCLE FOR A DIFFERENT SATELLITE (Y/N)
<'ENTER'=NO> ";AN$
2970 IF  LEFT$(AN$,1)="Y"THEN 700 ELSE F4=0:GOTO700
2980 REM
2990 REN
3000 REM          SUBROUTINE TO CONVERT TIME TO STRINGS
3010 REM
3020 H=INT(T/60)
3030 M=INT(T-H*60)
3040 S=T-INT(T)
3050 S=INT(S*100+.5)/100 * .6
3060 S=INT(S*100)/100
3070 IF S>=.60 THEN M=M+1:S=0
3080 IF N>=60 THEN H=H+1:H=0
3090 IF H>=24 THEN B=0
3100 H$=STR$(H)
3110 N$=STR$(N)
3120 S$=STR$(S):IF LEN(S$)<4,S$=S$+"0"
3130 IF H=0 THEN B$="00"
3140 IF H<10 THEN H$="0"+RIGHT$(H$,1)
3150 IF H>=10 THEN H$=RIGHT$(H$,2)
3160 IF M=0 THEN N$="00"
3170 IF M<10 THEN N$="0"+RIGHT$(M$,1)
3180 IF N>=10 THEN N$=RIGHT$(M$,2)
3190 S$=MID$(S$,3,2)
3200 TM$=H$+":"+M$+"."+S$
3210 RETURN
3240 PRINT:PRINT"TIME(UTC)";TAB(16)"AZ";TAB(26)"EL";TAB(35)"S-LAT";
TAB(44)"S-LONG";TAB(54)"DIST.(KM)":RETURN
3250 PRINTCR$;"** INPUT ERROR **":RETURN
```

nature of PRINT VISIBLE, contrasted against Fig. 4 showing the same orbit printed with the PRINT ALL MINUTES option.

Selecting the PRINT ALL MINUTES option will force Tracker to print data for the entire duration of the orbit selected without regard to the visibility of the satellite. With either option, if the program cannot find any time during the orbit when the satellite is within range, it will indicate that the satellite is NOT VISIBLE THIS ORBIT.

The HARD COPY option is pretty self-explanatory, but a word or two about its operation will help. The TRS-80's Line Printer routine will lock out your BASIC program if you issue an LPRINT command without a printer hooked up. To prevent this from happening and to support some of the after-market printer adapters (like the TRS-232 that I used here with my Anderson-Jacobson 841 Selectronic to type this article), Tracker samples the Printer Port for a READY signal. If it senses that the printer is off-line or that there isn't one there (the two conditions look identical to the computer), it will prompt:

PRINTER OFF-LINE . .
CANCEL HARD COPY
(Y/N)?—

Answering YES will reset the HARD COPY flag and cancel all further attempts to LPRINT. Answering NO will keep the HARD COPY flag set and will attempt to LPRINT the data requested. If you have a Centronics-type printer that uses the Expansion Interface printer port, this message will remind you to turn it on and get it ready. If you have the TRS-232 or a similar adapter that uses BASIC's Printer Device Control Block as a link to its machine language driver, this little option is not

Table 1. Symbol table for Satellite Tracker.

AN$	General-purpose input string. Contains keyboard input in response to prompts.
AZ	Antenna azimuth calculated each minute, in radians.
CO	Crossing longitude . . . from EQX input.
DC	Westward precess of orbit . . . used to update CO for "Sequential Tracking" function.
DG	Conversion constant (radians * DG = Degrees).
DS	Distance to satellite, calculated each minute, in km.
EL	Antenna elevation calculated each minute, In radians.
ET	Elevation seen from "Target." Used with "M. V. Track."
F2	PRINT LENGTH FLAG =1 means PRINT VISIBLE MINUTES. =2 means PRINT ALL MINUTES.
F3	VISIBLE FLAG =1 means bird visible once this orbit. =0 means bird not visible this orbit.
F4	CYCLE FLAG =1 means ORBIT CYCLE only. =0 means TRACK.
F5	HARD COPY FLAG =1 means NO HARD COPY. =0 means HARD COPY REQUESTED.
F6	M. V. TRACK FLAG =1 means NO M. V. TRACKING. =0 means TRACK.
H,H$ M,M$ S,S$, TM$,T, ST	Used in time conversion routine. Time is computed in decimal, then converted to strings for printing. H = Hours. M = Minutes. S = Seconds, TM$ = Composite.
HT	Height of satellite's orbit, in km.
IN	Inclination of satellite's orbit.
PR	Period of orbit.
LA	Your station latitude in decimal degrees.
LO	Your station longitude in decimal degrees.
SL	Latitude of sub-satellite point.
SO	Longitude of sub-satellite point.
TA	Target station latitude for "M. V. Tracking."
TL	Target station longitude for "M. V. Tracking."
OO	Angle, Theta, between satellite, center of the Earth, and you. Used to determine position of bird.
RD	Conversion constant (degrees * RD = radians).
SA$	Name of satellite being tracked.
US$	Name of "User" satellite that has been input.
W,X,Y, Z,ZT,P, HP,P2	Are either intermediate calculations to derive one of the above, or are system variables which do not change value.

necessary. If you don't have a printer, this little warning may save you some grief. Remember, if you do force the issue, and don't have a printer or other adapter, BASIC will lock you out of the program for good (or at least until you RESET).

Two Tracks for the Price of One

The MUTUAL VISIBILITY TRACK option is a feature that was not in the original KIM program. If you answer YES to this option, you will be prompted to input the latitude and longitude of a "Target" location. You can use this option for things like tracking a pass to see if that G3 station can hear OSCAR 8 when you can, or even to see if your buddy in North Dakota can access the same orbits as you. You will find it convenient and easy to use, and it will make working satellite DX a lot less chancy and a lot more fun. To indicate that this option is operational, the header printout will now include:

* = WINDOW OPEN TO (LAT), (LONG)

The program printout will be modified to print an asterisk (*) next to the time column for each minute when both stations have access to that satellite. See Fig. 5 for a sample printout. Tracker will retain the location of your target station and will allow you to update it or keep it the same each time you select the M.V. TRACK option. This makes it a snap to track more than one orbit for the same target.

Additional Features

Another slick feature of Tracker is sequential tracking. To eliminate repetitive data entry (and the inevitable sore fingertips), the Orbit Track routine is programmed to compute the EQX for the next orbit in normal sequence. After tracking any orbit, the computer will prompt:

COMPUTE NEXT ORBIT OF (satellite name)?

A YES answer will tell Tracker to update the EQX data to the next orbit in normal sequence and offer you the options selection for that orbit. A NO answer will bring the prompt:

ANOTHER ORBIT FOR (satellite name)?

A YES answer will retain the satellite selected but will allow you to input another EQX and track it. Use this when you wish to skip certain orbits that are of no interest to you (like when it is 5:00 am and the satellite is passing over southern Borneo, or some other exotic port-of-call). A NO answer returns you to the main menu. To fully appreciate the versatility of the options, note that Figs. 3, 4, and 5 are tracks of the same orbit, but printed with different options.

Some Niceties

During development of this program it became apparent that some tricky timing problems can occur for stations located close to the equator. These stations may experience a "wrap-over" of a visible pass from the southern to northern hemisphere, or vice versa. To eliminate this, Tracker monitors the status of any Orbit Track listing and if the satellite is still visible as it crosses the equator, Tracker will extend its computations across the equator until it loses visibility for that pass.

Slippery-Finger-Proof, Too

Tracker also monitors the values for all user entries from the keyboard and will print error messages as appropriate. You will not be allowed to make mistakes by entering a value that is too large or too small for the desired function, and you may even find Tracker questioning your input to the User routine if the parameters don't make sense. Believe me, after playing with some programs where there is no provision for error correcting, sometimes making the en-

tire output useless, using Tracker is a pleasure. Fig. 6 shows typical input error messages, and Fig. 7 shows User Input Routine error messages.

Input/Output Conventions

It should be understood that in OSCAR tracking, longitude is expressed as West only, from 0 to 360 degrees. Latitude is expressed as either +1 to +90 or −1 to −90 for North or South, respectively. Tracker printouts follow these conventions. All longitudes displayed are West. To find the correct East longitude for numbers exceeding 180 degrees, subtract 360 from the indicated West longitude. All latitudes are displayed as *positive* numbers for North and *negative* numbers for South. Your input to Tracker should follow this convention too, or you may get some very strange results.

Tracker will compute orbits for stations in either hemisphere as long as the above standards are followed in inputting station and target locations, etc. Tracks computed for southern hemisphere stations may take a while before they show output since Tracker uses a complex iterative method to compute the data for each minute of the orbit and cannot fast-forward these calculations. Since it begins each orbit calculation at the northbound equator crossing, it must compute between 40-50 minutes worth of data before it "wraps over" into the southern hemisphere. Be patient. It's still faster than a hand calculator. Just remember that the EQX data should be entered for a northbound equator crossing regardless of the hemisphere in which your station is located.

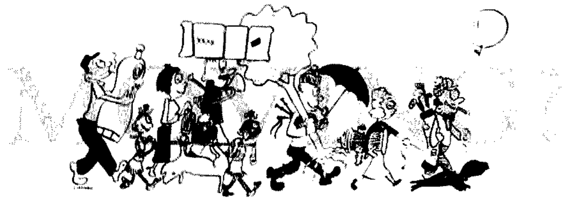
So How Does It Work?

For you programmers out there, Table 1 is a symbol table of the variables used and their significance to the program. Each of the flowcharts shows the BASIC line numbers of the program sections on that chart and where the jumps go. In addition, operations that change variables will have those variable names shown next to them, indicating changes. You should be able to use these aids to follow the program just about anywhere in its execution. If all else fails, use the TRON function of Level II BASIC to show you the line numbers as you are executing Tracker.

Some Final Notes

Dennis and I hope that you enjoy using Tracker on your TRS-80 system. The program is written in Microsoft's Level II BASIC and can be translated into other BASICs that have the trig functions with only minor syntax changes. Versions are available for the PET (yes, it will run on the 8K version) and APPLE (16K with APPLESOFT). And the updated KIM-1 version will also be available. As interest arises, we will translate Tracker into versions suitable for other micros as well.

As indicated before, cassettes for the TRS-80 (and for the PET as well) are available from GNOME Computerworks, at the address listed under our names. The price is $10.00, postpaid, and includes a user's guide that should answer any questions this article may have left unanswered. (We have other ham software goodies available, too. Please inquire.) For now, 73 from us both, and see *you on OSCAR.*■



Bill Vergona
3504 Taylor Avenue
North Las Vegas NV 89030

You Still Haven't Built a Logic Probe?

—try this one

Many people who get involved in home computer systems or any other form of digital electronics at one time or another run into hardware problems. If you want to fix them yourself, you need some way to look at what's going on inside the logic.

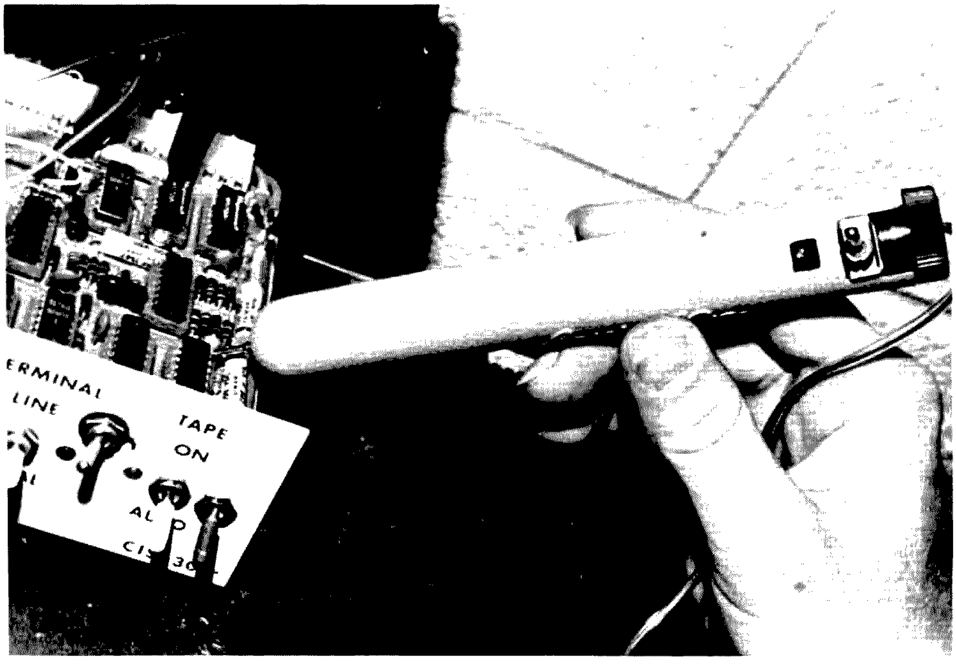
Usually, if you want to see logic levels, you might use a simple logic probe or a high-impedence FET (Field-Effect Transistor) volt ohmmeter (VOM). If you want to see a timing relationship, you need a triggered sweep oscilloscope to see the actual timing relationship of two different pulses or signals.

Not every home computerist can afford to buy a good scope just to look at a logic signal once in awhile, so here is a unique logic probe which can see timing relationships as well as perform the usual functions of a logic probe. It's inexpensive, with provisions for both positive and negative sync input. It can almost replace an oscilloscope in many digital applications. If you don't have an oscilloscope and can't afford one, then this logic probe is a useful substitute.

At work and at home I use my Synchronized Logic Probe to identify most logic problems easier and faster than with a scope. Many times it's too much trouble to pull out the scope, so I use this probe instead. My probe also has features missing in an oscilloscope. Did you ever try to see an 18-ns pulse on a scope when it only happens about once every 5 or 10 seconds? With a scope, such a pulse is invisible, but using a probe which stretches the pulse enables it to be seen.

This logic probe will display a P for approximately 0.75 seconds every time a pulse occurs. It also displays standard logic levels like L for a low (false), H for a high (true), and an F for a float (open). Not only that, you can synchronize it to one signal and see if another signal happens at the leading or trailing edge of the sync input. One of the nicest points about this logic probe is that you can build it for about seven dollars.

How does this work? See the schematic, Fig. 1, and the timing diagram, Fig. 2. Under all conditions, segments E and F are always enabled via the +5-volt power bus forming the left-hand vertical bar of P, L, H, or F. The first condition discussed will be the static or no-signal condition.



The completed Synchronized Logic Probe in action. Custom case is a cigar tube.

At this time, the probe tip

is connected to neither a ground nor a true value. Pin 1 of IC1A is floating (true in TTL) and pin 2 is connected to a true (Vcc) through S1 and J1 (Sync input), giving a false output of IC1A. Pin 13 of IC1D is at ground potential through R6, and pin 12 of IC1D is also true through S1 and J1, so the output of pin 11 is true. The false output of IC1A is applied to both inputs of IC1B, making its output true.

This true is applied to one input, pin 9, of IC1C. The other input, pin 10, also is true from the output of IC1D, so now IC1C has an output which is false. This false is applied to input pin 12 of IC2D. The other input is tied to the $\bar{Q}$ output of the one-shot, IC4, which is statically true. The output of IC2D is logic true, which causes segment A of the display to be lit. To complete an F, we need to light segment G and make sure segments B, C, and D are off.

Pin 9 of IC2C is true from the output of IC1D and pin 10 of IC2C is true from the one-shot, making its output false and thus keeping segment B off. Pin 3 of inverter IC3B is true from IC1, making its output false, which, when applied to IC2B, makes its output true.

This output is inverted again through IC3C and makes segment C false, thus keeping its segment off. Pin 1 of IC2A is false from IC1A, making its output true and lighting segment G; this output is also inverted by IC3D, keeping segment D off. Thus, segments A, E, F, and G are lit while B, C, and D are off, giving a display of F (float).

Now that we have seen the float condition and the basic operation, I am going to explain the logic true or high condition. When a logic true is present at the probe tip, it is applied to pin 1 of IC1A, making its output false. This false output is

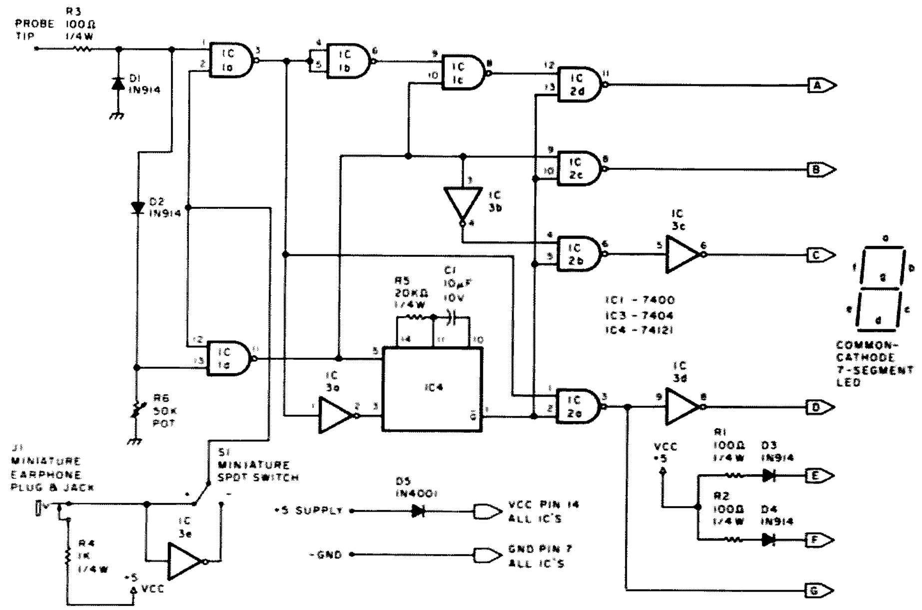


Fig. 1. Schematic diagram of the Synchronized Logic Probe.

applied to both inputs of IC1B, making its output true, which is then applied to pin 9 of IC1C.

The probe tip input is also applied to pin 13 of IC1D, making its output false and this being the other input to IC1C, thus makes its output true. This true which is applied to one input of IC2D along with a true on the other input from the $\bar{Q}$ output of the one-shot makes the output of IC2D false, which turns segment A off. Pin 9 of IC2C is false from IC1D, making its output true and lighting segment B. Pin 4 of IC2B is true from the inverted output of IC1D, making the output of IC2B false, which is inverted by IC3E, lighting segment C. Pin 1 of IC2A is false from the output of IC1A making the output of IC2A true, which is used to light segment G and is also inverted by IC3D which keeps segment D off. Now we have segments B, C, and G lit, while segments A and D are off. Remember that segments E and F are always on and thus the display of H for a static true.

As for the low condition, all segment outputs are opposite except for segment

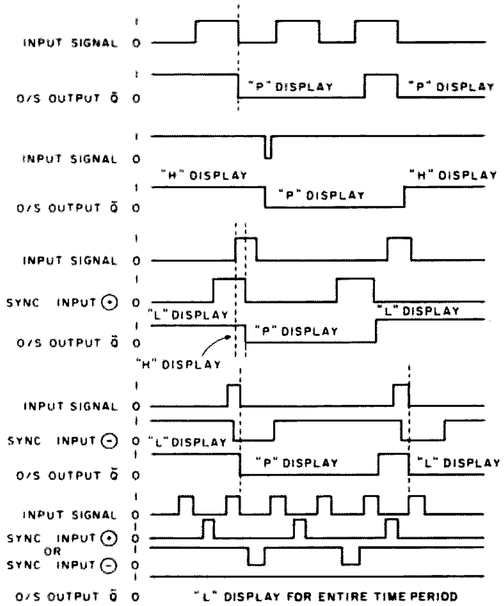
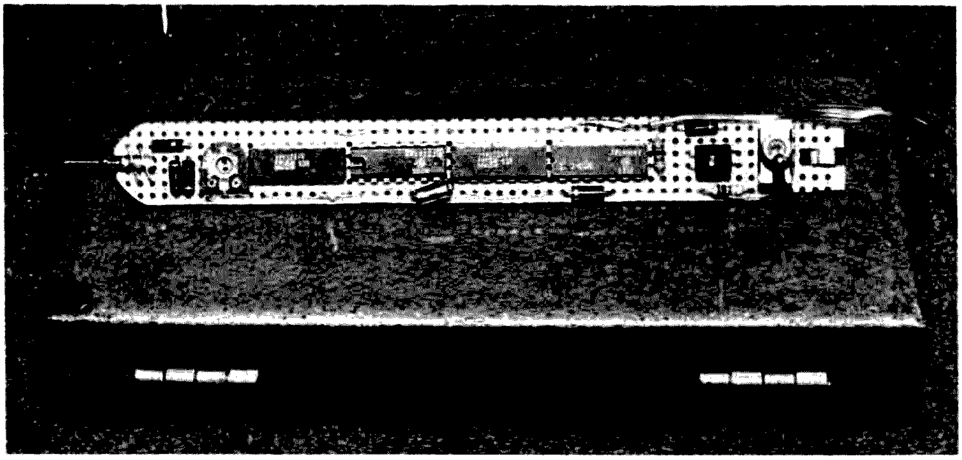


Fig. 2. Timing diagram for logic probe.

A, which remains off. Pin 1 of IC1A goes false, making its output true. This is inverted by IC1B, so a false is applied to pin 9 of IC1C along with a true from the output of IC1D. This makes the output of IC1C true. This is then applied to pin 12 of IC2D, along with a true from the $\bar{Q}$ output of IC4, which makes the IC2D output false. This keeps segment A off.

A note about the low condition: When you first apply the probe tip to a logic false signal, the changing state of IC1A through IC3A triggers the one-shot, making the $\bar{Q}$ output false. This, in turn, enables segments A, B, and G regardless of the other inputs and also disables segments C and D, thus displaying a P for approximately .75 seconds before going to an L display. This can be viewed as a self-checking way to see if



Components are mounted on 0.1" perfboard shaped to fit inside cigar tube.

the pulse circuit is working. Whenever there is a high-to-low transition at the input of IC1A, the one-shot will be triggered and a P will be displayed until a constant state is reached. This covers the generation of the H, L, P, and F display conditions. Note that the length of the P display can be changed by varying R5 and/or C1.

This brings us to the operation of the sync input. Under normal conditions (not using sync), switch S1 is kept in the positive (+) position, thus applying a logic true to one input of IC1A and IC1D. When the sync-pulse input is used, the logic true is disconnected from the switch input and replaced by the sync-input signal.

First the positive sync input will be discussed. When using the positive sync input, this means that we are looking for a signal at the probe tip which is either occurring at the leading edge (low-to-high transition) of the sync pulse or during the true state of the sync pulse. When the sync pulse is true, it is applied through the switch and enables the inputs to both IC1A and IC1D. If the signal you are looking for at the probe tip becomes true at the same time or during the time of the sync pulse, a P will be displayed, indicating that the logic true was present. This is accomplished by the changing states of IC1A and IC1D which trigger the one-shot, IC4. If the signal you are looking for was not true during the sync pulse time, an L will be displayed and remain.

When using the negative sync input, this means that you are looking for a signal at the trailing edge of a sync pulse or during the time that the sync is false. The first thing to do is to move the switch (S1) to the negative position. When the sync pulse goes low at its trailing edge, it is applied to pin 11 of IC3E, making its output true and thus enabling IC1A and IC1D. If the input signal goes true during that time, the pulse circuit is triggered and a P is displayed, indicating that the pulse was there at that time. When you are not using a sync input, switch S1 must be kept in a positive position or the normal probe functions will not work correctly. Also, when the sync input is used and the probe tip is floating, a P will display if the sync input is active.

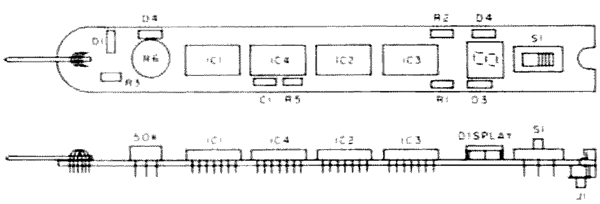


Fig. 3. Synchronized Logic Probe component mounting.

Construction

Fig. 3 and the photos show the complete circuit of the Synchronized Logic Probe, but there are a few things that might prove to be helpful. The prototype of this probe was built using 0.1" perfboard which was cut and shaped to fit inside a cigar tube prior to mounting any of the components. Wire buses were used for the +5-volt and ground connections for the chips and other components. As shown in Fig. 3, you should mount the display, switch, and sync jack on the end of the board first, and make any necessary cutouts on the tube housing and board. Make sure that switch S1 is easily accessible and sticks up through an opening in the tube.

There is only one adjustment on the probe—the 50k variable resistor used to establish the F state. When you get the probe assembled, connect it to your power supply and note that there is a legible display (L, H, or F). You should adjust the potentiometer until an F is displayed with no connection to the probe tip. Once this is obtained, you will notice that there is a range of adjustment before the display changes from an F to an L or H. This adjusts the sensitivity of the probe tip to a logic high or low.

Upon completion, touch the probe tip to the +5-volt side and then to the ground side of the power supply that you are using. The probe should display an H when touched to the +5 volts. A P should be displayed for approximately .75 seconds when first touched to ground, before going to an L display. If a P is not displayed when the probe tip is first touched to ground, the pulse circuit is not functioning correctly. As long as the other displays are correct, then the problem should be in the one-shot (IC4). Check the external capacitor and resistor connections to the chip. If the other displays do not work correctly, then you will have to troubleshoot the entire circuit.

A neat trick for troubleshooting can be used if you have a display with a decimal point: Connect a piece of wire approximately 10 inches long through a 100-Ohm resistor to the decimal point and use it for a simple probe. If you touch the wire to a logic high, the decimal point will light, and if it is a low the decimal point will stay off. The 100-Ohm resistor in series with the wire is to prevent burning up the decimal point.

I used this basic logic probe when troubleshooting the more sophisticated, Synchronized Logic Probe. This, along with the circuit operation and schematics provided, should give you everything you need to build and troubleshoot the Synchronized Logic Probe. Good luck! ■

Tim Daniel N8RK
73 Magazine Staff

VHF Contesting

—a magnificent obsession

There are several things this article *won't* say. For starters, I will not tell you that VHF contesting is easy. Nor will I guarantee any kind of success if you try it on your own. Instead, I will tell you about all the fun you are missing if you don't already participate in VHF contests; even if you are not interested in trying out this madness, you should be happy to hear that life does exist above two meters.

Having antennas that clear the trees is important, but the W8DJY contesters rely on a knowledge of VHF propagation to supplement their line-of-sight capability.

Cornfields

Until a few months ago, I thought that VHF contests were intended for hams living in the East or in the West. After all, that is where mountains are, and the densely populated areas, too. Those hams living in the flat Midwest were just plain out of luck since most VHF contacts are made using a line-of-sight path.

A 45-minute drive through the rolling countryside of southwestern Ohio to the station of W8DJY was what it took to convince me that VHF contesting not only exists in the Midwest, but also it is doing quite well. W8DJY is located on one of the taller "peaks" near Middletown, Ohio. It sits about 200 feet above most of the surrounding terrain, at an elevation of 850 feet.

What W8DJY lacks in height is partly made up for by a jungle of aluminum. An antenna "plantation" is probably the best way to describe it. There is no stately white mansion in the middle; instead, you will find a one-story shack devoted to VHF contesting. Rather than trotting off to a mountain for a couple of weekends each year, the

A mix of home-brew and commercial equipment is used to give W8DJY a big signal on 220 MHz.

W8DJY spares his family from the squeaks and squawks of ham radio operating by having a separate shack. Inside, there are operating consoles for each of the VHF bands. The 6-foot dish was constructed for less than $100 and will be used on 1296 MHz.

These hams are part of New England's smallest telephone company, "Mountain Bell." It exists for only one weekend each year. The large tower in the background is part of a fire lookout, not W1FC's contest effort.

W8DJY ops spend their time perfecting this fixed station—one that they can use year 'round.

The inside of the shack looks a lot like what you and I might have. There is a smattering of Drake and Collins HF gear and the usual collection of QSL cards. A closer look at the cards tipped me off, however, that this station, despite its appearance, is not like yours or mine. There is a card from Japan on the wall.

"So what, I've worked a million of those guys on ten meters," you say.

Yeah, but how many have you worked on six meters?

Most of the HF gear is used with receive and transmit converters on the UHF and VHF bands. W8DJY's owner, Brownie, prefers tube-type rigs because they are less susceptible to intermod, something that becomes important when you have four separate kilowatt signals generated within a few feet of each other. Brownie patiently explains that you need every Watt up to the legal limit on 6, 2, and, if possible, on 220 and 432 MHz. Unfortunately, you can't just pick up a kilowatt amplifier for 432 at the local Radio Shack; it's time to break out the schematics and a soldering iron.

Back at the antenna farm, I noticed that it has been designed to squeeze the most from each of those precious UHF Watts generated inside. Hard-line is considered a necessity rather than a luxury. Strangely enough, the W8DJY gang does not try to get the antennas as high as possible. Instead, they compromise between line loss, increased height, and propagation demands. The six-meter array, for example, is a pair of 11-element beams spaced 18 feet apart, only 36 feet off the ground. This, I am told, is part of the 54-MHz secret.

Secret on Six

One might think that W8DJY and other midwestern stations have three strikes against them before a contest even starts. They don't have mountains to use, the states are larger than in the East (meaning fewer section multipliers), and the centers of population are widely scattered. However, they need not drop out of the game yet. By emphasizing operation on six meters, they can make use of tropospheric scatter, a special kind of VHF propagation where the range goes far beyond line of sight. A strong signal with the antennas at the correct height for a scatter "take-off angle" allows W8DJY to work a lot of different stations on six meters and, more importantly, get section multipliers from four different directions.

By now you are probably asking yourself: "Is W8DJY a winner?" The answer is a relative one. The ops were elated to place in the top ten scores for the September, 1979, VHF QSO party. This came only three years after W8DJY started to take VHF contesting seriously. Each contest means improvements in scores and techniques. Always building and scheming, the W8DJY success is based on a nucleus of about half a dozen individuals.

W1FC—The Big Gun Station

While the men of W8DJY set their sights on a record division score, the members of the Barnstormer Amateur Radio Club aim at breaking the existing world's record, one that they set only a year before. "Big gun" is an understatement when it comes to describing the Barnstormer operation under the call of W1FC. Each June, the ops attack Pack Monadnock, southern New Hampshire's tallest drive-up mountain. Numbering more than 40 strong, they convert the normally tranquil Miller State Park into a beehive of activity.

Families planning a quiet picnic on those two sunny weekend days in June came in for a surprise. Everywhere one looked there were towers being planted and tangles of wire and tubing that resembled antennas; everything was being done with an urgency rarely found on mountaintops.

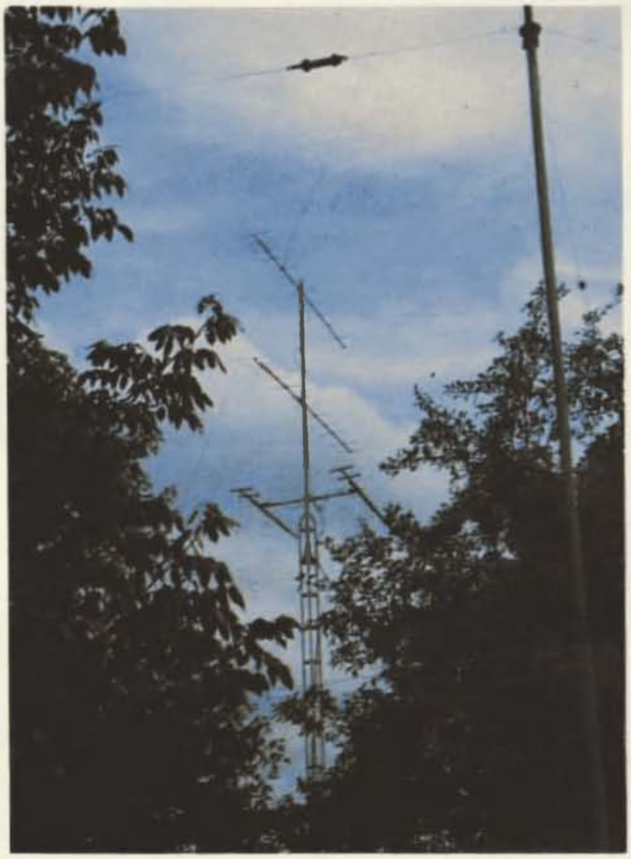
Off to the side, Fred Collins, one of the main forces behind W1FC, stood calmly watching the erection of six independent stations each with its own antennas, rigs, and shelter. The stations were tied together not only by a desire to win, but also with a common electrical system and dial telephone network installed just for this weekend.

Cherry Pickers and Microwaves

Fred explained that the Barnstormers had been active in VHF contesting since the mid-1950s. Their more than 20 years of experience

Microwave operation from Pack Monadnock means excellent range and great views of the New Hampshire countryside for the W1FC crew.

Up, up, and away. The cherry picker is pressed into service so that the microwave signals can clear the trees easily in all directions.



Visitors to Miller State Park shook their heads in disbelief as they saw erected arrays like this one for two meters.

had been molded into a comprehensive organization dedicated to winning the June VHF QSO Party. Each band was under the direction of a manager who oversaw the installation and then the operation. Other experts handled the liaison with park officials, telephone and power companies, and the very essential food tent.

The 1980 June contest was the Barnstormers' first effort involving a cherry picker snorkel truck. Arrays for 2 meters, 220, and 432 went up in minutes on 20- and 30-foot towers guyed to nearby rocks with packing twine. The cherry picker, borrowed from a Boston area firm for the weekend, was just one example of how the W1FC gang makes the most of available resources.

By 1978, the W1FC contesters had developed excellent stations and operating techniques for the frequencies below 2 gigahertz. In 1979, a year of hard work paid off when they were able to operate on 2.3, 3.4, 5.7, and 10 GHz. One setup remained on Pack Monadnock while others were sent traveling to nearby states so that five sections could be worked on each of the new bands. The efforts paid off. The score was a record one that outdistanced the nearest competitor by more than 20,000 points.

A rules change made the 1980 contest even more challenging. This year they needed five complete microwave stations, each capable of operating on four bands. The collection of gear required was probably the largest amount of amateur microwave equipment ever assembled in this country. Once again, the resources and skills of the Barnstormers prevailed.

At the last-minute strategy session, there was talk of setting another record—one that nobody could break. The friendly euphoria of setting up was gone. The mood grew serious. "Keep your stations transmitting all the time, always turning the antennas!" The operators on the populated six- and two-meter bands were expected to keep the rate up. Suddenly, the pep talk was over and it was time to begin.

The spirit of W1FC was expressed by one operator who gazed proudly at a remote 1296 rig which he had helped to build. He said that last year they made 19 contacts on 1296 and that this year the goal was 25. I noticed that he had a six-pack in hand as he headed for the shack (which was someone's van the rest of the year). It would be a long night of calling, hoping, and thinking about what could be done for 1981.

Conclusion

On the low bands, cynics abound. They claim amateur radio is dead. It is said that we are guilty of being appliance operators, that the gentlemen's camaraderie is long gone, and even that the fun has left ham radio. Visit or talk to a VHF contester, he or she will tell you a far different story. ■

Sell 'Em with Slides

—A/V shows can fire club enthusiasm

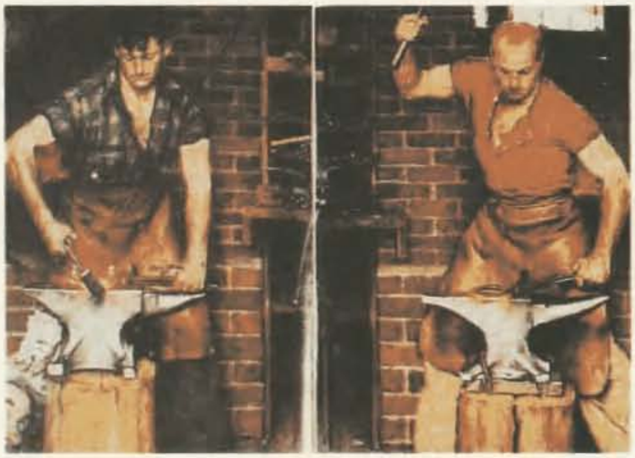
"Let's put on our thinking caps and produce one hamfest that will really draw a crowd."

Matt Beha N8BPI
3752 Lane Court
St. Joseph MI 49085

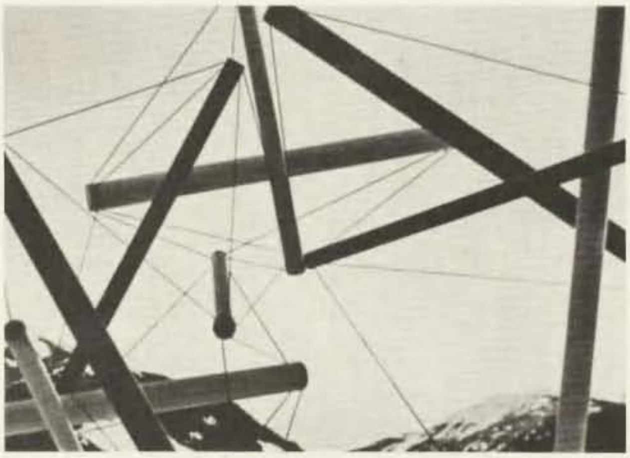
When I was named chairman of the Blossomland Amateur Radio Association's 1980 hamfest, I had some new ideas. To make sure they would be accepted, to thwart the potential wet-blanket-thrower every group seems to have, and to light a fire of enthusiasm under our club, I decided to promote our hamfest with a big kickoff.

For background, let me explain that the hamfest the year before had been held in an unheated county fair exhibition hall on a cold October Sunday. More than a few of us went home with the sniffles. That, plus the fact that I wanted to produce a little more than a flea market, prompted me to look for a new and better site for our 1980 function.

The logical site, in my estimation, was Lake Michigan College's new Community Center near Benton



"How about a brass-pounder's contest?"



"Let's let the club experts give a lecture on antenna design."

"It's conveniently located to Chicago, South Bend, and Kalamazoo . . ."

"The place we should hold our 1980 Blossomland ARA Hamfest is the beautiful new Lake Michigan College Community Center."

Harbor, Michigan. Not only did it offer us the chance to double our floor space, have heat or air conditioning as needed, and have separate areas for tech sessions, movies, and flea market, but also its location just one mile off exit 30 of I-94 was more convenient than last year's.

I checked with the College. Would the Community Center be available for Sunday, October 5, the traditional day for the Blossomland Fest? A sigh of relief—Linda Castle, the director of the Center, said the date was still available. Next crucial question: How much would it cost? Just as I had suspected—about double what we had spent the previous year. That would require a little selling job to the club members.

First, I gathered a nucleus of club members I knew would support me, and we arranged for a tour of the Community Center to make sure it would meet our needs. On February 18, Jon WAØTAQ, Matt WA3LOP, Craig WB8VKA, Al W8LRM, and I were given a tour by Mrs. Castle. Fantastic! The center had: more than twice the space of our previous site; plenty of electrical outlets; handy access for our dealers and distributors to unload and load large quantities of ham gear; a catering service to provide food; and our choice of one, two, or three beautifully carpeted lecture rooms in addition to the flea market area. They even had 2,500 paved parking spaces.

So far, so good. Now to prepare a presentation for the next club meeting to forestall any negative ideas . . . and to generate enthusiasm for our 1980 hamfest.

I decided an A/V (audio/video) show with lively music and a script supported by slides would sell the idea to the club. First I wrote the script, beginning with the negative aspects of our previous site, moving on to possible plans for a bigger hamfest with technical sessions, and then presenting the Lake Michigan College facility as the perfect setting for our 1980 "Blossomland Blast," as I decided to call it.

Once I had written and rewritten the script, I jotted down some notes on possible slides to illustrate my points. Armed with script and a list of pictures, I took off down Washington Avenue to the Lincoln Township Library. I made a beeline to the photography section and selected a dozen or so books of photographic art pictures. I set up camp at a table and flipped through each book, page by page. When I spotted a picture I thought would illustrate a point (sometimes humorous, sometimes not), I would put that book aside. Within two hours I had the pictures I wanted and checked the books out.

"That's the plan for the 1980 Blossomland Blast—the biggest and best hamfest yet in southwestern Michigan!"

I was spared the task of shooting the slides myself. We're privileged to have a professional photographer in our club, whose studio shoots the ham gear pictures for the Heathkit® catalog. Jim KA8GIX volunteered to make the slides for me and did a super job.

Naturally, not all the slides I needed were to be found in books. I wanted supporting proof that our club could afford the higher rent. First, I did a survey of hamfest ads for amateur magazines: I discovered that our 1979 ticket prices had been way below average. If we raised prices just to the average and maintained attendance, we would be able to cover our expenses. And with a little added promotion, we would be able to show enough profit to keep our repeater rig going for another year, which was the original intent of the hamfest.

I made up some charts, a rough sketch of the Community Center's floor plan, and a map showing access. Another club member, Floyd K8ZLO, arranged to have some beautiful graph-

ics done, and those also became slides.

When I got the slides, I put them in the projector and started a tape. The music I had selected for background music was Billy Joel's "Root Beer Rag," a very lively instrumental that I knew would generate enthusiasm. Then I ran through the slides and script, timing them to the music, changing slide sequence here and there, until I had the time down pat.

I practiced a number of times before the meeting to make sure I knew when to hit the slide changes (wishing I had the bucks to have it pulse-controlled). On meeting night, our club president, Larry W5VUF, arranged for me to have the last spot on the business agenda so that I could talk to potential volunteers for hamfest duty while we broke for refreshments.

My spot came, the lights went out, and I launched into a short, snappy six-minute presentation with the script I had memorized, the music, and the slides.

When the lights came on, there was a fair round of applause. Co-chairman Jon WAØTAQ and I passed out a prepared sheet to each member. On it I had written up a sample program for our planned hamfest—an ARRL movie (if I could get it), a slide-show tour of the Heathkit factory (if I could shoot it), an XYL program, lectures, and demonstrations by experts from our club or the area. At the bottom of the sheet I had typed out a list of requests—typing help, volunteers to take posters and flyers to other fests, volunteers to make signs, give ideas, etc. I put my name and address at the bottom of the sheet.

The enthusiasm was great. If there had been any wet blankets waiting to be tossed because of the high rent (or who knows what), they weren't in evidence when the membership voted to expend the necessary funds to hold our October 5 Blossomland Blast at Lake Michigan College. It was unanimous.

I enjoyed the slide show so much that I've since done another on our club's first transmitter hunt, using the folksong "The Fox" for background music. I'm going to do another on our Field Day activities for another club meeting. Slide shows are fun to do, and they can add a new dimension to your club's meetings. ■

Slide	Narration
Churchill holding up two fingers in Victory sign	In the past, the Blossomland Amateur Radio Association has held *two* hamfests each year.
Modern art skeleton	They were pretty bare-bones affairs—basically flea markets where everybody came...
Modern art junk pile	to look at everybody else's used gear, kick the tires, and then go home.
Crowd of 1910 kids	This year let's really draw a crowd to our Blossomland Hamfest...
Kid with weird hat	let's put on our thinking caps and produce one hamfest that will...
Large crowd with motorcycle cops	really draw a crowd.
Girl watching puppet show	Let's really put on a show...
Man with huge 5¢ sign	and give ticket buyers their money's worth!
Squiggly art work	We could give demonstrations on slow-scan TV.
Old-timer at typewriter	Or show people how RTTY works.
Two blacksmiths	How about a brass-pounder's contest?
Boat and flooded sign	Hutch WB8WLS could give a presentation on emergency operations...
1920's rig	Neil WD8MAW, would you like to head a program on contest operations?
Rube Goldberg contraption	We could have a slide and sound tour of the Heathkit factory.
Modern art spider web	Let's let the club experts give a lecture on antenna design.
1910 school kids	We'll send our ticket buyers home a little wiser than they came, with a program like this.
"Etc." cartoon	Those are just a few ideas. With the talent we have in this club, there's even more that we can do.
Packed football stadium	A hamfest like this will draw a crowd, so we'll need a place to put them.
Nutty tractor driver	The place I'm thinking of has plenty of free, paved parking—2,500 spaces, in fact!
Men with electronic gizmo	It's a place that will attract a lot of dealers and distributors to display their wares.
Kid with hamburger stuffed in mouth	The place I have in mind even has a food catering service...
Crazy sheriff	and its own security force.
Map with distances	It's conveniently located to Chicago, South Bend, and Kalamazoo.
Lake Michigan College Community Center	The place we should hold our 1980 Blossomland ARA Hamfest is the beautiful new Lake Michigan College Community Center.
Floor plan	14,400 square feet of space, more than double what we have had in the past—with separate areas for movies and lectures. All the space we need to put on a first-class hamfest!
Baby crying	Now you're asking, "How much is this going to cost?"
Less-than-$650 slide	Including tables, chairs, setup and security, less than $650. But you're asking, "Where will we get the money?" Take a look at this...
Chart—1979 hamfests	a survey of 1979 hamfests shows that our ticket prices were well below average.
Chart—1979 sales, projected sales	Last year we brought in $1,266.00 in ticket and flea market sales. If we have the same attendance in 1980 and raise our prices to the average (and that's only the 1979 average), we'll bring in $1,817, more than enough to meet the increased expenses. Of course, if we put on a great fest and promote it, we could double attendance.
Chart—promotion	How can we promote our hamfest? First, with a mailing to last year's ticket buyers; second, a mailing especially for clubs; third, ham magazine ads, press releases, and photos to area newspapers; next, television and radio talk shows. What about a QSO party to promote our fest? Later I'll be giving you flyers to send out with your QSL cards. We'll have flyers to give dealers who will be attending. Finally, you'll receive mike-side fact sheets you can use to promote our hamfest when you make a contact.
Club's Bumblebee with Blossomland Blast logo	That's the plan for the 1980 Blossomland Blast—the biggest and best hamfest yet in southwestern Michigan! See you on Sunday, October 5.
KA8GIX slide	I'd like to give special thanks to Jim KA8GIX for the photography...
K8ZLO	and to Floyd K8ZLO who provided the graphics.

The Power Waster

—adjustable electronic load for power supply testing

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Testing of bench power supplies, batteries, voltage regulators, or current limiters often requires application of an adjustable load to the circuit. After years of connecting haywire combinations of resistors together to test various power supplies, I determined that a really high-power adjustable electronic load would be a welcome addition to my test equipment. In short order the Power Waster was created, and during some three years it has proven most useful.

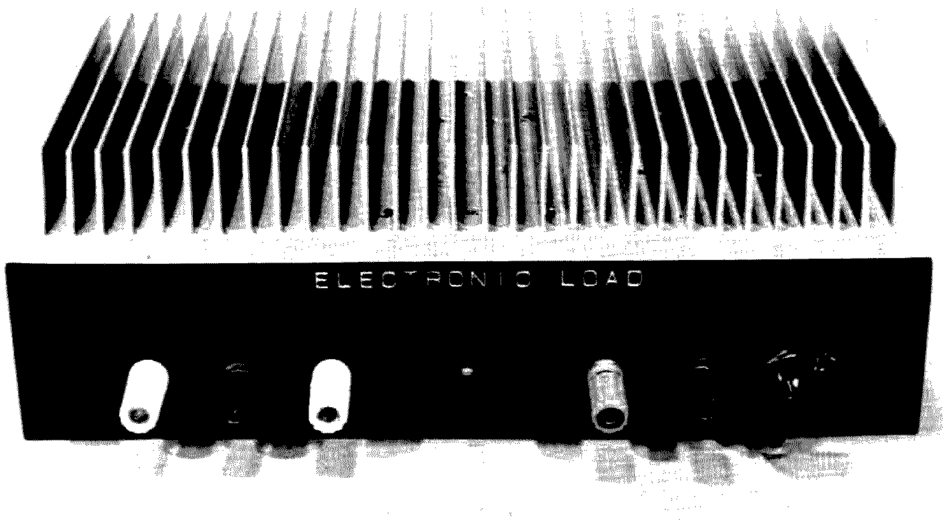


Photo A. *The Power Waster. This electronic load is adjustable from 0 to 10 A and can dissipate up to 300 Watts. The unit is built upon a piece of heat-sink extrusion and has both reverse polarity and thermal overload protection.*

The load described in this article will handle the majority of amateur radio and microprocessor power supply tests. In addition, it has a number of other uses, such as constant-current battery charging.

Current drawn by the load is adjustable from 0 to 10 Amperes. Input voltages up to 30 volts are permitted at full current; that's 300 Watts dissipation! Heat sinking of the pass transistors is sufficient to permit 300-Watt operation for about ten minutes, at which point a thermal protection switch shuts the current off.

At 100 Watts dissipation the heat sink is adequate for indefinite operation. By directing a small blower at the heat sink, I have run the load at 300 Watts for hours without difficulty.

Since I desired essentially self-contained operation, I included a small supply in the unit to bias the load transistors. Current is controlled by means of a front panel pot, and reverse polarity protection is included. A front-panel LED indicates operation of thermal shutdown circuitry. I took advantage of extra heat sink area to add two 8-Ohm, 50-Watt resistors. These are used for testing audio amplifiers or to increase the dissipation capability of the Power Waster circuit.

Circuit Operation

The simplified schematics in Fig. 1 are useful in understanding how the circuit operates. Commercial load boxes use current sensing and feedback to set the load current. My approach is simpler and uses the constant-current collector load-line characteristic of all bipolar transistors.

Fig. 1 shows the basic idea. The base of Q1 is biased at several volts from voltage source V1. The collector supply (V2) is greater than V1 by at least 1 volt. The voltage at the emitter of Q1 is one diode drop (0.7 V) below the base voltage, and the circuit is essentially an emitter follower. Emitter current is set by dividing the emitter voltage by R1. As R1 is decreased, the emitter current increases.

The collector current for any transistor is simply alpha (the common-base current gain) times the emitter current. As alpha is essentially equal to 1 for any modern transistor, we see that setting the emitter current also sets the collector current. And this is the point; the collector current is determined only by the emitter current. Collector voltage has almost no effect on the collector current, provided the transistor is kept from saturation or breakdown. Saturation occurs if the collector voltage becomes less than the base voltage. Breakdown will occur if any excessive voltage is applied.

The constant-current collector load line is a useful property. If the voltage across R1 is small compared to the collector supply, a lot of power can be controlled and will be quite independent of the collector supply voltage. If a relatively low base-bias voltage is used, most of the power will be dissipated in the transistor and relatively little in R1.

As useful as this circuit is, there are some disadvantages. The main problem is that R1 must be a variable resistor capable of handling the entire load current. In a practical circuit, this becomes a 0.2-Ohm pot rated for 10 Amperes, which is an expensive item.

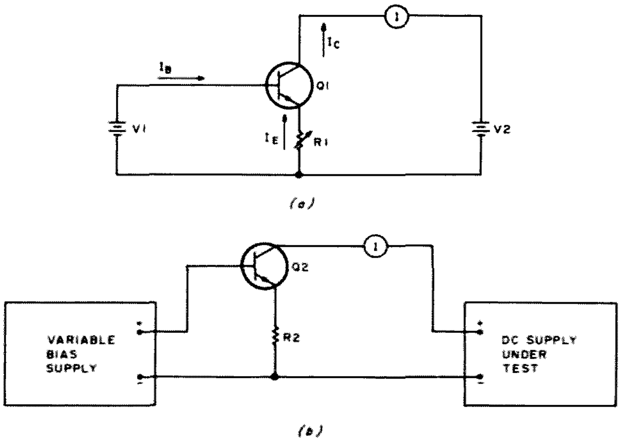


Fig. 1. Constant-current bias circuits. (a) A transistor with fixed base voltage. Collector current is set by emitter resistor. (b) Basic circuit of the electronic load. Emitter resistor is fixed, and both emitter and collector current are controlled with base-bias supply voltage.

By arranging the circuit as indicated in Fig. 1(b), things become a bit easier. Resistor R2 is a fixed high-power resistor. The base supply is made variable. Since the circuit is essentially an emitter follower, the emitter voltage follows the base voltage. Increasing the base bias increases the emitter voltage and the emitter current through R2. This increases the collector current to the desired value.

Within limitations, the collector current is set solely by the base-bias voltage and the value of R2. These limitations are: The collector supply must be at least one volt more than the max-

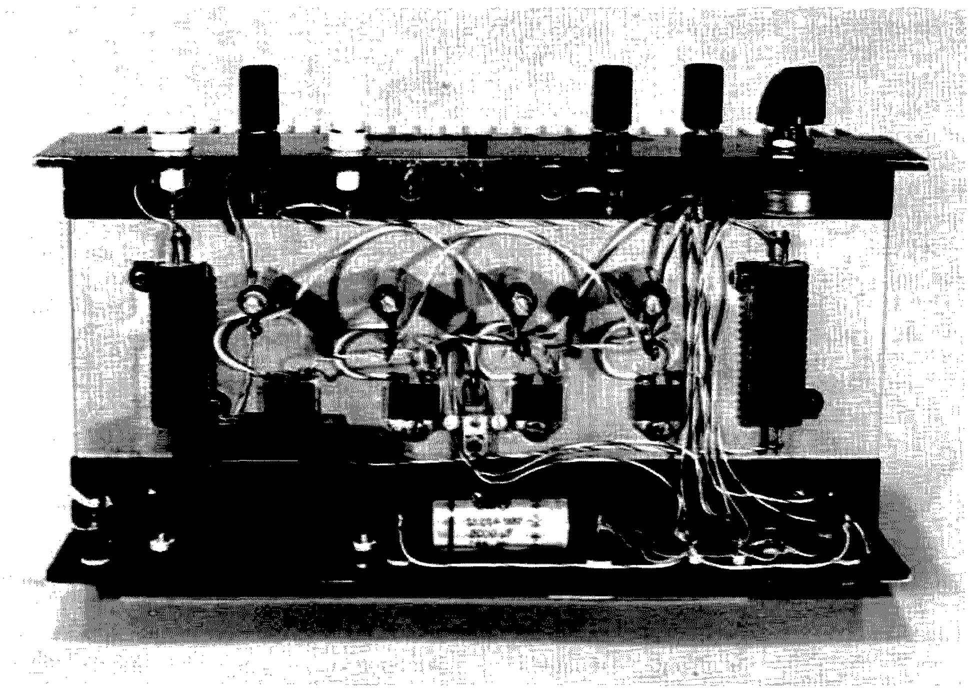
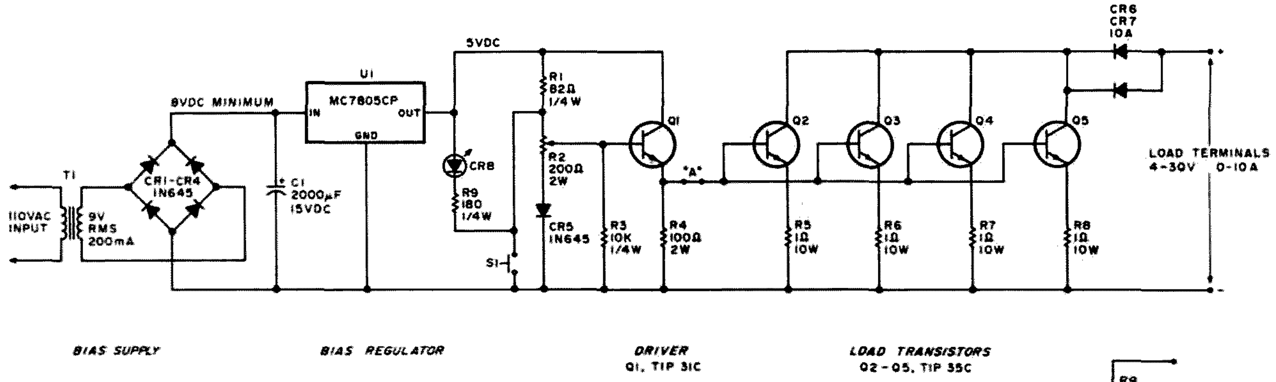


Photo B. Interior view of the Power Waster. Four TIP 35C load transistors are mounted to the heat sink. The thermal switch is located between the two center transistors. A U-shaped chassis is formed from the heat sink and two pieces of aluminum angle stock.



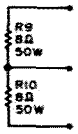


Fig. 2. Schematic of the Power Waster electronic load. S1 is a 75° C NO thermal switch. S1 is in thermal contact with the heat sink. The collectors of Q2-Q5 are connected directly to the sink. LED CR8 indicates thermal shutdown. Jumper at point A is opened in test.

imum base-bias voltage, and must be less than the transistor breakdown voltage for the current drawn.

In addition, it is assumed that the base-bias supply is capable of supplying increasing current to the transistor base as the collector current increases. The base current will be the transistor collector current divided by beta, the common emitter current gain. Beta will vary from 10-50 for practical power transistors.

To convert these ideas into the final design, I had only to add a base-bias supply, circuit overload, reverse polarity protection, and to increase the number of load transistors to handle the required power. The result is shown in the schematic diagram.

Power is dissipated in the pass element (consisting of Q2, Q3, Q4, and Q5 connected in parallel). Four TIP 35C transistors are used in order to safely handle the 10-Ampere maximum load current. Each pass transistor has a 1-Ohm resistor in the emitter which corresponds to R2 of Fig. 1. In addition to setting the collector current for a given base voltage, these resistors also equalize the load distribution between the four pass transistors and help to keep the load current constant as the transistor temperature increases.

Variable base voltage for the load transistors is obtained from emitter follower Q1 which operates from a 5-volt regulated supply. This circuit consists of transformer T1, the bridge rectifier (CR1-CR4), C1, and an MC7805CP three-terminal regulator chip (U1).

The base of emitter follower Q1 is connected to a variable voltage divider consisting of R1, the pot (R2), and diode CR5. R1 and CR5 limit the driver base voltage range to approximately 0.8 to 4 volts. An additional 0.8-volt offset in the base-emitter junction of Q1 results in a driver output voltage range of 0 to 3.2 volts. Restricting the drive voltage to 3.2 V sets the maximum current the load will draw to 10 A. CR5 was included to compensate for the change in the base-to-emitter threshold voltage of Q1 as the temperature changes. In use, this simple bias supply has proven completely adequate. There is very little drift in load current as the temperature increases.

Some additional features are worthy of mention. Diodes CR6 and CR7 provide reverse polarity protection. A thermal switch (S1) shorts the base-bias supply and turns the current off if the heat-sink temperature becomes excessive. An over-temperature shutdown is indicated by illumination of the LED (CR8).

R4 provides a return path to the transistor emitters for collector-to-base leakage current. This assures that they will actually turn off when the base-bias voltage is removed. R3 is there for safety in case the wiper of R2 opens. This is the usual method of failure for pots. Inclusion of R3 assures a path from base to emitter for the collector-to-base leakage current of Q1. In its absence, failure of R2 could cause the load to pull more than 10 A and damage something. With R3 included, the circuit just shuts off.

A series-connected pair of 8-Ohm, 50-Watt resistors is also mounted on the heat sink of the electronic load. These are provided to increase the dissipation capability of the unit and, in addition, are handy for testing audio amplifiers.

Power Rating

While the nominal input capability of the Power Waster is 10 A at up to 30 V, it may be operated at higher voltages if the proper conditions for safe operation are understood. In this section, I will explain how the nominal power rating is derived.

All high-power transistors have a "safe area" of operation, in which no damage will occur. Fig. 3 is a safe-area curve for a single TIP 35C. This is a plot of maximum-permitted collector current as a function of collector voltage. Operation at any point in the region below and to the left of the curve will not damage the transistor. Combinations of voltage and current above and to the right of the curve will certainly destroy the transistor.

It is interesting that the power dissipation capability is not constant. At a Vce of 5 V, a current of 25 A is permitted. That's 125 Watts. But if the voltage is increased to 50 volts, only 1 Ampere is allowed, providing a dissipation capability of only 50 Watts! The successful designer of high-power transistor circuits stares long and hard at the safe area curves before picking a final configuration!

When I designed the Power Waster, I tried to be conservative so that it could really take abuse without failure. Thus, four TIP 35C transistors were used. In Fig. 4, the composite safe-area curve for the four devices in parallel is shown. This is Curve B. Curve A indicates the "rated" operating envelope for the Power Waster. Only at the 10 A and 30 V point does the "rating" curve approach the safe-area curve.

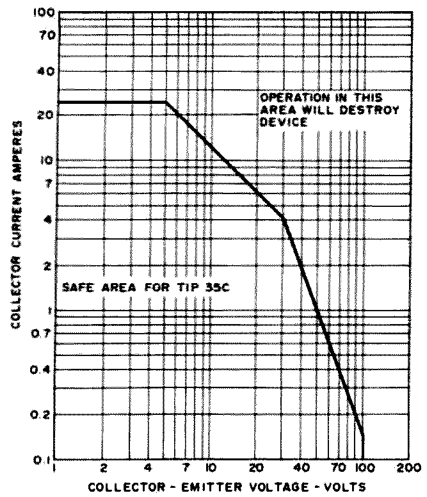


Fig. 3. Safe-area curve for TIP 35C. Safe operation is limited to the area below and to the left of the curve. Operation beyond the safe area will destroy the transistor.

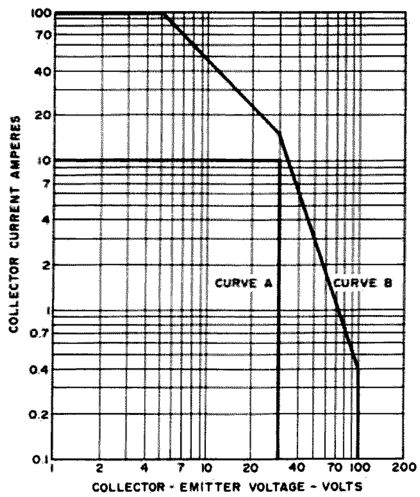


Fig. 4. Operating areas for the electronic load: Curve A indicates the rated operating area for the load. Curve B shows the composite safe area of the four TIP 35C transistors used as the load element. The rated operating area (Curve A) is well inside of the safe area.

At all other combinations of current and voltage, the power dissipation is comfortably inside of curve B.

This conservative design assures that the unit will never fail as long as the 10 A and 30 V maximums are observed.

Construction

Construction of the electronic load can take almost any form because of the non-critical nature of the circuit. In most cases, the shape of the heat sink will determine the final configuration. In order to dissipate 300 Watts, a sink having a thermal resistance of 0.1° C per Watt is required. This is a truly massive piece of metal. I elected to depend upon thermal inertia to permit short tests of up to ten minutes duration and to let the thermal cutout act if things got too hot. Continuous operation is obtained by directing a small blower at the heat sink.

I used a 5″×11″ piece of heat-sink extrusion having 32 one-inch-high fins as a chassis. To this I fastened a pair of 0.75″×2″ pieces of angle to form a U-shaped chassis with the fins on top. All parts are mounted on the underside of the extrusion, and the front and rear panels are formed by the pieces of angle. Vertical fins are more efficient, of course, but since a cooling fan is required to obtain the full power rating, this arrangement is quite convenient.

Parts located on the front panel include the three binding posts for the 8-Ohm resistors (R9 and R10). These are at the left end of the panel. Next is the LED over-temperature indicator. Adjacent to the LED are the input terminals for the electronic load. The load current adjustment pot, R2, is on the extreme right end of the panel.

Mounted directly to the underside of the heat sink are the two 8-Ohm resistors, the four emitter resistors for the load transistors, and transistors Q2 through Q5. The thermal switch (S1) is located in the center of the sink. Two reverse-polarity protection diodes (CR6 and CR7) are also mounted directly onto the heat sink near the center of the front panel. All parts are mounted to the sink by threaded holes tapped directly into the extrusion. The cathode ends of CR6 and CR7 are connected to the sink via threaded mounting holes. In the same way, the collectors of Q2-Q5 are screwed directly to the sink. Thus, the connection from the polarity protection diodes to the transistor collectors is via the heat sink itself. Fastening the transistors to the sink without insulating wafers puts the entire chassis at the potential of the positive supply input.

Normally, I would have insulated the transistor collectors from the sink but there is a good reason for not doing so. The thermal impedance of the transistor junction to case is 1° C per Watt. Most insulating wafers have a thermal resistance of at least 0.5° C per Watt. If a wafer were used, the resistances are summed to yield a thermal resistance of 1.5° C per Watt. The junction temperature would rise by fifty percent! Instead, I elected to have the positive supply input on the sink and to exercise caution in using the unit. The low voltages involved certainly pose no shock hazard.

On the rear panel are located: the power transformer, bridge rectifier, filter capacitor, 5-volt regulator, and the driver transistor (Q1). The transformer is located at the left end of the rear panel. The filter capacitor is in the center of the panel as is the bridge rectifier, which is hidden by the capacitor in the photograph. Adjacent to the filter capacitor is the 5-V regulator and the driver circuit components. U1 and Q1 are both fastened to the rear panel for cooling. All small parts such as resistors, capacitors, and diodes are mounted with push-in Teflon terminals. Threaded standoffs are used for the larger components.

Not everyone who wishes to build this circuit will be able to find a heat sink similar to the one I used. One approach is to use four smaller sinks and to mount a load transistor on each. A suitable configuation would use four Wakefield Engineering type NC-423 heat sinks. Individually, these units have a thermal resistance of 0.8° C per Watt so the resistance of the combination would be 0.2° C per Watt. Such an arrangement would permit inputs of about 150 Watts without forced-air cooling.

Testing

A few simple tests prior to using the load will prevent damage to it, or to the circuit being tested. First, break the circuit between

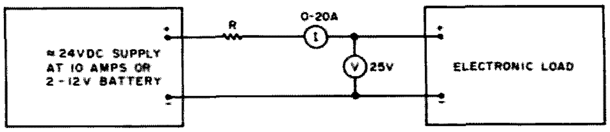


Fig. 5. Testing the Power Waster. A high-current supply such as a pair of 12-V batteries is connected to the load via current-limiting resistor R. The resistor should be chosen to limit the current to a few Amperes for the initial tests.

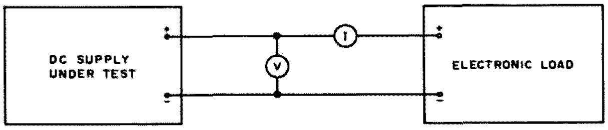


Fig. 6. Using the load to evaluate a power supply. Increasing current is drawn from the supply, and the regulator performance is measured. The load also may be used to ensure proper current-limiter operation.

the driver transistor (Q1) and the load transistors (Q2 through Q5), at point A in Fig. 2. Apply 110 V ac to the power transformer and verify that the voltage is variable from about 0 to 3.5 V as R2 is rotated. Zero volts should occur at the extreme counterclockwise position of R2. This is the zero current setting.

Reconnect the circuit at point A. Then arrange a high-current test setup similar to Fig. 5. Resistor R is chosen to limit the current to 3 or 4 A under short-circuit conditions. Two automobile headlamps in series may be used for this resistor. Set the current control pot (R2) at minimum (CCW position) and turn on the supply and the bias supply in the Power Waster.

Increase the current setting until 2 A is drawn by the load. Measure the voltage drop across R5 through R8 and assure yourself that the voltages are about equal. About 0.5 V should appear across each resistor for a 2-A load. If no voltage appears, then the associated transistor is not drawing any current.

Next, advance the current control. The load current should increase smoothly until the voltage at the load input terminals drops well below 5 V. At this point the load transistors will saturate and the current will be set by resistor R.

The next step is to test the current-limiting feature to verify that the load current is limited to about 10 A. Reduce R in value so that for the supply voltage present under load, about 15 A may be drawn. Again increase the load current from zero with R2. The load should current limit at 9 to 11 A if the same parts values were used.

If all of the above tests were successful, the electronic load is ready for use.

Applications

My purpose in building the electronic load was to enable rapid test of power-supply circuits. The 10-A and 30-V input capability will suffice for almost the entire range of solid-state supplies found in amateur equipment. After I built the load, a number of other applications surfaced. Some of these are worthy of mention.

The performance of a voltage regulator is easily plotted by using the load, connected as indicated by Fig. 6. The regulator is connected to the load via an ammeter. A voltmeter is connected across the output of the supply. By increasing the load current and noting the meter reading, the internal resistance of the regulator may be found, and the percent regulation as a function of load determined. If the supply has a current limiter, the current-limiting point may be found by slowly increasing the load current until the voltage drops. The smooth control of current afforded by the electronic load makes these tests easy.

At times it is desirable to know if a surplus transformer of questionable ancestry can meet a given requirement. Of particular concern is the "overhead" voltage requirement. This is the input voltage required to maintain a regulator in operation (at full load) subtracted from the output voltage.

Typical three-terminal regulators require a 3-volt overhead to function properly. If all circuit parameters are known, it is easy to determine if a certain transformer, rectifier, and filter capacitor will work. If junkbox parts are used, the calculation is often difficult or impossible. It takes only a few minutes to connect up the unregulated supply parts and apply the expected load current using the Power Waster. The unregulated voltage and ripple may be measured, and the suitability of the components determined.

Battery charging is another application. All batteries must be charged from a current source so the charging current is held constant as the battery terminal voltage increases. To use the load as a battery charger, simply connect it in series with a source having a voltage at least 4 V greater than the full-charge voltage of the battery. Then place the combination in series with the battery and dial up the desired charging current.

One final application is protection of high-power transistors during tune-up. The electronic load is placed in series with the supply and programmed for the maximum current that you feel is safe for the amplifier under test. At currents less than the setting, the load saturates and the voltage drop across it is quite small. This is especially true at the lower currents.

Should the amplifier try to draw excessive current, the maximum will be limited to the set value. Response is very rapid. Current limiting occurs in about a microsecond and in the case, is much faster than a normal power-supply current limiter. So effective is this method of protection that I have built it into several solid-state transmitters.

Conclusion

Electronic loads are common in professional labs where power supplies are developed. Many are built from scratch, but also they are sold by commercial test equipment manufacturers. Such devices permit evaluation of supplies prior to connecting them to their intended (and often very expensive) loads.

In writing this article, I have attempted to describe the application and operation of a little-known but very useful piece of test equipment. While my Power Waster is certainly austere as compared with the professional units, it will definitely do the job. The basic design could be modified to include meters and an internal cooling fan. If this were done, the complete unit could be packaged in a well-ventilated box where the heat sinks would be better protected from accidental contact.

I welcome comments or questions from anyone wishing to either duplicate or modify the circuit.■

Alex Haynes WB3HXY
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QRZ Sunshine

—building solar-powered repeaters

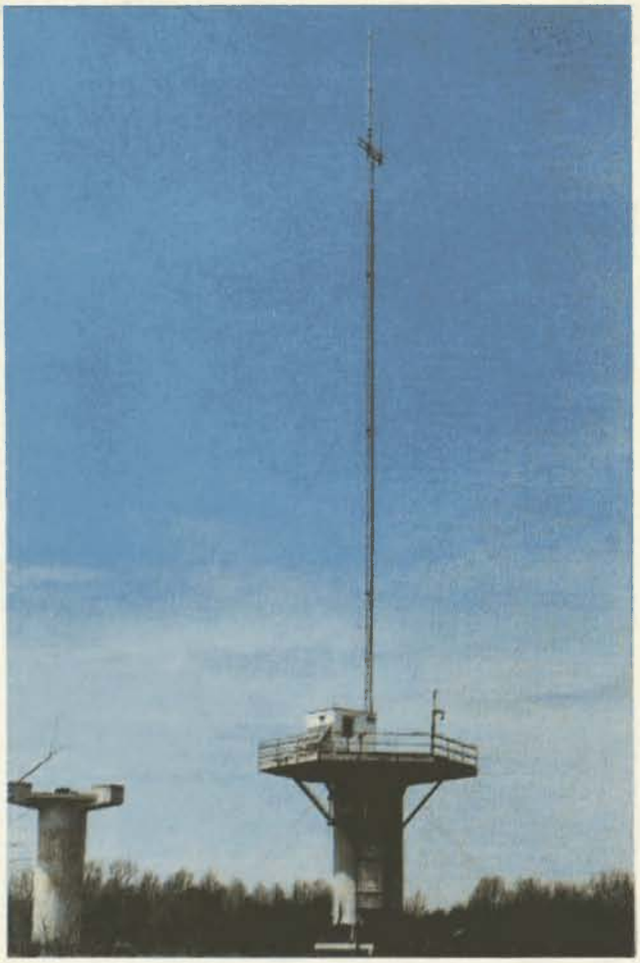

Photo A. AARC repeater. Photovoltaic array is visible on the left side of the shack at the base of the tower.

A totally solar-powered repeater recently went on the air in Maryland. On March 15, 1980, the Anne Arundel Radio Club (AARC) switched from 110 V ac to sunshine to power a new 220-MHz repeater recently installed at the AARC site in Davidsonville, Maryland, near Annapolis. This unique microprocessor-controlled repeater will itself be the topic of a forthcoming article, as soon as its builders get around to writing it up.

The Site

The repeater is located at an abandoned Nike missile site which was provided to AARC by the local Davidsonville Family Recreation Center. A ready-made clubhouse and a 10m-high structure (former radar pedestal) at one of the highest points in the area offer an ideal location for this active and public-service-oriented amateur radio club. A 3m × 3m repeater shack was built atop the pedestal and a 40m antenna tower was added. At the present time, the club operates both a 2-meter repeater (147.105/147.705) and the 220-MHz repeater (223.88/222.28) and is planning to install a 430-MHz ATV repeater in the near future.

The repeaters offer reliable and convenient communications within the Washington, Baltimore, Annapolis, and central Chesapeake Bay area. Many of the club members are avid boaters, and during the boating season maintain a weekend weather net which also provides real-time information to the National Weather Service about the rapidly changing weather conditions on the Bay.

Photovoltaics

Photovoltaic (PV) panels, which convert sunlight into electricity, were provided by the Department of Energy in response to a request from the AARC in December, 1979. The panels were shipped to the club on loan from the Jet Propulsion Lab in Pasadena, California, in late February, 1980. (Who says government can't react quickly?) The PVs were part of a DoE research-and-development program to improve PV technology and reduce production costs.

he PV array consists of 14 ıdividual panels, made by ensor Technology Corp., ach about .3m × .6m ×)3m, attached to a 1.3m ‹ 2.3m frame made of ressure-treated lumber. he frame is fastened irectly to the south side of ne repeater shack at a 53° ngle (from the horizontal) /hich will optimize electric eneration during the /inter. Each panel is rated bout 18 V at 0.55 A, and vith the panels connected ı parallel, the array was ex- ıected to produce about 18 ' at 8 A (at noon on a sunny lay).

Output voltage for this ›articular panel is some- vhat temperature-sensitive, ›ut at a constant tempera- ure, it is fairly independent ›f current draw up to the ated current, whereafter it alls very rapidly to a max- mum short-circuit value of).62 A per panel. A check of ›ur 14-panel array showed ı maximum short-circuit :urrent of 8.7 A. Even on a /ery cloudy day, the array ›roduces about 0.5 A, vhich is more than ade- ıuate to provide the repeat- ›r's standby current draw of ıround 300 mA.

The 14-panel array is ex- ›ected to produce almost 400 Watt-hours during an ıverage December day, vhile in June it should be almost twice that amount. The array converts only about 6 percent of the sunlight falling on it into electric energy (actually the individual cells are about 10-percent efficient, but there is considerable open area between each cell in the panel). This should be sufficient power to run the repeater without auxiliary power, year-round, hopefully for the next 10 years, the panel service-life design goal.

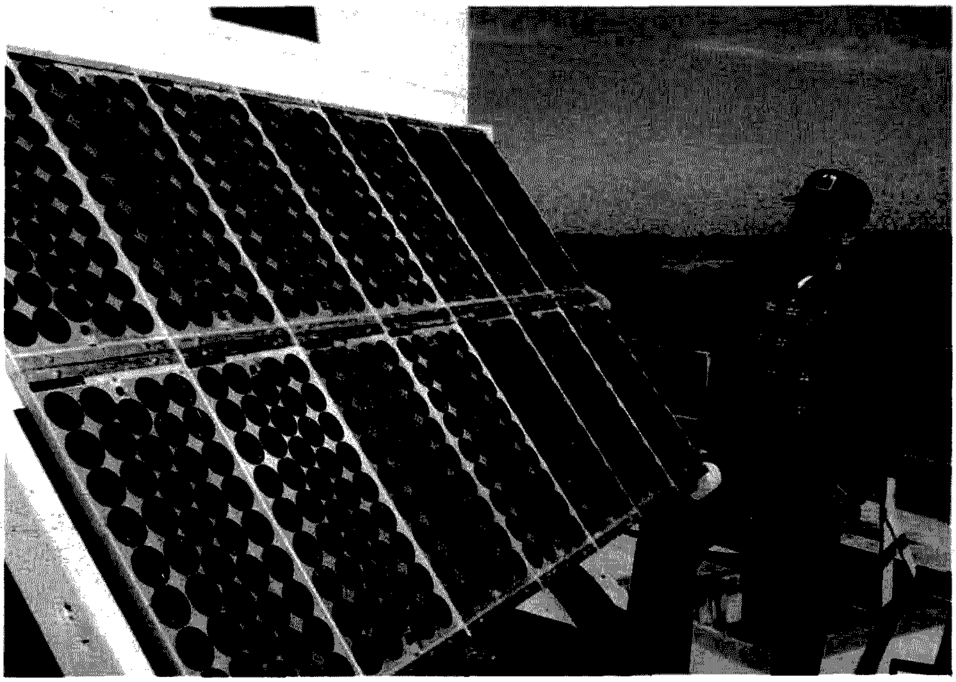

Photo B. Photovoltaic array. Frank Troutman WB3CLF helped install the array on the side of the shack.

Power Conditioning and Storage

Since the repeater requires 12 V dc around-the-clock, and the array produces 18 to 25+ V dc for only part of the 24-hour cycle, some sort of power-conditioning and energy-storage system is needed. A simple system was designed to provide high reliability and efficiency at a low cost. It consists of a 16 V (13-cell, 20-Ah) primary nicad battery storage module, charged directly by the PV array through an overcharge protector. A 12-volt (60-Ah) secondary-storage auto battery is diode-isolated from, and trickle-charged by, the nicad battery.

A clock attached to the transmitter measured an average daily transmit time of about two hours. At a transmit current of 3 A, the average daily transmit power is 6 Ah, and at the .3 A standby level, another 7 Ah is consumed. Thus, the total average daily power consumption is around 13 Ah at 12 V dc (156 Wh/day). While the array output of 400 Wh would appear to be more than sufficient to power the repeater, there are major energy losses built into the system which must be taken into account.

Batteries are less than 100-percent efficient, and the trickle-charge circuit dissipates an appreciable amount of energy. If we assume an average battery efficiency of 80 percent and a trickle-charge rate of 700 mA, we end up with only about 170 Wh being delivered to the repeater, which just slightly exceeds its anticipated demand of 156 Wh/day. It must be remembered that this was calculated for the worst part of the year (December), and in any event, the fully-charged 12-V battery should have enough capacity to run the repeater for at least four consecutive cloudy days.

During the design and testing of the power-conditioning and storage equipment, it was found that current and comprehensive technical information on lead-acid and nicad batteries was very difficult to obtain. Building a battery-charging circuit may appear at first to be a simple task. But to build one that does not damage the battery, seriously degrade its performance, or doom it to an early death is not really as straightforward as one might expect.

An excellent handbook has just become available on this topic entitled *Handbook for Battery Storage in Photovoltaic Power Systems,* February, 1980. The 120-page handbook was prepared for the Department of Energy by Bechtel National, Inc., and contains a wealth of engineering data on most types of rechargeable batteries. It includes a section on advanced batteries now under development primarily for electric vehicle applications. The handbook is well-referenced and includes an extensive listing of battery manufacturers, suppliers, and developers. A limited number of copies are available at $9.95 (including handling and postage) from: Moonraker East, Publications Department, Box 117, Riva MD 21140.

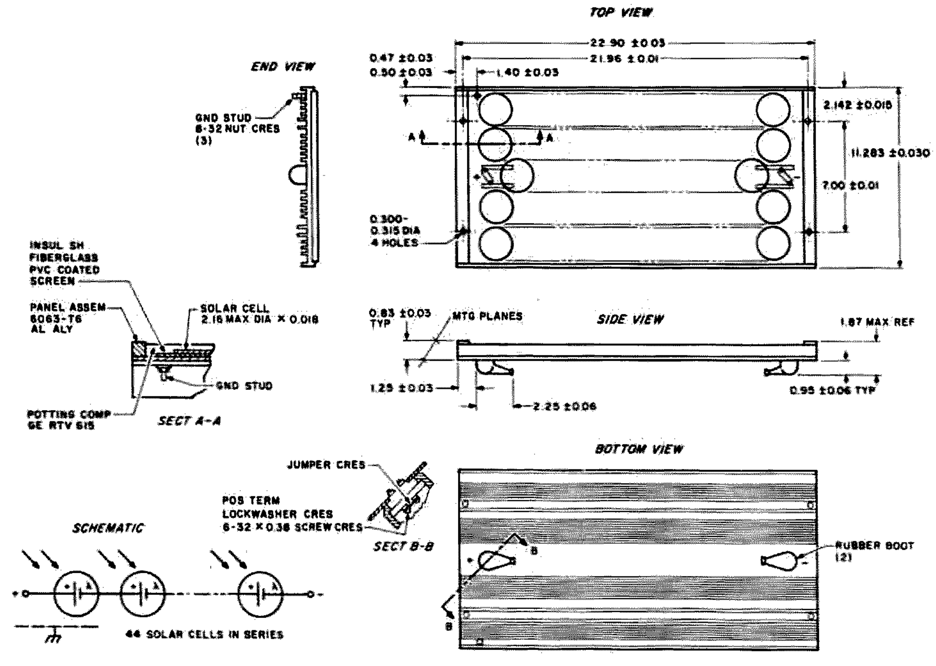

Fig. 1. Diagrams of PV module.

Design Considerations

A simple constant-voltage charging circuit was considered, which would have eliminated the need for the 16-V nicad battery by connecting the PV array directly to the 12-V auto battery through a regulator. While the overall efficiency might have been slightly better, the design was rejected for several reasons:

1) The lead-acid auto battery would discharge continuously at night due to the power demands of the repeater, with the terminal voltage falling to about 11.5 V by dawn. The PV array would then start to charge the battery with currents rapidly increasing to almost 9 Amps and, as the battery attained full charge, its terminal voltage would climb to about 15 V. This wide swing in supply voltage was not considered conducive to stable repeater operation, or to extended battery life.

2) Nicad batteries are much better suited for repeated charge/discharge cycling and are far more resistant to damage from overcharging.

3) The two-battery circuit provides an almost constant supply voltage to the repeater by continuously trickle-charging the lead-acid battery around the clock, not just when the sun is out.

4) The two-battery circuit design appears to be much more fail-safe in that a regulator failure would not cook the lead-acid battery, as it could in the simple circuit. Component failure in the two-battery circuit likely would result in a decrease in repeater performance noticeable over a period of days, allowing time to correct the problem rather than resulting in a sudden complete repeater failure.

This last consideration is an important factor in the operation of our repeaters, since routine inspection of the system is limited by the requirement that someone must climb the 10m structure, and thus periods of unattended operation of a month or more are expected. But this is all just theory and we should know much more about the reliability of our solar-powered repeater in a year or so.

PVs: Current Technology and Future Potential

The principle of the photovoltaic effect was discovered by Edmond Becquerel back in 1893, but useful energy conversion devices have been available only for the last 25 years. An early PV application was in photographic exposure meters. The first breakthrough in PV cell manufacture for electric power generation was made by researchers working at Bell Laboratories in 1954. Subsequently, high-reliability single-crystal silicon PVs were used as an energy source for U.S. and Russian space vehicles thoughout the 1960s. A few terrestrial PV devices were marketed on a trial basis as early as 1959 using silicon cells rejected by the space program as not meeting NASA's high-reliability requirements, but the first PVs designed specifically for terrestrial use were not produced until 1973. Thus, we are dealing with a very new product only recently available in the marketplace, and it is probable that PV applications will grow rapidly in the coming years, especially if anticipated tenfold PV cost reductions can be achieved.

Photovoltaic cells have much in common with transistors and utilize semiconductor technology to convert light into electricity. They consist of a junction of semiconducting material formed by one of three methods: (1) adding impurities (dopants) to one side of a pure material (homojunction); (2) joining two dissimilar semiconductor materials (heterojunction); (3) joining a semiconductor to a metal (Schottky junction).

The combination of materials creates a potential difference across the junction, with the materials on each side of the barrier having different electrical characteristics. One side has excess negative charges and is called n-material, while the other side has excess positive charges and is called p-material. Absorption of light in the semiconductor energizes the negative and positive charges and creates an electrical current when the absorbed energy is greater than the material's energy bandgap.

Fundamental restrictions of quantum physics limit the portion of the sun's spectrum which can be utilized by solar cells and the efficiencies which are achievable. Thus, each different cell design has a unique performance characteristic across the spectrum of sunlight from ultraviolet to infrared. Light with energy below the material's bandgap is insufficient to generate a current; light with energy above the bandgap produces energy equal to the bandgap, with excess energy resulting in heat which must be dis-

sipated. The direct-current electricity that is produced is collected by a contact grid imprinted on the surface of the cell.

The capability to control the energy bandgap and the electrical characteristics of the materials on each side of the barrier is fundamental to the science and art of photovoltaic cell design. Particularly for terrestrial photovoltaics, the technical problem is to construct and control these sophisticated material characteristics in a mass-production process.

Manufacturing of the cell, or a module (panel) of cells, is complete when anti-reflection coatings and protective encapsulants are applied. Single-layer anti-reflection coatings can reduce average reflective losses from 40 percent to as little as 10 percent, and double-layer coatings can further reduce reflective losses to about three percent. Glass, plastic, or silicone encapsulants seal the panel of cells against environmental elements and are a key factor in determining the useful life of the cells. The output of a terrestrial solar cell in peak Watts (Wp) depends on the daily insolation in each location.

On a clear day, the sun's energy reaches the Earth at a rate of about one kilowatt per square meter. This is equivalent to the energy contained in a gallon of gasoline for every 10 minutes the sun shines on an area the size of a tennis court. Even with the low efficiency of today's solar cells (say, 10%), 60 square meters of cells with adequate storage under optimum conditions can provide the needs of an average single-family residence 6 kWp, 700 kWh per month). Unfortunately, such an installation would be far too expensive for an average homeowner. For example, at a PV module price of $10/Wp, the cost would amount to $60,000 just for the PVs, and the installation, energy storage, and power conditioning equipment would be extra.

That is precisely why the Department of Energy is spending over a billion dollars on a 10-year program to develop the technology and production techniques needed to reduce the cost of PVs to $.50-$1.00/Wp by 1986. By then, utility electric rates will be considerably higher and PVs should be able to compete on a sound economic basis. But what are DoE's chances of pulling this off, you might ask? Of course, no one really knows, but DoE is fairly confident that the price goal can be achieved. So much is happening in the PV field (advances in competing cell materials such as silicon, cadmium sulfide, gallium arsenide, encapsulation improvements, better and lower-cost manufacturing techniques being developed) that it is just too early to attempt to select the best technology/manufacturing mix. The next few years may bring several major breakthroughs in PV material technology providing lower-cost cells and in developing cells with much higher efficiencies.

One particularly promising avenue of PV research involves the use of lenses or reflectors to concentrate the light striking the PVs. Concentrations equivalent to many thousands of suns have been tried with very encouraging results. A recent breakthrough was achieved with one type which is called a thermophotovoltaic cell, which reached an efficiency of 26 percent. This particular device utilizes concentrating mirrors to focus the light on a spectral converter which absorbs the full spectrum of sunlight, then reradiates the energy at specific wavelengths which match the optimum operating bandgap of the cell. Ultimately, 30- to 50-percent efficiencies are expected.

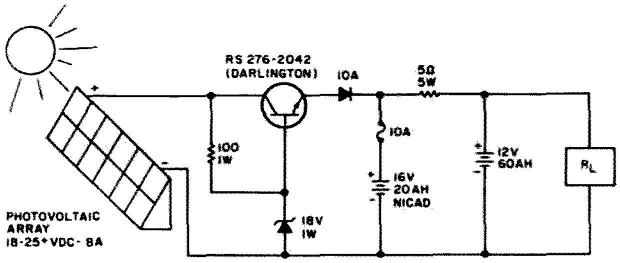

Fig. 2. Power conditioning and storage circuit.

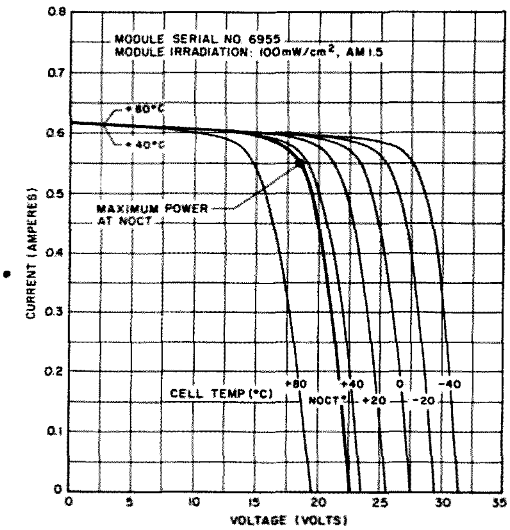

Fig. 3. Specifications of photovoltaic array.

Much of the R-&-D effort on concentrating PVs has been privately supported, and it is still too early to tell just how much of a competitor they will be to flat-plate non-concentrating options. But the overall trend is plain; the immense potential of PVs is no longer just theoretical, and the question now appears to be one more appropriately stated in terms of how long will it take PVs to capture a significant market share.

Photovoltaics and Repeaters

The use of PVs to power amateur repeaters provides us with new opportunities to locate our repeaters at sites which offer better coverage, but which otherwise may not be usable because of a lack of electricity. PVs with battery storage also provide a much greater degree of communications reliability during local emergencies accompanied by commercial power outages (as is often the case). Although many repeater clubs are equipped with auxiliary generators, it is often not easy to find a member who is willing (or able) to hurry over to the repeater site in the middle of a flood or blizzard, start up the generator, and keep it running during an extended power outage.

At the present time, high cost is one of the major problems hindering use of PVs by amateurs. Eventually, prices will come down, but it will take a number of

years, and in the meantime our repeaters will remain dependent on external power. This is a situation where a little creative groundwork could be of great service to amateur radio. Here's how: The Congress is very anxious to accelerate the commercialization of PVs and for the past few years has appropriated millions of dollars over and above agency requests with the intent of stimulating PV manufacture and use. But it is not always easy for the administration to effectively utilize all of the funds; hence, most deserving PV projects have been welcomed with open arms.

Amateur radio spokesmen could approach the newly-created Federal Emergency Management Administration with a proposal to solar-power a number of repeaters throughout the country, to strengthen the nation's emergency preparedness. The Federal Emergency Management Administration, in cooperation with the Department of Energy, might provide the PVs at no cost to repeater clubs as part of the PV accelerated commercialization program. The whole program could be coordinated at the user end by the ARRL.

The federal cost of a program to solar-power 1000 repeaters based on today's PV prices and a collector system similar to ours would be less than $5 million. This is a pretty small part of a billion-dollar PV program budget, and not only that, the real benefit the nation would gain from such a program would far outweigh its very modest cost. So how about it, ARRL, is anybody there in Newington listening? ■

Transmitter Tune-Up for Blind Hams

—an audible indicator for power out

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Blind hams have used a variety of devices to tune their transmitters, with the conversion of visual indications to audio tones being the most common approach. A blind friend, W5KUY, recently asked me to build a coupler to insert in his coax to sample the rf voltage. This voltage would be used to drive a voltage-to-frequency converter. After looking at his converter with its three transistors and two transformers, I decided to build a more up-to-date version to go with the new coupler.

The audible tuning aid described in this article operates on the assumption that maximum power trans-

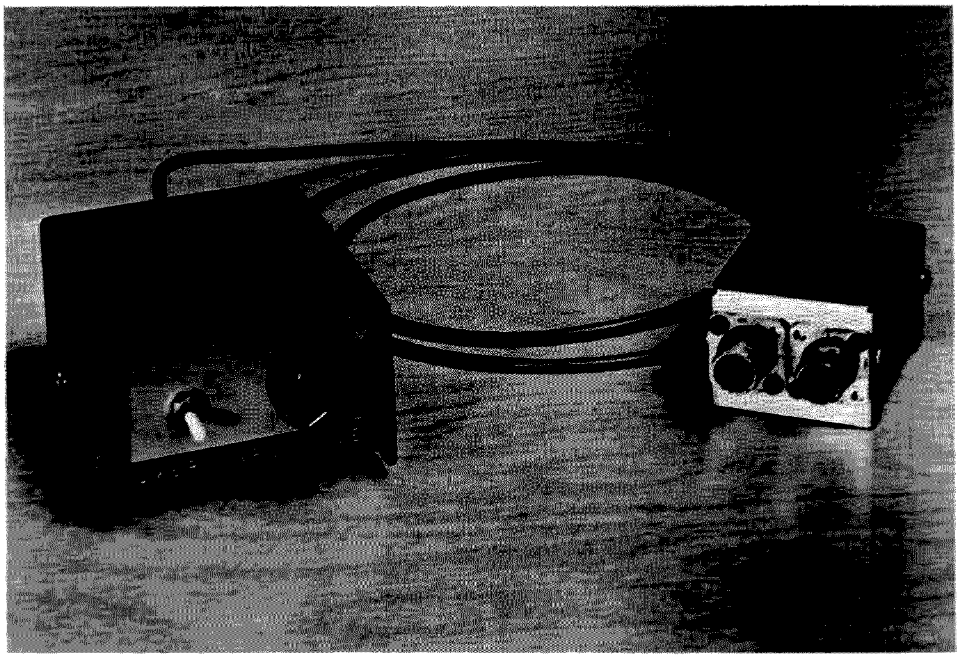

Photo A. Complete audible tuning aid.

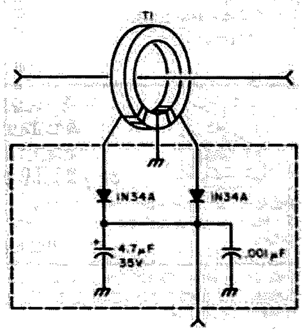

Fig. 1. Rf coupler. T1 = 60 bifilar turns #30 enameled wire, center-tapped, on an Amidon T-68-2 toroidal core (see text).

fer from the transmitter to the antenna will occur when the transmitter is properly tuned. Rf power is sampled by inserting a coupler similar to the ones found in wattmeters into the feedline following the transmitter or linear amplifier, if one is used. The coupler is connected by a length of shielded microphone cable to a voltage-to-frequency converter constructed around a 555 timer IC.

The circuit for the rf coupler is shown in Fig. 1. It is built in a 2-3/4" × 2-1/8" × 1-5/8" minibox. Two SO-239s are mounted next to each other in the small end of the box (Photo B). A two-inch length of center conductor and inner insulation from a piece of RG-8/U is prepared by removing a half inch of insulation from each end and bending the bare wire at right angles on each end, so that it fits into the center contacts of the SO-239s.

The rf transformer is wound on an Amidon T-68-2 core. To make the transformer, take two lengths of #30 enameled wire, each five feet long, and twist them together with about five turns per inch. Wind 60 :urns of this twisted pair on :he core. You will find that 30 turns will fill the core when the turns are evenly spaced. When these turns are on, continue winding he remaining 30 turns over he first layer until all 60 urns are in place. Trim the ends to about three inches and untwist them back to he core.

Scrape the insulation off of all four ends to within an nch of the core and locate he start and finish ends of ach wire with an ohmmeter. Twist the start end of ne wire and the finish end f the other together to orm a center tap. Slip the oroid over the wire from ne RG-8/U that you previusly prepared; it should be a snug fit. You now have an rf transformer with the center wire constituting the primary and the secondary consisting of 120 turns, center-tapped.

Mount a three-lug terminal strip in the center of the large side of the box and an RCA phono jack and ground lug set in the end opposite the SO-239s. Solder the center wire of the transformer to the center terminals of the SO-239s. The center tap of the secondary is soldered to the center ground lug of the terminal strip, and the ends of the secondary are wrapped around the two insulated lugs.

A 1N34A diode is connected from each end of the secondary to the center terminal of the RCA jack, with the cathode band of each diode positioned toward the RCA jack. A 4.7-uF 35-volt electrolytic or tantalum capacitor and a .001 disc capacitor are also connected from the center of the jack to its ground lug, and all joints are soldered. This completes the coupler, and the other half of the minibox can be attached.

The voltage-to-frequency converter is housed in a utility box measuring 3-1/4" × 2-3/16" × 4". Fig. 2 shows the circuit of the converter. Voltages between 1.7 and 9 volts applied to pin 5 of the 555 timer IC cause the oscillation frequency to vary. With the values given, the frequency of oscillation will be about 10 kHz with less than 1.7 volts applied to pin 5. As the voltage is increased above 1.7 volts, the frequency of oscillation will decrease in a linear fashion until the voltage reaches 9 volts, at which point oscillation will stop.

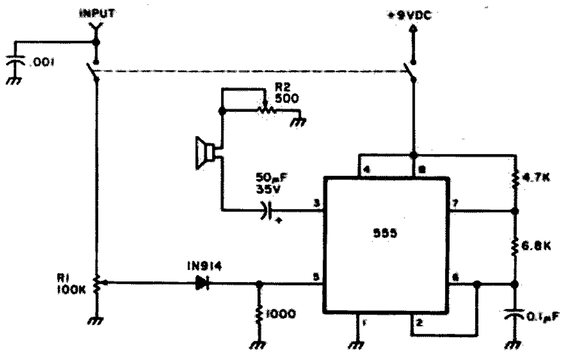

Fig. 2. Voltage-to-frequency converter schematic.

Potentiometer R1 controls the voltage reaching pin 5. When R1 is adjusted to place maximum resistance between the wiper and ground, approximately 20 Watts of output power from the transmitter will begin to lower the audio tone from the converter, and 100 Watts will lower it to about 1 kHz. If higher power is used, adjustment of R1 will set the tone to a usable frequency.

All parts for the converter are mounted on a printed circuit board with the exception of R1, R2, the power switch, and the speaker. An etching pattern for the circuit board is shown in Fig. 3. Although I used a panel-mounted potentiometer for R2 (the volume control), a printed circuit type can be used with only a

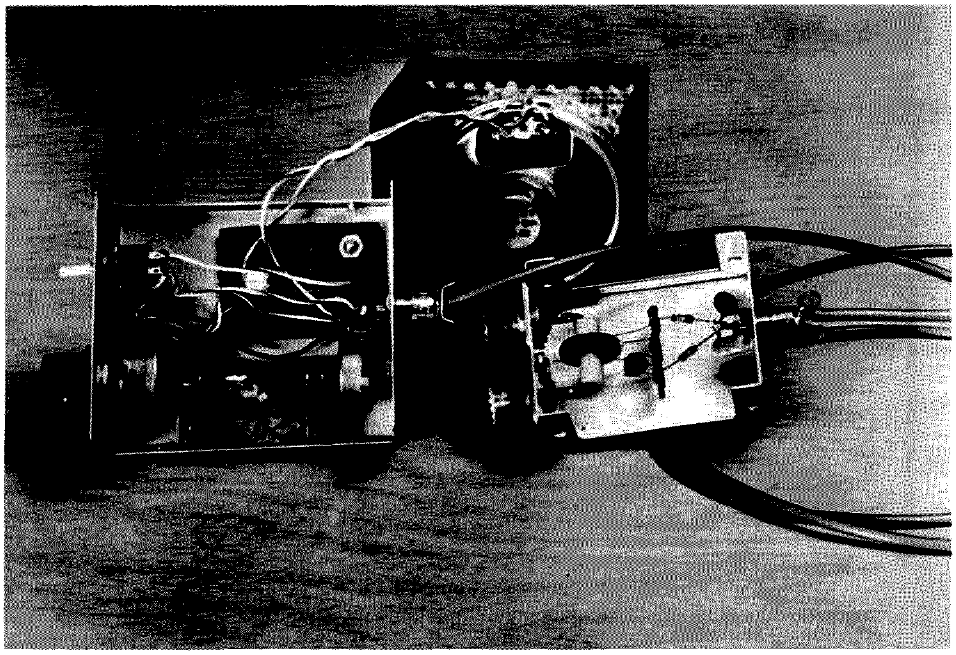

Photo B. Assembly details. Voltage-to-frequency converter is on left, rf coupler is on right.

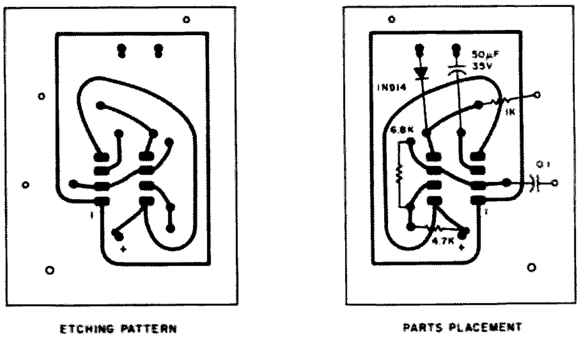

Fig. 3. PCB layout and parts placement.

minor modification to the circuit board. Input voltage from the coupler is through an RCA phono jack on the rear wall of the enclosure along with R2.

The DPDT switch shown is necessary to remove voltage from pin 5 of the IC when the converter is not in use. I failed to remove the input voltage while breadboarding the circuit, and the IC got very hot in a hurry. The resistors are all 1/4 Watt. C1 is mylar™ and C2 is either electrolytic or tantalum.

Since I did not want any bolt heads showing on the outside of the cover, I mounted the speaker by fastening it with hot-melt glue. I cut a 2" diameter hole in the cabinet top with a wing cutter in my electric drill. Next, I glued a piece of perforated aluminum to the inside of the cabinet, painted it, and then glued the speaker to the underside of the cabinet top.

I mounted the circuit board by removing the screw from the left rear foot of the cabinet and drilling out the hole to clear a 6-32 bolt. I then reattached the foot with a 1-inch-long 6-32 bolt and nut. I ran another nut about halfway down the bolt, put the circuit board on the bolt, and tightened a third nut on top of the board. Be sure to scrape the paint away from around the inside of all mounting holes to ensure good electrical contact. The battery is fastened down by making a loop of masking tape with the sticky side out and pressing it between the battery and the bottom of the cabinet.

As with any construction project today, finding the parts is a major part of the job. Most of the parts are available at Radio Shack, and I have added a parts list with Radio Shack part numbers where available to aid in locating the parts.

Operation of the audible tuning aid is very simple. Just insert the coupler in the antenna feedline and connect it to the converter with a shielded cable to prevent rf pickup. The coupler is non-directional, so either SO-239 may be connected to the transmitter input.

When the power switch is turned on, a high-pitched tone will be heard from the speaker. Adjust R2 for minimum usable volume to preserve battery life. Apply transmitter power and tune the transmitter for the lowest tone pitch from the tuning aid. For power levels up to 100 Watts or so, R1 should be set to minimum resistance between the input and pin 5 of the IC. If the tone stops during the tuning procedure, advance R1 until a high-pitched tone is reestablished. When further tuning of the transmitter results in no further lowering of the tone frequency, the transmitter is tuned for maximum output and is ready for use.

I hope this tuning aid will help amateurs with visual limitations to enjoy their hobby more. Other uses of the voltage-to-frequency converter can be made (such as audible voltmeters and other test instruments) with changes in the input circuitry. I would be interested in hearing of such uses which others find for the converter. ■

Parts List

Component	Radio Shack Part Number
50-uF, 35-volt capacitor	272-1027
0.1-uF dipped mylar™ capacitor	272-1069
0.001-uF disc ceramic capacitor	272-126
4.7-uF 35-volt capacitor	272-1012
100k-Ohm potentiometer	271-092
1000-Ohm, 1/4-Watt resistor	271-023
4700-Ohm, 1/4-Watt resistor	271-030
6800-Ohm, 1/4-Watt resistor	271-032
1N34A diodes	276-1123
1N914 diode	276-1122
555 IC	276-1723
DPDT switch	275-614
Battery clip	270-325
2-1/2" speaker	40-247
SO-239	278-201
RCA phono jacks	274-346
Minibox	270-235
Utility box	270-251

The T-68-2 toroid core is available from Amidon Associates, 12033 Otsego Street, North Hollywood CA 91607. Radio Shack does not stock a 500-Ohm panel-mount potentiometer. If the circuit board is modified for a PC-mount pot, part number 271-226 may be obtained from Radio Shack.

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Installing Subaudible Tone Encoders

—do it right

Today's communication channels are becoming more crowded every day, and with the increasing amount of intermod and other interference, amateur repeater systems are incorporating tone-access systems to help solve these problems. Probably the most common use of tone-control signaling in FM two-way radio is the continuous-tone-controlled squelch system (CTCSS). This consists of a low-level subaudible tone, typically below 250 Hz, being modulated on the radio frequency carrier of an FM transmitter.

One of the most difficult aspects of connecting CTCSS equipment to a radio is locating the proper injection point for the subaudible encoder. Depending on the encoder used and the type of radio in which the encoder is installed, this procedure can be relatively easy or it can produce many hours of frustration. This article will describe some of the problems of installing a subaudible encoder and will guide you to the successful installation of these units.

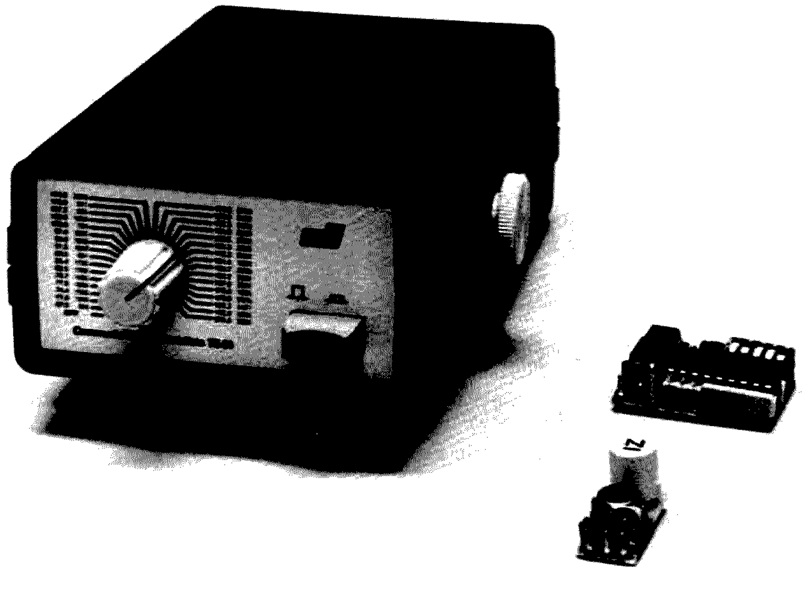

Photo A. This is an example of the types of subaudible encoders available with low-impedance outputs. Moving clockwise from the top is the TE-64 universal encoder, capable of encoding all 32 CTCSS tones via a front-panel switch. Next is the model SS-32 programmable encoder which can be programmed without the use of a frequency counter. Third is the model ME-3 microminiature encoder which uses field-replaceable, plug-in frequency-determining elements. All units are manufactured by Communications Specialists in Orange, California.

Proper connection of a subaudible encoder is very important. If the correct connection point is not found, the result can cause serious system problems. These problems include an excessive buzz on the carrier; loss of microphone audio, loss of transmit power, and intermittent or unreliable operation.

The key to locating the proper tone-injection point involves looking at two areas. First, how universal is the encoder? Is it capable of driving a low impedance load? Second, does the transmitter have a phase modulator or an FM modulator? Are you using a synthesized transceiver? These are just a few of the questions which are important to the proper installation of

the encoder.

Fig. 1 shows a block diagram of a typical phase-modulated transmitter. Most transmitters using individual crystals for each transmit frequency are of the phase-modulated type. The output of the subaudible encoder is typically connected in or just prior to the modulator stage in the transmitter. If the transmitter has a subaudible tone connection point, this point should be used. Do not confuse this connection with another common point often referred to as *tone input*. This is normally used for touchtone™ pads or audible encoders, and is not satisfactory for subaudible connections. This is primarily because this point is usually located in the microphone amplifier section of the transmitter (more on this later).

A radio manufacturer's connecting point is often to the center of the deviation control (sometimes called the IDC control), to the input of the final audio driver, or directly to the varactor modulator diodes. Should the transmitter not have provisions for tone injection, one or all of these connection points should be tested, and the one that provides the best results with minimum distortion and a minimum amount of voice intermoding should be used. This connection point varies with each different model radio, and you must determine which provides the best results.

In some cases, amateur transceivers are not designed to interface readily with tone-coded squelch systems, and injection of the subaudible tone sometimes can be very difficult. In these cases, when using a phase modulator, a varactor assembly can be used. The varactor changes ac voltage into changing capacitance which truly FM modulates the transmitter.

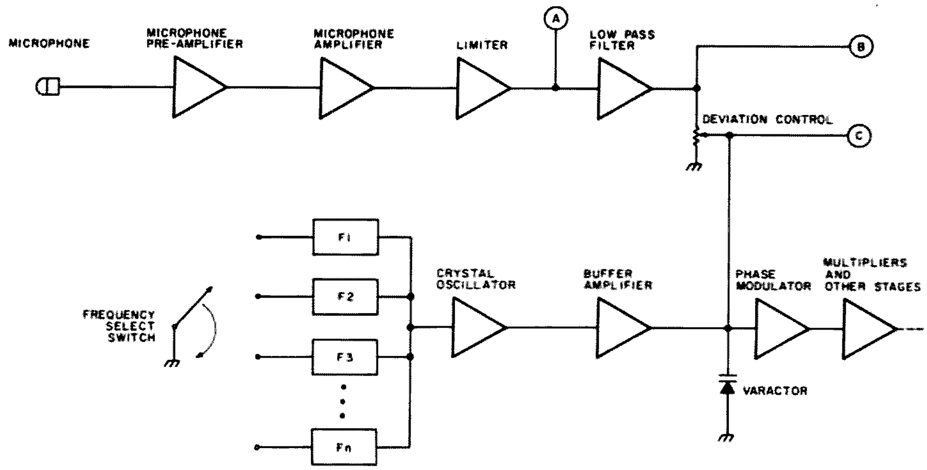

Fig. 1. Partial block diagram of a phase-modulated transmitter. The points labeled A, B, and C are typical connection points for the subaudible encoder. These points are located after the audio-shaping circuitry which would cause tone distortion.

No intermoding or distortion of the voice will be noted with this method, as compared to some injection points in the phase modulators.

Fig. 2 shows a typical varactor assembly, where the collector-base junction of a low-frequency NPN silicon transistor is used as the varactor diode. Various values of coupling capacitors are shown for different frequency ranges of the transmitter; a higher value of capacitance will increase the deviation level. However, if the capacitance is too high, it may be difficult to set the transmitter on frequency. It should be noted that when the varactor assembly is connected to the oscillator circuit, the oscillator frequency will probably shift slightly and require retuning. This method is used quite often in tube-type transmitters and in a few solid-state units, as well. This method also can be used if other connection points prove unsuccessful.

Another common type of transmitter that is now extremely popular is the synthesized transceiver (Fig. 3). This type of radio often uses a frequency modulator whereby a varactor, as described before, is used to vary the frequency of the crystal oscillator. In some transceivers, the varactor is used to change the frequency of a voltage-controlled oscillator (vco). This type of modulator interfaces quite well with subaudible encoders.

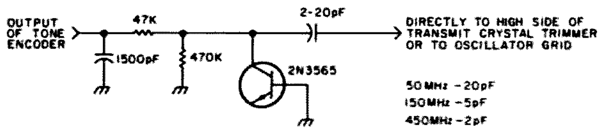

Fig. 2. Schematic of a typical varactor assembly. The collector-base junction of an NPN transistor is used as the varactor. The output of the assembly is connected to the high side of the transmit crystal trimmer. In a tube-type transmitter, the output is often connected to the grid of the oscillator tube. The value of the coupling capacitor changes, depending on the frequency range used. The values shown are approximate and may require adjustment to obtain the proper deviation level.

The frequency-modulated transmitter is very similar to the phase-modulated transmitter up to the low-pass filter section. The FM modulator is identified quite easily, as the audio is fed into the varactor, which is often part of the crystal oscillator. The tone-injection point for a frequency-modulated transmitter is found in a similar manner as with the phase-modulated transmitter.

When connecting power to the encoder, be sure to use switched power that is active only during transmit. This voltage can be taken right from the transmitter circuit board or a push-to-talk relay coil. Switched power should be used for two reasons. First, the encoder will draw current only during transmit since it is not used during receive operation. Second, the crystal oscillator, which is frequency modulated during transmit, is often the same oscillator which is used during receive operation. If the encoder is not disabled during receive, a buzz will probably be heard through the speaker as the encoder continues to modulate the receiver oscillator.

If you have an encoder that has a low-impedance output, insufficient level output should never be a problem. However, if the tone connection point is a high-impedance load such as a 100k deviation control,

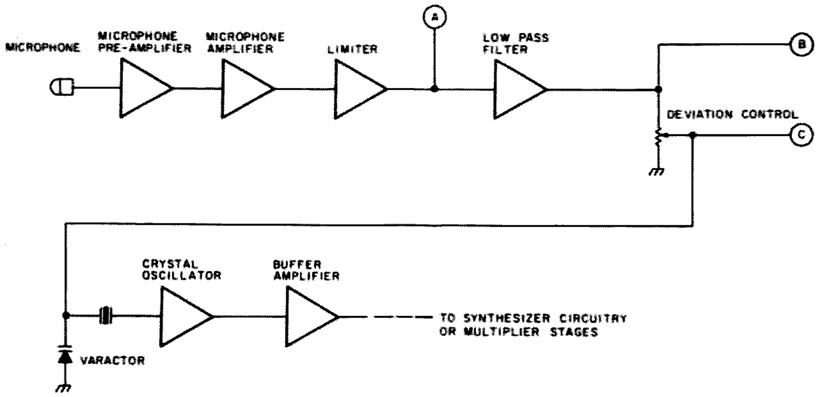

Fig. 3. Partial block diagram of a frequency-modulated transmitter. Although these transmitters are generally a lot easier to interface, some synthesized transmitters using FM modulators can be difficult.

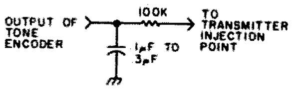

Fig. 4. Tone output filter.

then a series isolation resistor will be required so as not to load down the normal voice modulation. This resistor value must be determined experimentally, but a 100k resistor would be a good starting point. This value could change from 10k to 1 megohm, depending on the radio used. It is best to use an encoder with a low-impedance output (less then 10k). This is more easily adaptable to various types of transmitters, since the encoder often is required to drive into a low-impedance load. If the tone deviation cannot be set up to the proper level, it is possible that the encoder is not supplying a sufficient output level. This would be the case when using an encoder with a high-impedance output to drive a low-impedance load. If this happens, another connecting point must be located which is at a higher impedance level.

Do not connect the encoder tone to the microphone input or the microphone preamplifier as this invariably causes excessive tone distortion due to the frequency response of the transmitter's speech amplifier. The speech amplifier has a typical response of 300 Hz to 3000 Hz and does not permit the fundamental tone to be transmitted. This is the usual cause of a distorted tone output as monitored through a speaker or with a deviation scope. If the purity of the encoder output is in question, look at the output of the encoder with an oscilloscope.

If tone distortion continues to be a problem, then a capacitor can be placed on the tone output to provide additional filtering when required (see Fig. 4). This is not noticeable in phase modulators, since the frequency response can be quite poor at the low end of the audio range. If a deviation scope is used, the scope trace will not be a pure sine wave and will sound like a buzz. The additional filtering will cure the problem. If a deviation scope is not available, then another receiver on the transmitter's frequency can be used. Using this method, an oscilloscope can be connected to the discriminator output in the receiver, and a clean sine wave should appear when transmitting.

Another area which should be given special attention is rf interference. This is most common when installing encoders into hand-held portable transceivers. Although the encoders tested were not susceptible to being affected by rf, care should be taken when installing the units near the transmitter circuitry. In most cases of rf interference causing loss of audio or loud buzzing oscillations, it has been found that the rf is coupled into the connecting leads of the encoder and then fed back into the transmitter itself. This causes the bias conditions and other tuned circuits to become unstable, producing oscillations and distortion. But, under these conditions, it should be noted that the encoder is still working properly. The solution to this is to keep all leads as short as possible and install one or more bypass capacitors on the radio's circuit board where the encoder leads are connected. Also, relocating the encoder or rerouting the connecting leads through another part of the radio should correct the interference caused by the stray rf.

One final problem which is common when connecting tone-coded squelch equipment is setting the encoder to the proper deviation level. Unless you have access to a communications monitor with a deviation scope (not a deviation meter!), setting the proper level can be very difficult. If the proper injection point is not found, you could be encoding a highly-distorted tone which would have to be set at a very high level in order to open the associated decoder. If you are encoding a clean sine wave, then follow this procedure for setting the level:

1) Turn the level adjustment all the way down so that you have zero output and move to a repeater requiring tone access.

2) Next, turn the level up just a little bit and key your transmitter.

3) Did your transmitter key up the repeater? If not, repeat step 2 and continue to increase the level until the repeater keys up reliably.

4) Now increase the level just a little bit more, and you are finished. This little extra level will help you in marginal signal areas, and will operate the decoder more reliably.

5) Button up the radio, and you are on your way.

If you happen to have access to a deviation scope, then the proper deviation level of the subaudible tone should be set from 0.5 kHz to 1.0 kHz peak-to-peak. This is the standard range for this setting. However, it is best to keep the deviation as low as is practical within this range as long as reliable operating is maintained.

It should be clear that installing a subaudible encoder to a transmitter is not an easy job. There are many variables to contend with and each one of them can cause a multitude of problems. But, with practice and experience and, of course, a little patience, excellent system operation can be attained.

I would like to thank the various manufacturers of tone equipment for providing the test equipment and information required for this article. I would also like to thank them for the use of their new line of encoder products which were used for testing and evaluation. ■

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Four-Band Mobile Antenna

—looks like a weird hat rack

Do you ever find yourself cruising down the highway working forty meters and wishing you could switch to twenty, fifteen, or ten without having to stop to change resonators? You can! I experimented with this contraption in 1960 and have been using it ever since. There is even a commercial version that came out a couple of years ago.

Any set of three resonators may be used but I prefer the 40-20-10 combination since you also get a 15-meter fallout from it. When I first started using it with an old Galaxy V, I installed a remotely-operated super-tuner gizmo in the trunk, but later found that with patient stinger adjustments on the three resonators, the tuner was not really needed. I am presently using an Atlas 210 for mobile, and the broadbanded rigs are supersensitive to swr over 1.5:1. I have worked many foreign countries with this rig with good signal reports.

The strap that holds the resonators must be of sufficient strength to prevent the angles of the forward and aft resonators from changing. Changing this angle affects the resonant frequency. The strap I happened to start out with was about one inch wide and 3¼ inches long. A hole large enough to accommodate the threaded extension on the mast is drilled in the center. (I happened to have had all Hustler equipment so that is what I have used since.) The other holes on each end are large enough to hold non-corrosive bolts that will screw into the bottoms of the other resonators. The strap is bent as shown with each end dropped at forty-five degrees. The assembly is attached to the mast and held in place by the center resonator, and the time-consuming tuning is started.

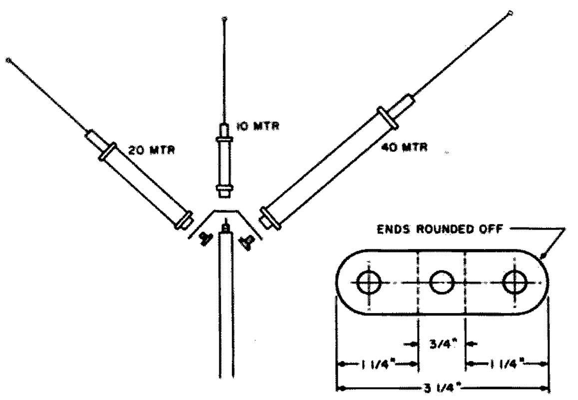

Fig. 1. Four-band mobile antenna construction details.

Begin with the lowest frequency resonator, adjusting to the lowest swr, then proceed to the next higher and then the last. The resonators interact, and this procedure must be repeated several times until the swr no longer can be improved. I have 1.1 at 7.260 and 1.35 at 7.225 and 7.295. On twenty meters, the swr is less than 1.35 across the band and even better on ten. The swr does peak up to 1.5 on fifteen meters. I use the ten-meter resonator to hold the strap to the mast with the twenty-meter resonator in front and the forty-meter aft. This streamlines the assembly in the direction of travel and reduces wind resistance. Also, with the larger resonator aft, it tends to stabilize the assembly at normal highway speeds.

I have found that the majority of the noise associated with mobile reception can be eliminated by using the copper braid out of RG-8 coax as grounding straps and grounding the car hood and trunk lid to the frame of the car. In addition, the exhaust should be grounded in at least two places, one in front of the muffler and one aft. Be sure to scrape the rust off to bare metal when attaching the grounding straps. The braid can be cut to the desired length, the ends shaped to hold a bolt, and then heavily soldered to make a good connection.

Several of my ham friends around the country have built this antenna system over the years and have enjoyed it. I would be pleased to hear from anyone who tries it and of any ideas for improvement. ■

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Computers and HF

—a discussion of alternatives

Microcomputers are becoming increasingly popular, and they can be used to give us faster and more reliable communications on the amateur bands. But what is the best way to use them? If the FCC offered us a choice of several emission types and transmission speeds for computer communications today, which should we choose? It would be good for us to start now to consider the character of the ham bands we have to communicate over and the nature and potential of the computer links that we want to set up so that later we can go to the FCC with proposals and justifications for what we want.

This article will present my thoughts on how an optimum scheme for computer-to-computer communications on the HF amateur bands should be designed. For purposes of this discussion, whether or not these techniques are authorized under the current FCC rules is immaterial; we can work on the rules after we decide what we want.

Advantages

Why, in the first place, do we *need* a special emission type for use in computer-to-computer communications? Current practice for those with microcomputers running in their ham shacks is to program the computer to emulate a TTY machine. This allows communications with other amateurs using TTY machines, but we can do much better.

Computers will allow us to communicate at much higher speeds than TTY machines. This will reduce the time required for transmission of large data files and also allow retransmission of data that was garbled by fading or QRM without incurring unacceptable overall transmission times in the process.

Computers will allow us to implement error-detecting and error-correcting codes in the transmission of our data. This means that the receiving computer will be able to determine whether or not it has received a particular data block error-free and request retransmission of portions if some were garbled. This is a fantastic step forward compared to current RTTY operation.

By combining the use of computers with frequency-shift keying (FSK) and error-detecting codes, we can obtain another advantage—diversity operation. The receiving computer can detect independently both the mark and space signals. Since these two signals are separated in frequency, the overall system gains immunity to fading of one channel with respect to the other ("selective fading") and also to narrowband QRM such as CW signals which might be obliterating one of the two tone frequencies at any given time.

Uses

There are several immediate uses for interconnected microcomputers on the amateur bands. First, in emergency communications, links with computers supporting them could handle formal message traffic error-free and at much higher rates than either CW, phone, or RTTY operation can today. This could reduce the typical logjam of message traffic out of disaster areas.

Second, the transfer of image data (TV pictures or

computer graphics) from one amateur to another could be done much better using microcomputers and digital techniques than by the current slow-scan TV system. This is because the images could be digitized and sent over the link using error-detection coding. By retransmitting portions of the image that were received garbled, display of a perfect image could be ensured.

Third, people will want to exchange computer programs. This will require a high-speed communications link between computers, with a means to detect and retransmit garbled data, since programs can tolerate no errors.

Now let's discuss an inter-computer communications scheme that is intended to be optimum for amateur use on the HF bands.

Emission

One of the most important characteristics of the HF amateur bands is the typical presence of fading and interference. For operation under these conditions, a frequency-shift keying approach is best. Since it is desirable to keep the signal bandwidth as narrow as possible, use of the present standard FSK shifts of 170 and 425 Hz is recommended. Use of 170-Hz shift would minimize one's bandwidth, at the expense of reduced advantage from diversity operation (the wider the mark-space frequency separation, the better the diversity receiver will work).

On the other hand, on a band that is not too crowded, 425-Hz shift can be used and the system will be closer to being immune to narrowband interference. A shift of 850 Hz would offer even more diversity advantage and also allow a faster signaling speed, but I am not recommending it due to the greater bandwidth required.)

Speeds

Once the frequency shifts are chosen, the maximum signaling speed is set also. This occurs because the significant sidebands produced around each tone frequency must be separated enough to allow reliable detection at the receiver. Analysis shows that we should be able to use a pulse width as short as 7.84 milliseconds (ms) with 170-Hz shift and still allow adequate separation between the mark and space sidebands. With 425 Hz, a minimum pulse width of 3.14 ms should be usable. Both these schemes would require good quality detection filters at the receiver. And in both cases, the system could be slowed down from this maximum rate when band conditions are bad so that added interference immunity could be gained from the longer pulse times.

If we assume use of an asynchronous 8-bit ASCII code, the 7.84-ms pulse width yields a speed of 12 characters per second (cps) and the 3.14-ms width yields 30 cps. Overall emitted bandwidth of the 170-Hz shifted signal at 12 cps would be about 340 Hz, and that of the 425-Hz shifted signal at 30 cps would be about 850 Hz.

Coding

While the Baudot code presently in use for RTTY is most efficient for sending text messages (it requires only a 5-bit code), the 8-bit ASCII code set (with its capability to send special characters and represent full 8-bit computer words) is superior when transmission of all sorts of data is considered. The only penalty in the use of ASCII will be that pure text messages will require slightly longer transmission times than if Baudot coding had been used.

I recommend that we use asynchronous ASCII coding for our inter-computer communications because the design of the receiving hardware and software is simpler. Also, the timing accuracy requirements of the sending and receiving computers are greatly reduced compared to those required with synchronous codes (no start or stop pulses). The code will use a 1-unit start pulse, 8 bits of data, and a 1.5-unit stop pulse—similar to present RTTY coding.

We can take a tremendous step and obtain error-free reception of data by employing error-detecting or error-correcting codes in our scheme. These are special methods of coding the basic ASCII characters of a message so that the receiving computer can determine, after it has received the full message, whether there were any errors in it. If there were, it can request a retransmission of portions of the message from the sending computer. The sending computer can retransmit data blocks that were garbled in transmission whenever necessary until the receiving computer has received the entire message correctly. (There is a catch, of course, in that as more transmission errors occur, data blocks must be retransmitted more often, and the longer it then takes to receive the entire message error-free.)

Since we can expect a lot of interference on the ham bands, it is best to break up the data we are sending into small blocks containing perhaps 16 or 32 characters each. A typical transmission might contain 20 or 30 blocks, and only garbled *blocks* would need to be repeated, not the entire transmission. (This is known as "block coding.")

Diversity

As mentioned earlier, the use of FSK with block coding and error-detecting or error-correcting codes will in turn allow the use of diversity receivers. After detecting both the mark and space signals complete with error-detecting information, the receiving computer can request retransmission of garbled blocks. Since the receiving computer need receive only one of the two signals without garble to receive a complete block, the system is now much more nearly immune to narrowband QRM and selective fading.

What Now?

The hardware and software needed to implement all of these ideas has not yet been completed, but it is under development. Much experimentation will still be required, even within the framework of ideas presented here, to determine which of the several possible schemes is really optimum for use on the HF bands for computer linking. The most experimentation will probably be required in determining which of the many available error-detection and error-correction schemes we want to use. I am starting to work along these lines and would like very much to hear from others interested in participating in this development effort.

The ideas presented here are intended to be a starting point for discussion and experimentation within the amateur community, with the eventual goal being an optimum agreed-to standard for inter-computer communications on the HF bands. Let's give this topic some thought and ensure that the eventual FCC rules authorize us to use state-of-the-art techniques for linking our personal computers. ■

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Ned Novice and his Capacitance Meter

—you, too, can build one

Ned Novice visited Mike Cord (the boy electronics wizard) the other day with a perplexing problem pertaining to plastic parts. Ned asked, "Mike, what are these?" and set a box of parts on the workbench.

Mike replied, as he pawed through the box of parts, "They seem to be capacitors with no markings as to value."

"Do you know a way to determine the value of these parts?" asked Ned quizzically.

"First of all," Mike replied, "let's get back to basics."

The Capacitor Defined

"My father's physics book should be of help. Hmm . . . Ah, yes, here it is . . . Q=CV. This says that the charge on a capacitor in coulombs is equal to the capacitance in farads multiplied by the voltage."

"How can that relationship be of use to me?" interjected Ned.

"Quite easy," replied Mike. "If we charge up a capacitor to a known voltage and measure the coulombs, we will have it."

Ned thought for a few moments before retorting: "But I have never heard of a *coulomb* meter!"

Mike grinned and searched through his junk box for a few moments before coming up with a 0 to 100 microammeter. "With this we will measure your capacitors."

"You *do* have a coulomb meter, then," said Ned, hopefully.

Mike replied, "Look at it this way, Ned. The definition of the Ampere is one coulomb per second, so what we will do is measure the current."

Mike wrote the cryptic formula: $I = Qf = CVf$. "We will charge and discharge the capacitor at a frequency. The measurement of picofarads will be indicated by microamps," he stated in a firm voice, with the confidence one would expect only from a more mature individual.

The Circuit Designed

"Now for specific values," said Mike as he studied over the scratch pad for a moment. He wrote down: V=4.5 volts, I=100 microamperes, C=100 picofarads full scale.

"Therefore, $f = I/CV =$ 222 kHz!" exclaimed Mike as he turned off his calculator. "And to change ranges all you have to do is change frequency. Thus, 100 pF = 222 kHz, 1000 pF = 22.2 kHz, .01 uF = 2.22 kHz, .1 uF = 222 Hz, and 1 uF = 22.2 Hz."

Just then Mike's father entered the ham lab and asked what fun the boys were into today. Mike related all that had happened and asked his dad if he had any suggestions.

"So far, so good, Mike.

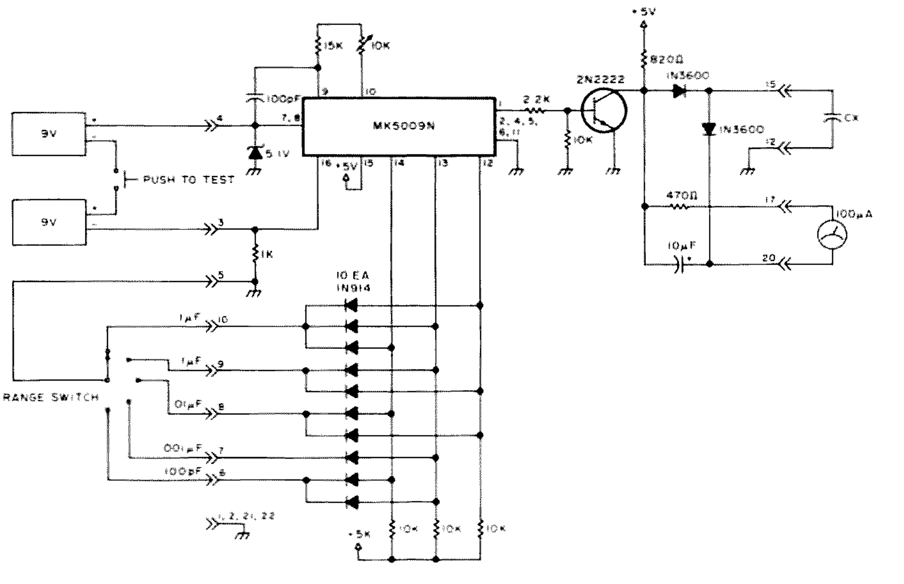

Fig. 1. Capacitor meter schematic.

Parts List

9-V transistor battery	2
Battery jacks	2
Push-to-test switch, SPST	1
Zener diode, 5.1 V, ½-Watt	1
Rotary switch, 5-position	1
Diode, 1N914, 1N697, etc.	10
Diode, 1N3600, 1N198, etc.	2
IC, Mostek MK5009	1
Transistor 2N2222	1
Resistors:	
15, ¼-W, 5%	1
1k, ¼-W, 5%	1
2.2k, ¼-W, 5%	1
470, ¼-W, 5%	1
820, ¼-W, 5%	1
10k, ¼-W, 5%	4
TO5 pot, 10k	1
Meter, 100 dc uA full-scale	1
Capacitors:	
100-pF dipped mica	1
10-uF tantalum, 10 V	1

Circuit board is available from O. C. Stafford Electronics, 427 S. Benbow Road, Greensboro NC 27401.

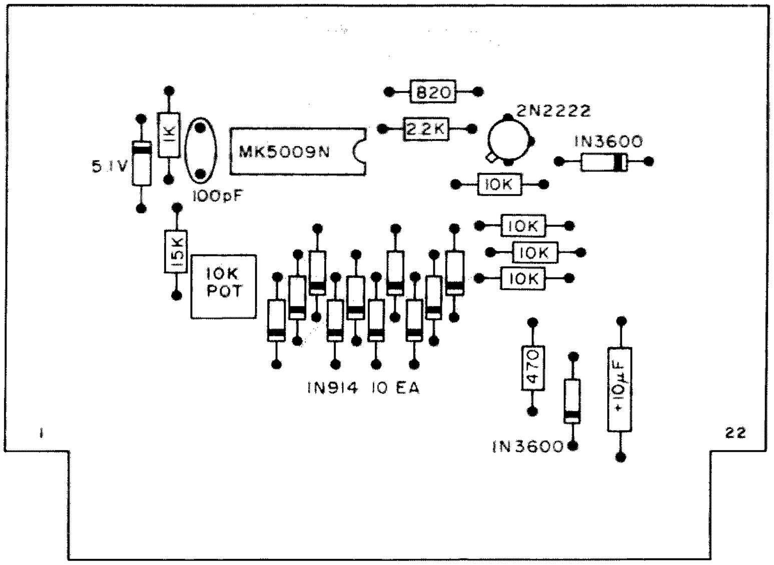

Fig. 2. Capacitor meter parts layout.

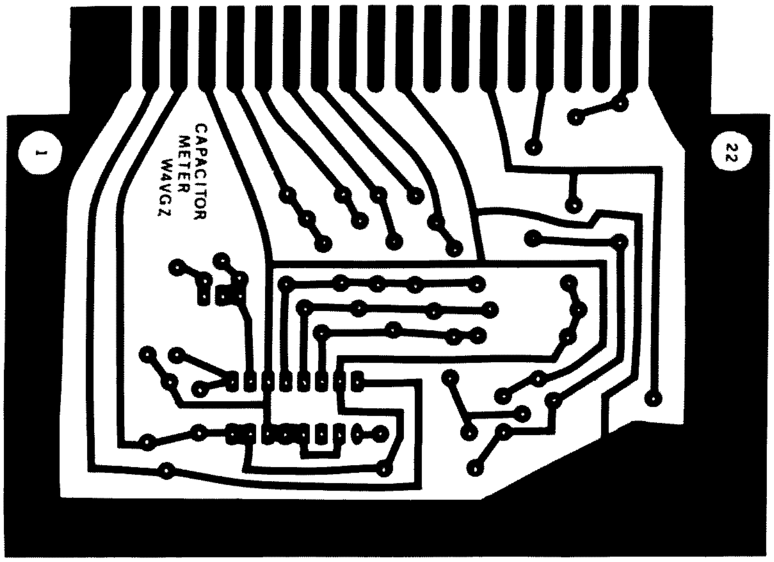

Fig. 3. PC board.

However, I do have a suggestion. Mostek has an integrated circuit that will do all you want in generating a 5-decade range of signals. This chip has an oscillator implemented as well." Dad then reached for the Mostek data book from a crowded bookshelf and drew the schematic shown in Fig. 1.

The Project Built

The next evening, Dad came into the ham lab with a grin and threw a large envelope on the bench. "I had a few spare minutes at work today, so I laid out a PC board for your capacitor meter, and here is the phototomaster."

"Golly, Dad!" exclaimed Mike, "I was going to build it on perfboard, but this is so much better."

Ned was already putting the negative over a pre-sensitized PC board blank and exposing the resist with the photoflood lamp. Mike reached over and turned on the crock pot that contained the ammonium persulfate etchant. A half-hour later, the boys were stuffing the board with parts. Luckily, the local industrial parts distributor had the MK5009 in stock, and Dad had had the foresight to pick one up on the way home.

"What are all these diodes for?" asked Mike.

Dad signed off from his 20-meter QSO. "The decade selection is made by 4 binary-coded lines to the MK5009. I weighed the cost of a BCD thumbwheel switch against the cost of the diodes, considering that we have many rotary switches in the junk box. At 20 for a dollar, the diodes won," explained Dad.

While Dad was explaining, Ned had been soldering wires, and he called from the workbench area, "It works! I tried a .001-uF capacitor and trimmed the oscillator for full scale. Then I measured a 470 pF and the meter was *exactly* on calibration!"

By the next evening, the circuitry was mounted in a nice looking box purchased from the local hobby electronics store. Dry transfer labels were used to mark switch positions, and Ned was busy identifying his unknown capacitors.

"Mike, I have noticed that the meter reads 3 or 4 picofarads on the most sensitive scale, with no connection to the output terminals. This must be distributed capacitance and leakage effects, right?"

"Yes," replied Mike. "Dad explained it to me just that way after you left last evening."

"Mike, what do we do if we have a really large electrolytic to measure?"

"Hmm . . ." said Mike, as he reached for the physics book. ■

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Daze of Whine and Noises

—intoxicating information about alternators

One of the puzzling problems that crop up in our VHF FM equipment is the sudden appearance of alternator whine. It is usually the first comment you receive if you have it on your signal. As befits the individualistic aspect of the hobby, there are many myths pertaining to its elimination which I shall attempt to dispel, after which I will suggest some ways of eliminating it. First, however, we should understand the reason for its being, and learn where to look for its source. The charging system in your car is the cause; the reason we have the charging system is to keep the source of all of your car's electrical power at its proper potential; the source being the car battery.

Fig. 1 diagrams the charging system for late-model GM cars. Note that the alternator is a 3-phase full-wave bridge with an output shown in Fig. 2. It is the dc component of the pulsating output voltage of the alternator that charges the battery. Since the output of the alternator will vary with engine speed—anywhere from slow idle of about 600 rpm to several thousand rpm—a regulator is added to ensure an almost constant charging voltage to the battery. This constant voltage is perhaps one to one-and-one-half volts higher than the 12.5-volt battery. Note that the battery is 12.5 volts, not the 12 volts often assumed.

Photos courtesy of Ford Motor Co.

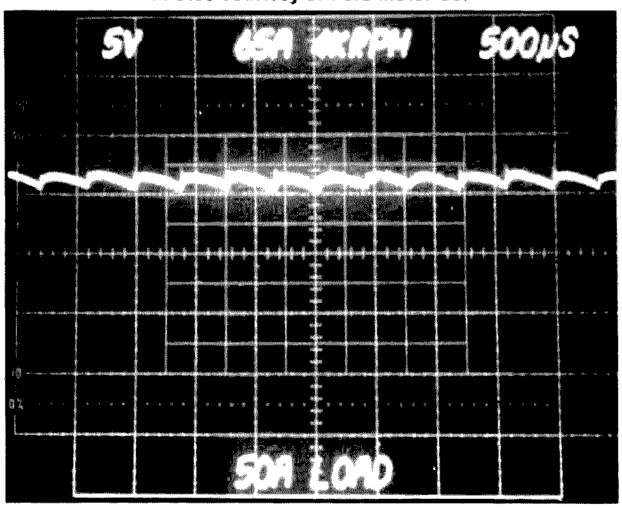


Photo A. Alternator output under actual load condition.

At one time, it was possible to adjust the charging voltage and current. My late-model car is permanently adjusted. The regulator module is mounted inside the alternator. Granted, it is a solid-state assembly, but if the permanent adjustment becomes temporary, the regulator must be replaced in its entirety. A very positive aspect of these new-fangled solid-state regulators is that there are no longer any arcing contacts involved. The older regulators had (at least) one set of contacts (voltage-adjust) opening and closing all the time the engine was running. The spurious radiation from these beauties was stultifying!

Alternator whine is the squeal mixed in with your audio that the receiving stations hear when you transmit. It varies in frequency in proportion to engine speed. The root cause of alternator whine is related to diode switching and the chopping action of the regulator. Rather than the ideal waveform shown in Fig. 2, the output of an alternator is the square wave shown in Photo A—a photo of alternator output under actual load conditions. All the scope-trace photos used a setting of 5 v/cm on the vertical axis and 500-μs timebase for the horizontal sweep.

Square waves contain many harmonics extending well into the VHF range, and since automotive designers may not be aware of the fact that we amateurs are installing VHF equipment in our cars, they don't spend too much time properly routing wiring. Nor do they spend time or additional parts trying to clean up the garbage you will see on a 12-V (sic) bus in the car, should you happen to put a scope on the Vcc line to your radio. They design in only what they have to for general usage. The fact that cars are becoming physically smaller compounds the felony. All wires, by necessity, are closer together.

In most cases, spurious radiation in the audio frequency range gets into your rig via what automotive engineers call backway point of entry. This means

through the "A" lead to your rig. The result of this is the modulation of your signal with an unwanted audio signal, represented by the squeal, in addition to the desired modulation from the microphone. I would hazard a guess that the reason that the whine manifests itself more on the transmitted signal, as opposed to receiver audio, is related to total gain in each audio circuit and the number of stages (discrete and/or IC) in the chain. I have experienced whine in a receiver, but not in its transmitter in one instance, and vice versa in another.

The spurious audio is generated by the unique nature of the alternator system. Its frequency is related to alternator rpm times a constant, K, where K equals the number of poles times the number of phases times the diode rectification factor, all divided by 60 (the conversion of rpm to Hz).

For Ford cars, which use a six-pole alternator, K = 0.6; for GM cars, which use a seven-pole alternator, K = 0.7. With an engine speed of 600 rpm, the alternator rotates at approximately 2400 rpm, since there is about a four-times multiplication factor between the engine pulley and the alternator pulley. The spurious is therefore about 1440 Hz (0.6 × 2400) for Fords—right in the middle of the audio range.

All FM gear uses audio wave-shaping in the receiver audio system not only to de-emphasize, but also to limit bandwidth. Audio is usually cut off above three kHz. Any spurious audio is also reduced in amplitude; therefore, when a radio is transmitting alternator whine, you will usually hear it only at low speeds of travel or at idle speeds. The whine may still be there, but your radio's audio system cuts it off or reduces it by a substantial amount. As a point of information, you can, with a little mathematical manipulation, ascertain that when you rev up your Ford engine above 1300 rpm, a ham, listening for your whine, will no longer hear it. All of this presupposes that your charging system is in perfect working order.

Photos B and C show the results of a failure in one of the rectifier diodes in an alternator. Photo B shows a shorted diode; Photo C, an open diode. Note first that the average output voltage drops just a little but, more importantly, that the waveform is more distorted. Without getting into a Fourier analysis, it follows that more spurious harmonics will be generated along with more spurs in the audio range. This will affect the "purity" of the whine you transmit. Get the hint? If your whine suddenly changes its characteristics, check your alternator diodes! Hopefully, you will have removed this annoying signal from the air long before any diodes break down.

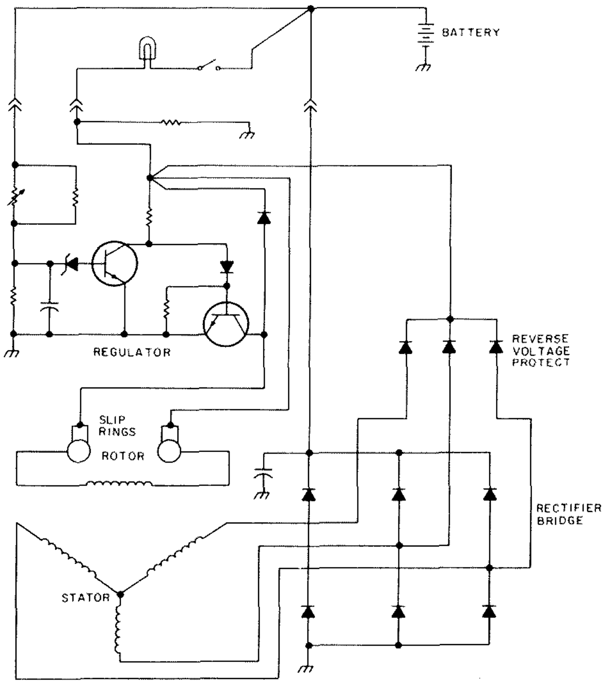


Fig. 1. The charging system for late-model GM cars.

Much has been said, but little written regarding ways to reduce the spurious transmission of whine. The most effective way that I have found, borne out by automotive people I've contacted, is to insert a properly rated choke in series with the "A" line to your radio. A value of about 20 mH worked for me. The most flagrant error made is to attempt to use a standard CB-type choke. These things are rated at only 2 Amperes. Most amateur equipment draws up-

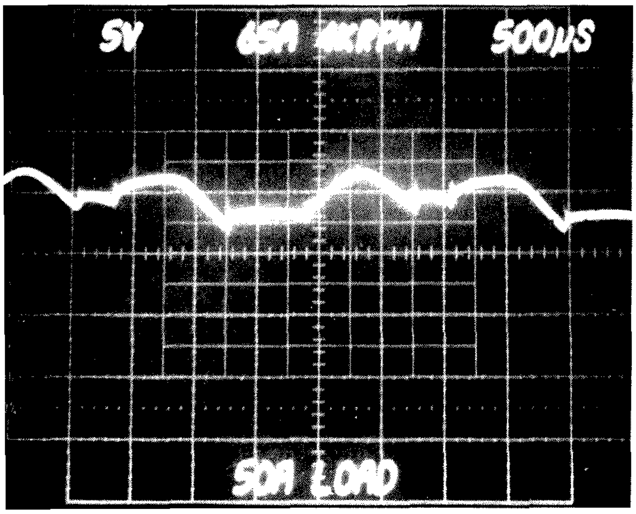


Photo B. Result of shorted diode in an alternator.

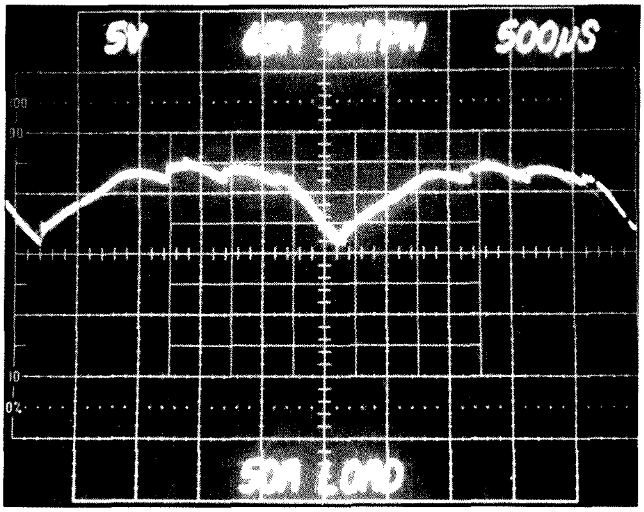


Photo C. Result of open diode in an alternator.

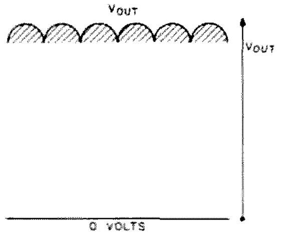


Fig. 2. Three-phase full-wave bridge output.

wards of three Amperes. This amount of current flowing through a choke rated at 2 Amps would saturate the iron core, rendering it useless. There are some 5-A CB chokes available, as well as high-current chokes used with high-power auto stereo systems.

Make sure that there is, in fact, some iron in the choke you buy. I built one on a toroidal core which had strip-iron as its base—not ferrite. Since it involved winding about 100 turns of #16 wire through the toroid, I don't recommend it—unless, of course, your hands are really calloused. I don't find that adding electrolytics across the power line is as effective as a good 0.1-to-0.5-uF capacitor. Among others, Sprague makes an excellent line of feedthrough capacitors (48P series). These should be connected in series with the battery output terminal of the alternator after you check that the capacitor case is truly grounded to the alternator case. Be sure to get a capacitor with an adequate current rating. Remember, the environment under the hood of a car is severe insofar as temperature is concerned.

For years I've been hearing that the only way to eliminate whine is to run the Vcc feed directly to the battery. One problem with this approach is that the batteries in the new cars have terminals that do not lend themselves to adding external connections. The other problem with this approach is that running long lengths of unshielded wires in the engine compartment can cause more problems than using existing wiring.

If you happen to run this new wiring in close proximity to the car wires that are radiating, you're making the job tougher to correct. Your connections should be made with at least #16 wire if there is any appreciable run length. In case you're interested in using coaxial cable for your power connections, be advised that the inner conductor of RG-8 approximates a #12 wire, RG-58 has a #19, RG-59 a #22, and a good "mini 8," a #16 wire.

Bring an AM radio close to your car wiring in the engine compartment, and note the presence or absence of whine. Don't worry too much about the other noises you hear. What you are listening to is the snap, crackle, and pop of the primary and secondary of the ignition system, the myriad solenoids and valves that are now added to the engine for pollution control. The saving grace in all this is that all of the aforementioned snap, crackle, and pop is in the form of amplitude modulation. Our VHF equipment, being frequency modulated, is pretty much immune to these spurious AM radiations. Generally, only whine is the problem.

In view of the number of models of autos on the road, it is obviously impossible to list specific fixes for whine. In general, make sure that you are making good grounds in your installation. If you are connecting your ground to a factory-installed ground, be sure the latter is a *zero resistance* connection to the battery. Arm yourself beforehand with a roll of bonding braid (Belden 8663, 8669, or equal) and literally bond your car together—electrically. You can use the same braid to shield long runs of wire by snaking the wire through the expanded braid and then grounding one or both ends of the braid.

Move some of the wires in the engine compartment away from each other to see if the induced spurs are reduced. Be careful in this operation. The SAE (Society of Automotive Engineers) has had much experience (75 years) in routing wires to prevent them from being wrapped around fans, belts, and other moving parts guaranteed to rip a harness from your car. I cannot stress too strongly the need for good grounding, and one area you should be sure to check is the antenna-to-radio ground connection if you use a magnetic-mount antenna. Remember, the base of this antenna is not grounded—it is insulated from car ground by the paint on the car, rubber gasket, or other nonconducting base material. If you use a gutter-clip mount or a trunk mount, be sure that the mounting screw(s) break through the paint and make zero-resistance contact with the body of the car. These points should be checked regularly to ensure that no oxidation or corrosion sets in to take your antenna off ground.

In my previous car, I used an extra Faston connector in the fuse block as my source of power with a choke in series with my Vcc line. But with the purchase of a new car, I found, much to my chagrin, that GM (at least) changed this connector to a special one, not yet available to the public. Temporarily, I used the cigarette lighter to power my rig with the same choke in the line. According to current myth, this is supposed to be a no-no, but I've had no complaints with that setup. I have since made a direct connection to an unused connector in the fuse block, because the cigarette lighter connection was sloppy and I wanted—or at least my wife wanted—a neater installation. This also provided me with the advantage of ignition-key control of power.

Speaking of cigarette lighters, I have been told that some new cars have reverse polarity. Be sure to check for this, because if you don't have reverse-voltage protection in your rig, you may well cause serious (and expensive) damage to your equipment. When your car is delivered with a factory-installed radio, the manufacturer usually installs a bypass capacitor—probably at the fuse block. After all, they have to have some justification for the prices charged for radios. You might consider tapping the lead that goes to your AM/FM radio for a source of power. This is easily accomplished by three-way pressure taps available in auto supply stores.

In an older car, I once was advised that I had whine where I didn't have it before and that the cause was a "weak" battery; that the internal resistance of the battery was increasing and causing whine. Well, it may have been true that the internal resistance of the battery was increasing with age, but putting in a new battery—which I hastened to do—did nothing to eliminate alternator whine!

Now, after a great deal of time expended in communicating with people at both General Motors and Ford—all of whom have been most cooperative—I have come to the conclusion that eliminating alternator whine must be done at the source—that is, at the alternator. Capacitive bypassing plus a suitable choke in series with the power feed to your radio (at the radio), in addition to good grounding practice should alleviate, if not eliminate, most whine problems. ■

LOOKING WEST

from page 12

this service, I have the knowledge to do so. Why don't I? Simply because I want to see pay-TV flourish. I feel that it has a lot to offer in quality of entertainment and consider the monthly service fee to be the same as money given to support public broadcasting. I am, however, very critical of the subscription-TV services themselves because I feel that the piracy problem is one that they have indirectly generated, and, therefore, it's one that they must solve without government intervention.

SIX METERS: A NEW YEAR'S RESOLUTION

The mail has something to say, and I am delighted with what it says. Amateurs who had put their six-meter gear in the attic or garage are taking it out and putting it back into operation. Others tell me of next-to-nothing purchases that they're making at flea markets. They're gobbling up old Heath Sixer's for 10 bucks or less, and grabbing Gonset Communicators for a song, and Clegg 99ers, radios that for years had been a collector's item, are being put back into service. People are coming back to good old six meters and having fun to boot. Many call it a return to the good old days of ham radio. No, it's not a mass exodus from other bands. In fact, it's not a mass anything—not yet. But movements take time to gain momentum and repopulating six meters will not be an overnight affair.

With the exception of one letter from a VRAC chap, all correspondence received has been highly positive. Some did question the wisdom of a return of activity to six in light of possible severe TVI, but in most cases, those writing said they would chance such a move if some good low-pass filters could be found. Many stated that the low-pass filters marketed may claim a 52-MHz cut-off but that they do not seem to be very effective. True, most are not very effective, as years of six-meter operation have shown me firsthand but, back in the early 60s, there was a very effective low-pass filter. The next time you hit a swap meet, keep your eyes open for a dull-gray aluminum box with the name "Gavin" marked on it. If you can find one of these beauties, you can literally tune away most TVI caused by six-meter transmitters operating below 52 MHz.

As I remember it, the Gavin six-meter filter had 6 sections with a tuning capacitor for each section brought out to the front panel. As I remember it, you first tuned it for maximum forward power and then re-tuned it for minimum TVI. . . and it worked. My buddy, Larry Levy WA2INM, had one of them, and it's the only filter he ever condescended to use on his home-brew six-meter masterpiece.

Larry's transmitter was a 6U8 driving a 6146 with an outboard pair of 1625s as class B modulators. The transmitter was not shielded in any way, shape, or form and completely took out the low VHF band on a TV in the next room. When Gavin came out with their filter, *73* gave it to Larry for evaluation. Reluctantly, Larry installed a coax connector on his transmitter and put the filter in-line. (ed note: Until that time, WA2INM's transmitter had no connectors in the rf circuitry. The only break in the coax came at the antenna changeover relay—an antique itself.) A "tune-for-minimum-scream" technique was employed wherein Larry tuned and waited for the screams of anguish from the other room to subside. Amazingly, in short order they did.

Later on, I borrowed the same filter from Larry and tried it at my place with the same results. In my case, the filter had an even harder job since my 6BQ6 final amplifier tube was also a doubler rich in harmonic content, and the transmitter had a link-coupled output. (ed note: I did use coax connectors and my transmitter was in a shielded enclosure.) The Gavin filter completely eliminated every trace of TVI on both the RCA set in the living room and the old DuMont upon which the entire station sat.

I do not know what ever happened to the manufacturer of this device. For a while they were involved in the consumer-TV antenna business, but seem to have now dropped from sight. Maybe one of you out there knows where they are, or perhaps how to contact someone from that company in relation to obtaining the specifications for their six-meter filter. If we were able to obtain such specifications, along with the necessary clearance to publish the data, I would be happy to do so. The Gavin filter worked; I can attest to this from firsthand experience. I also have the inimitable "INM" to back me up in this one.

Another important matter discussed in the received mail was that of converting older AM equipment to FM. I have personally converted only three radio types to FM service. They were the Lafayette HE-45 series, the Gonset Communicator II, and, believe it or not, one Heath Sixer. The Sixer was the easiest, since the superregenerative detector was broad as a barn door to start with, permitting marginal FM reception as it stands. It's only necessary to FM the transmit oscillator stage using the existing internal modulator, while rerouting the final amplifier B+ supply around the modulation transformer and directly to unmodulated B+.

I should warn you that the early HW-32s that used 50-MHz overtone crystals were extremely unstable, and conversion to 8-MHz crystals is a necessity. This means adding another tube on a sub-chassis as an electron-coupled oscillator, and converting the original oscillator to a doubler stage. Again, those of you with a good library of older *73 Magazines* are in good luck here, since Larry Levy and others wrote countless articles on how to modify a Sixer. The later HW-32As used an 8-MHz oscillator, so here it's just a simple rewire job. But, the Sixer receiver on FM? Well, if you must, but remember that they were barely marginal on AM.

The easiest FM conversions are to the Gonset Communicators. Here, there are two ways to go. If you have a matching Communicator vfo, you need only to plug in a mike and preamp. Or you can again rewire the existing transmit oscillator and screen-grid modulate it. Transmitter conversions in general are usually a matter of rerouting existing wiring. Receiver mods run the gamut from "use as they are and slope detect" to "crystal control and quad-detector installation." Here, the choice is yours.

With equipment costs as low as they are for old six-meter gear, we can afford to experiment to our hearts' content—kind of like the experimentation with 10-meter gear salvaged from the 11-meter CB service. The 11-to-10 and what is starting to happen on six meters are similar. The idea of getting back to low-cost basics. As my friend Bob Heil K9EID says in his new book about 10-meter FM, it's "putting the ham back into amateur radio." In fact, I am in the process of reading Bob's new book at this moment, and may have a review for you next month.

I guess the greatest joy I am getting out of all of this is the stir I seemed to have generated among the 10½-meter illegals. I am very proud to tell you that I have become a thorn in their side, and consider being hated by that crowd a position of honor in our society. The other evening I sat glued to my Realistic DX-160 as one of them read what he termed a "*73 Magazine* exposé" to his cronies, and then listened as this group of fanatics discussed ways to get even. Obviously, we amateurs are not the only ones who read *73*.

For those of you who may wonder if my divulging of what I have overheard is legal, well, Section 605 does not offer any form of protection to those who operate illegally, out-of-band, and unlicensed. And I do not worry about them either. Like those who harass two meters and other bands, their bark is greater than their bite. Remember, I am also a persona non grata among certain segments of the Los Angeles two-meter community, and consider this also something to be proud of. When I took to writing this column, I did not intend for it to become a popularity contest. I believe in calling things as I see them, and if certain elements of our society don't like it, such is life.

I'm not out to win any popularity contest, be it with the ARRL or anyone else. But, it's also the

same reason that I have waited a long time in some cases to report on some items, such as cases involving malicious interference. I have no intention of "trying cases in print." It's for the courts to make the legal decisions—we report. I know this is a bone of contention with some readers, but here in this nation, a person is considered innocent until proven otherwise. With the slow movement of the bureaucratic system, coupled with normal magazine lead time, it's sometimes months before you read something here that might appear in other news services sooner, though in far less detail.

But we are getting off the subject. The main thing I want to report is that people are coming to six meters little by little. They're discovering a whole new world in amateur radio. A world seemingly untouched by time. A place where they can still experiment, rag-chew, and enjoy a hobby, and do so with practically no monetary outlay. Eventually those who supply equipment for our service will catch on and start promoting new goodies, but in the meantime we can still sit back and enjoy what amateur radio is really all about. Six meters may be the band that time forgot, but, in retrospect, this may have been a blessing in disguise.

WESTLINK UPDATE DEPARTMENT

Another question that is often asked of me is why I continue to produce a weekly amateur radio newscast when there is no way to subsidize it. Actually, I am not the only one who subsidizes it, there are two of us. For the most part, the funding to keep the Westlink Amateur Radio News alive comes from Bill Orenstein KH6IAF and me. Currently, it costs us close to $500 each month, a cost that we share. And we cannot use Westlink as a tax deduction since it's not a charity, business, or any known category of business operation. It's simply the "free service" that its founder, Jim Hendershot WA6VQP, meant it to be and we intend to keep it that way. Every now and then we do receive a small donation but after doing the math out a few weeks ago, the results show that Bill and I fund over 97% of the operational costs.

Unlike other similar services, we do not solicit financial support and only accept that which is offered with no strings attached. It's this concept of total autonomy that has kept us from soliciting support from any organized group, Including the ARRL. It has also kept us from asking funding from the amateur manufacturers and publishers. One cannot be autonomous if one accepts the open support of industry or anyone else. So, we just continue as best we can. It's not ego. It may have been in the beginning, but spending 10 hours a week in producing a 10-minute newscast can become an ego buster really quickly. Yet, instead of falling apart, we are growing! And I think I know the reason.

Unlike anything else in amateur radio, save one's own private station, Westlink is the only entity of its type. First, it costs the amateur nothing but a phone call to get news about his hobby service, and another phone call by him may put him into the position of providing an important story to his peers. These days, better than half of our news stories are those which are phoned to us. True, the 10-minute time constraint of our format makes it impossible to use every story we receive, but, nonetheless, the input from the amateur community itself coupled with other standard news sources is what makes it really work. It adds up to about 10 hours each week, 52 weeks a year. We take no holidays.

The reason for bringing this all up at this time is to tell you about the latest expansion of the Westlink news service: A second automated number located in the Dayton, Ohio, area is intended to provide bulletin stations and visually handicapped amateurs in the eastern and central time zones with a more economic method of obtaining the weekly newscast. The people sponsoring the new automated newsfeed are the same people who put on the nation's largest amateur radio convention each year. I speak of the Dayton Amateur Radio Association and its current President, Vic Stauder WA2KOO/8.

The whole idea started over a late snack during the 1980 Hamvention and became a reality in late September of 1980 when the Dayton newsfeed went into full-time operation. Both the Los Angeles (213)-465-5550 and the Dayton (513)-275-9991 numbers carry the same information produced in the Los Angeles Westlink facilities. The new service was inaugurated with newscast number 156, the start of the 4th year of Westlink operation. Another change made was to make the dial-in numbers public. We realize that there will be some who may abuse the service as a result of this change, but we also feel that it is far more important to have the service available to all who may need it with as little effort in obtaining it as is possible.

So, to those who ask why people like Bill Orenstein, Alan Kaul W6RCL, Jim Davis KA6IUH, Lenore Jensen W6NAZ, Burt Hicks WB6MQV, and others far too numerous to mention devote their time and effort to something that has no monetary reward, I can only tell you that we do it because we love the Amateur Service, and if nothing else, it's our way of paying back a bit of the debt we each owe amateur radio for the many hours of enjoyment we have obtained from it.

Personally, I know that Westlink, this column, and everything else I do in the name of amateur radio will never begin to repay the debt I owe the hobby, a debt that goes back many years when it was my fellow hams who carried me through one of the worst times in my life.

FUN!

from page 22

5) Believe it or not, Hiram Percy Maxim wrote an autobiographical book about his experiences as a youngster, called *A Genius in the Family*. Later, it was adapted as a motion picture and retitled. What was the name of this movie, and who played HPM's parents?

1) "That Gang of Mine"—Leo Gorcey and Joyce Bryant.
2) "Black Like Me"—James Whitmore and Judy Canova.
3) "You for Me"—Peter Lawford and Jane Greer.
4) "So Goes My Love"—Don Ameche and Myrna Loy.

ELEMENT 4—TRUE-FALSE

		True	False
1)	The original Novice license restricted its holders to QSOs of ten minutes or less, and limited conversations to discussions of signal reports, names, QTHs, weather, and rigs.	____	____
2)	A technical editor of *QST* once electrocuted himself.	____	____
3)	Nikola Tesla, father of practical ac power, was deathly afraid of round objects (such as baseballs and pearls) and spent many years trying to invent a device that would photograph a person's thoughts from his retina.	____	____
4)	SSB was originally called SSSC.	____	____
5)	The first "W" calls were issued in 1929.	____	____
6)	Before 1950, you only had to confirm 80 countries to become a DXCC member.	____	____
7)	Major Edwin H. Armstrong, inventor of FM radio, committed suicide by leaping fom a 13th story window. He was despondent over the fact that commer-		

cial interests were using his invention without paying due compensation. ______ ______

8) ARRL Headquarters has two club stations, W1AW and W1INF. ______ ______

9) Before 1940, the continental code for a "period" was .. .. .., not today's . - . - . -. ______ ______

10) During the "atom scare" of the late 1950s, the FCC required amateurs to monitor a broadcast station while operating in case of an enemy attack. ______ ______

11) Louis Daguerre invented the resistor. ______ ______

12) The average spark transmitter used up to 18 tubes. ______ ______

13) The US Post Office issued an amateur radio commemorative stamp in 1952. ______ ______

14) In 1957, ARRL membership cost only $5.00. ______ ______

15) First marketed in 1946, Collins' KWM-1 was the world's first fully transistorized transceiver. ______ ______

Five Questions About Marconi

16) Marconi had only one eye. ______ ______

17) Marconi won a Nobel Prize for inventing radio. ______ ______

18) Marconi was a Fascist. ______ ______

19) Marconi was half-Irish. ______ ______

20) Marconi held the amateur callsign I2CC. ______ ______

ELEMENT 5—SCRAMBLED WORDS

Unscramble these names of men who made Amateur Radio possible.

zerht	atwt	soomli
atvlo	xiwemla	yfaaard
miteteszn	plopred	pamree
mroinac		

THE ANSWERS

Element 1:
See illustration 1A.

Element 2:
1-J, 2-P, 3-T, 4-S, 5-U, 6-H, 7-C, 8-E, 9-N, 10-F, 11-K, 12-A, 13-G, 14-L, 15-I, 16-R, 17-O, 18-M, 19-D, 20-Q.

Element 3:
1-1 Sort of makes you think that ham radio hasn't really come all that far in the past 60 years, doesn't it?
2-3 Named after GE's founder, this award was tossed on the scrap heap when the company ceased selling its products to amateurs.
3-1 DX clubs and foundations, prepare your spaceships!
4-2 But friends just called him Al.
5-4 I'll bet you wonder where I dig up this info. Never mind. Just let me know the next time it appears on the *Late Show*. Perhaps the ARRL should spring some loot for a print of this classic. Bet it would be a great draw at hamfests and conventions.

Element 4:
1 False—But it sounds like a typical Soviet QSO.
2 True—Ross Hull's last experiment in 1938 involved touching the high-voltage cage on an experimental TV.
3 True—He also thought you could beam electricity from satellites in orbit around the Earth. A "crazy" idea that may actually come true in the future.
4 True—"Single-sideband, suppressed carrier" was the original name.
5 True—Before then, things were pretty confusing when you had a 2XYZ in 40 different countries.
6 False—Eighty countries isn't a "century," is it?
7 True—Typical American "success" story.
8 True—It was abuses like this that led the FCC to eliminate all new club callsigns.
9 True—And the exclamation point was - - . . - - until the change.
10 True—It was hard trying to keep the music from going out over the air.
11 False—He invented photography.
12 False—Spark transmitters didn't use tubes, silly!
13 False—1964.
14 False—It was only $4.00.
15 False—That would have been a neat trick, considering that the transistor wasn't even invented until a few years later.
16 True—He lost his right eye, in 1910, in an auto accident.
17 True—A prize which he shared with radio's "co-inventor," Karl F. Braun. By the way, the unknown Braun was so amazed that he was chosen for the honor, he actually apologized to Marconi at the awards ceremony.
18 True—Politically naive, he was an early supporter of Mussolini's Blackshirts.
19 True—His mother was born in Ireland. Marconi's first wife was also Irish.
20 False—Marconi was never a licensed amateur.

Element 5:
(Reading from left to right) Hertz, Marconi, Loomis, Volta, Watt, Faraday, Steinmetz, Maxwell, Ampere, Doppler.

SCORING

Element 1:
Twenty points for the complete puzzle, or ½ point for each question correctly answered.

Element 2:
One point for each manufacturer/distributor you matched to its QTH.

Element 3:
Four points for each correct answer.

Element 4:
One point for each correct answer.

Element 5:
Two points for each name successfully unscrambled.

0-20 points—Novice school dropout
21-40 points—Vacuum resident
41-60 points—RCC member
61-80 points—Good memory
81-100+ points—Ham historian

F	R	A	N	C	E		S	K			D
I	M	I		Q			V	A	L	V	E
V		R		D	R	S			O		F
E	P		H			S	A	R	A		O
M		G	O	N	E		F		F	D	R
E			N		L	F		L			E
T	R	I	G	G	E	R		W	E	R	S
E	I			E		C	W		C		T
R		N		A			H	F		R	
S	U	P	E	R	P	R	O		L	O	T
		R			E			W	I		O
H	A	M	M	A	R	L	U	N	D		M

Illustration 1A.

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 8

duce already invented and developed products more cheaply than other countries.

Further, I said that I felt that this was a perilous long-term course. Only by the development of their own electronic engineers and technicians will they be able to compete with Japan in technology. I then quoted the figures on hams in Japan... 500,000 active, and the US with perhaps 200,000 active. I further said that the technologies of all countries of the world are surprisingly proportional to their ham populations. Taiwan could hardly expect to compete with these other countries when it has but one single licensed radio amateur.

I told them that you get people interested in technical careers when they are teenagers and that these are the people who have always made the technology breakthroughs. Recognizing the security problem which is almost paranoic in Taiwan, I mentioned that amateur radio had been introduced in the country of Jordan right in the middle of their civil war and that no security problems had been encountered.

The Taiwan businessmen came up after the talk to thank me for it and say how much they appreciated me speaking out like that. One American was furious with me... a representative of the Electronic Industries Association (EIA) who felt that we should try to keep technology in the US and not encourage other countries to compete.

Two of the newspaper reporters present wanted copies of my talk to publish, so Sherry typed it up for them from her recording of my impromptu remarks. They also sent photographers to take pictures of me to go with the articles. Whether this will have any long-range effect or not remains to be seen.

To show that Japan is decidedly ahead of us in the development of electronics products, all I have to do is open my gadget bag which I cart around. Out comes a Sony TCS-300 stereo recorder, a Sony 400 micro-recorder, a Sharp Talking Clock, A Casio musical calculator or two... things like that. On my wrist is a Casio C-80 calculator watch which has replaced the Rolex I wore for many years. Sherry usually has her Sharp computer and cassette interface in her bag, along with her Sony recorder for program and data storage. This is the same unit Radio Shack is importing and selling as their TRS-80PC. With about twice the number of active hams in Japan, is it any wonder they are so far ahead of us in electronics technology?

My recent visit to Kenwood in Tokyo did not brighten my view of the prospects for American firms. I've seen nothing here to compare with the Kenwood development lab... and with the Yaesu lab which I visited last year. These labs are packed with hams, all having a ball designing next year's ham rigs.

JAPAN AND REPEATER JAMMING

Since repeaters are not yet permitted in Japan, what is the connection I'm trying to make? This one is a bit far afield, but perhaps you'll come with me and see some parallels. By the way, with regard to repeaters in Japan, the benefits of repeaters in other countries have not been entirely lost on the Japanese... it's just that their version of the FCC moves far more slowly than ours, though you may think that impossible.

Having recently wandered the streets of several Asian countries, often at night, and never once having to fear that I would be in trouble, I have been wondering about this. Why is it that women can walk alone at night in Tokyo with no worries? Why is it that I have no problems when I walk in even the seemingly worst parts of Hong Kong at night? Yet, there are many areas of New York City which are not even safe during the daytime?

One of the reasons why I deserted New York almost 20 years ago had to do with the deterioration of life there. Nowadays, when I do have to visit the city on business or for a show, I can feel the fear which grips New Yorkers as they plod through the subway stations or walk the streets... even the well-lighted streets... at night.

Another indication of the wide difference between the Asian cities and our U.S. cities is evidenced in the graffiti. This is just one clear evidence of resentment which is not well hidden... the growing hate of the government by the people. This manifests itself in incessant vandalism, where anything which can be destroyed usually is. You don't see this in Japan, Hong Kong, Taiwan, and Singapore.

Milton Friedman put his finger on this in a recent *Newsweek* column... and I think he is right. This vandalism and the growing crime are results of the frustrations people are having with government. The recent election results certainly showed that the frustration level is high. It makes sense to me.

Having recently read the William Simon paperback, *A Time For Truth*, an expose of the gradual encroachment upon us by our government... and having felt the helpless frustration of being in the clutches of that government myself... I am beginning to understand what has happened to our country... and to much of Europe, which has been going along with the same political tide. In the Asian countries which I have visited, the governments for the most part are not interfering with business and with the people... certainly not to the extent which we have developed.

Having been around since before these great changes started, back in the 30s, I've seen personally the enormous change which we have undergone in our country... and been frustrated by it. Much of this has been in reaction to the panic and depression of the 30s, yet we know now that that was brought about primarily by the actions of our government and was not a failure of business at all. Friedman, in his TV series, *A Time To Choose*, made this clear.

Hong Kong and Singapore are shining examples of what can result when the government does not try to shackle business and dominate the people. Both are centers of great industrial growth and wealth. Indeed, you see more Mercedes cars per block in these countries than anywhere else in the world I've visited. Yet this wealth is not gained from taking advantage of workers, who also are enjoying a level of living which is attracting people from all over the world.

One wonders what would happen to the spirit of our country if the government stopped trying to manage the economy and business... a sort of small-scale copy of the Russian management system, which has failed so monstrously. It does seem likely that our oil problems would be resolved in a free market... that businesses could save billions a year if they could stop having to fill out forms for the government. I know that even in a business as small as mine, we are spending an estimated $75,000 a year just in filling out forms for the government... gathering information that we have no need for ourselves and sending it in. That may not seem like much, but that's almost a dollar per subscriber for *73*.

It may be that Reagan will be able, as none before him has, to start cutting down on the government proliferation. Will they be able to get rid of the HEW? Of the ICC? OSHA? The Energy Department... and so on? And will that eventually bring about happier people and less crime? My end question... I wonder, if we are able to make these changes, if it will result in a spirit in our country which will still the jamming of repeaters, the cursing on the bands, and the general unhappiness which is being demonstrated on our ham bands?

We really don't have to just learn from our past, when we did not have the government bureaucrats all over us and things were happier... we can learn from the lessons of those few countries where there is freedom and they do show the same spirit I saw here when I was young... and which I think we can regain.

The people in Japan are happy and their subways clean. There is not one hint of the graffiti which covers every car and station in the New York subway system. In describing what I saw in a public toilet in the leading restaurant in Canton, China, I

was moved to compare it with the filth and smells of a toilet in a New York subway...only worse, if such is imaginable. Japan, though close to China, has nothing like that.

Several of the people on our visit to China described the frequent serving of tea as the Chinese water torture...since the use of any bathroom but that in our hotel was almost impossible for the women...and the tourist service kept us away from the hotel from early morning till very late at night.

OOPS, WE GOOFED AGAIN?

A few years ago, I ran an article in *73* by a chap who told about discovering the principle of the transistor back in the 1930s...the only problem was that he didn't recognize what he had discovered. Thus amateur radio managed to miss out on one of the most startling discoveries of history. Win a few, lose a few.

Some recent events lead me to wonder if we may not have managed to miss the boat again, though this time there is still an opportunity to pick up the marbles and claim ourselves winners.

Thirty years ago, when amateur radio was in a period of very rapid development using ideas left over from the War and catching up for the time lost from 1941-1945 when we were off the air, we saw the beginnings of VHF repeaters, the first single sideband rigs, and a brief experimentation with double sideband. But, let me explain some recent events so you'll see what I'm talking about.

My success in recording business meetings and symposiums with a miniature Sony TCM-600 cassette recorder was such that when the need arose for a second recorder for this purpose, nothing else was even considered. It is small, light, and amazingly sensitive, putting similarly sized recorders of other brands to shame. Fortunately for me ...and possibly for you...the local Sony dealer was out of TCM-600s when I wanted one.

A few days later, I saw an ad in *The New Yorker* for a Sony TCS-300, a miniature stereo cassette recorder. Having enjoyed the phenomenal reproduction of the Sony Walkman stereo cassette player, the idea of being able to make stereo recordings with something not much larger than the player was attractive. And the ad pointed out that a stereo recording of a meeting made it possible to sort out the various voices talking with ease, while a mono recorder mixed them all together. Definitely a plus.

Despite the full-page ads for the new recorder, Sony had no TCS-300 recorders available when I called. Okay, I'd be in Tokyo in a few days and I'd get one there. Sure enough, I checked with the Sony store in Tokyo and was able to get a 300 immediately. Further, the price was $130 instead of the U.S. price of $220—a plus. I'd brought along my Walkman Sony and some music tapes, so I checked them out on the 300 and found it as fantastic on music as the Walkman...though a bit more bulky to carry.

As a side note, the Sony Walkman has been such a hit worldwide that I saw imitations of it at all of the consumer electronic shows...in Tokyo, Seoul, Taipei, and Hong Kong. They all seemed to be good buys and less expensive than the Sony. Once you hear one of these tiny stereo cassette players, you almost have to have one. I use one while I walk, to make the time pass better on plane trips, and even while skiing.

On the Asian trip, I began to use the 300 to make recordings during some of the dinners. When I checked the recordings, I was surprised to find that I could indeed hear what everyone around the table was saying, despite the high level of din from surrounding tables. Most Chinese meals call for ten people to a table, so there are two to five simultaneous conversations going on. With the stereo I could "tune in" with my mind and listen to any of them.

This brought to mind a letter to the editor in one of the ham magazines back in the early 50s. It had to do with using the General Electric Signal Splitter, with one earphone connected to the upper sideband output and the other to the lower sideband. The letter reported that using this system it was possible to tune in one double sideband signal and hear it much more clearly than with ordinary monophonic reception. I tried the idea at the time and found that the writer was right—the result was a very easy to copy phone signal which could be heard clearly through considerable interference.

The next idea came quickly ...what would happen if we were to use stereo microphones on our double sideband transmitter and separate channels into stereo earphones for reception? I suspect that the result would be much the same as listening to the individuals around the table amid the babble in the background...something which completely ruins monophonic recordings.

Would it be possible to use stereo DSB on the ham bands? With such a system, would it be possible for us to operate with stations every few Hertz up and down the band? I suspect that this might well be so. We know that monophonic double sideband signals with a synchronous detector can give good results with very narrow channel spacing. Using the human brain for the filter we should be able to get even better operation since no filter has ever even come close to the ability of the brain to do this kind of work.

The ball is in your court. There is the idea...now it is up to you to do the experimentation and development. Will it be possible for phone stations to operate at a density of perhaps 50 times that presently possible using single sideband...and with far less interference? I suspect this may be true. If it is, we may have another amateur radio breakthrough in communications techniques. You may be sure that I'm interested in getting articles for *73* on your experimental work ...and the results.

As I've written recently, the possibilities for DSB seem greater than those for SSB and one is led to wonder what might have happened in history if General Electric had supported John Costas and his DSB work as well as Art Collins did single sideband. Amateurs who were active on the DX bands in the 50s remember the many experimental flights of SAC planes with Collins sideband gear aboard. I remember Mort Kahn W2KR and Don Merten W2UOL (also K2AAA) and their efforts to promote SSB for Collins. I don't know how much they got out of their work, but I know Mort would be unlikely to work that hard for much less than millions. Since billions were at stake, a few million would have been a small investment.

It thus turns out that Kahn has had a substantial impact on amateur radio...and the world, for that matter. He originally owned Tempco, a firm making transmitters, but which he sold to Otis Elevator. Kahn retired to his yacht with several million dollars from the sale, as I understand the story. The SSB coup did not hurt his fortunes and I think got him interested in taking over the ARRL, which he did almost singlehandedly during the early 60s.

I've already reported on how Kahn managed to get elected to the ARRL and how he quickly took over running the organization. I've also covered how he engineered the move toward a return to the Class A and B licensing which stopped U.S. ham growth for over ten years and set up Japan to surpass us in technology in the 1980s.

If DSB/stereo turns out to be as efficient a communications medium as it appears, we may find that Kahn, by masterminding the sales pitch for Art Collins on SSB, did it to us again.

HORIZONS' FALL

Ham Radio Horizons, which was started in early 1977... about the same time that I started *Kilobaud MICROCOMPUTING*...and reached its peak about a year later when we had a fair number of new hams in need of the simplified articles they presented, finally threw in the towel. With the number of ad pages shrinking constantly, the magazine was losing money every month. A last-ditch effort to rescue it by changing it from a Novice magazine into another *Ham Radio* was doomed to failure.

Ham Radio itself seems to be going the same route, with the average number of ad pages dropping off. In 1977 they had 66 pages average...in 1978 there were 65 pages. By 1979 it was down to 54 pages. This year the average is down to under 35 pages of ads per month! That's obviously a catastrophe.

Part of this has been due to the competition with *73*, where most authors are aware of the better payment they get for articles in the larger circulation magazine, thus bringing the best articles first to *73*. Part has been due to the drop in interest in amateur radio in general... reflected in a particular drop in esoteric, high-technology articles. Part has been due to the

troubles between the top management of the magazine, now resolved with the death of Jim Fisk, which was reflected in the magazine content. Part was the result of the gathering depression on everyone at the publication over the failure of *Horizons* and the panic over the failure of *Ham Radio* to cope with the changing market.

These are generally hard days for the starting of new magazines. Much of the economy is hurting. Even computer magazines have been more characterized by failure than success. We've seen *Microtrek* and *ROM* give it a big try, only to fail. We've seen *Personal Computing* magazine stagger alone, losing money for several years before throwing in the towel and giving up (it's now in the hands of Hayden Publishing, who is going to have a try at it). One of the worst debacles in the computer field has been the *Byte* offspring, *onComputing*...a total disaster. Despite incredible investments in circulation ads, the magazine has brought little more than laughs to the industry.

Our *MICROCOMPUTING* and *80-MICROCOMPUTING* magazines showed that it was not the market, only the understanding of the market that was responsible for the success or failure of a magazine. *80-MICROCOMPUTING* has been one of the most successful high-technology publications in the history of publishing.

Frankly, though the failure of *Horizons* came as no surprise, we were really expecting *CQ* to go down for the final count first. Cowan ran it into the ground before turning it over to the new crew. Despite major efforts at bringing it back to life, neither circulation nor advertising has seemed to really respond. The pages of ads have dropped from 40 average in 1979 to 36 in 1980. With the ham market continuing to drop off, the going is getting tougher for all ham magazines...and the weaker can be expected to go under. Even *QST* has been dropping...from 107 pages average in 1979 to 95 in 1980. *73* dropped a little, about 2½ pages average, running now about even with *QST*.

What will 1981 bring? Unless amateurs are able to get the hobby going again, there are going to be fewer magazines... and fewer sources of information.

THE NEW ENGLAND CONVENTION

Though I was in Tokyo at the time of the show, some spies have reported on the Boxborough ARRL convention. It appears that a fair crowd turned out for Saturday, but it was virtually deserted on Sunday. There is considerable difference of opinion on the actual number of attendees, with exhibitors putting it at around 3,500 and management at 4,500 or so. Judging from the response at the *73* booth, even the 3,500 figure is generous.

There were only two dealers at the show exhibiting...Tufts and Harrison Radio. Harrison, which seems to be in trouble these days, had little merchandise, but was promising shipment. With all but one of their stores closed and a lot of rumors flying, it was good to see that there was some life left. Tufts, which had piles of equipment available, racked up record sales for a convention.

The *73* booth kept active all through the convention, but some of the other magazines folded up early due to inactivity. *CQ* apparently has yet to win over many amateurs with their "new" format...which looks amazingly like the one which sunk it for Cowan. *HR* and *HRH*, with the loss of Fisk, seem to have lost direction and the resulting boredom with the publications was evident at the convention.

The hit of the show was a new slow-scan system from KW Control Systems. This new system provided virtually 500-line resolution pictures and had just about everything you could ask. Kenwood was there with their new equipment and that certainly got the blood going. Ditto the new Icom gear. Yaesu seems to have lost enthusiasm and was not present...nor was Den-Tron. There are rumors of a change in management at Den-Tron, with emphasis on non-ham equipment.

The Avanti and Kantronics booths were packed all through the show, as was the Optoelectronics booth. The convention was definitely worthwhile for the attendees...and for the exhibitors...no matter the actual attendance numbers.

RADAR DETECTOR PRECEDENT

The state of Connecticut was recently backed down by the courts and prohibited from confiscating radar detectors. Since this decision came from the Appeals Court, it will act as a precedent for other courts. The court also affirmed the right to a jury trial for radar detector defendants, which should further discourage that state from harassing detector users.

I WANT *YOU!*

With most magazines, your responsibility as a reader ends once you have subscribed or bought a single copy. This is not true with *73*. When you decide to read *73*, you are committing yourself to much more. I expect you to do your part toward making the magazine interesting and to accept some responsibility for this.

For instance, one of the reasons you enjoy *73* is because we have the newest in state-of-the-art articles. In fact, many professionals write to say that they are able to find out far more about new ideas by reading *73* than by reading the dry papers in the professional journals. You can help with this by keeping your eyes open for any friend who has done something or built something which we all should know about. For some reason, those who do the most brilliant work are usually least interested in doing the paperwork, so they need to have you lean on them.

You should be aware of one other factor: The more readers we have, the more advertisers we will have...and the more pages of articles we will be able to publish. So see that everyone in your ham club knows about *73*, spread the word at work, and help us to grow.

You can help me get information, too. Though I breeze through some 200 magazines a month, with several thousand out there I don't see, it is very likely that I am missing a lot of things which I should know about. So, if you run into something which you think might be of interest to me, please cut it out or make a copy and send it so I can read it. I'm interested in many things...anything on hamming, radar detectors, UFOs, Jordan, getting the US going again, microcomputers, etc.

Each month I read *Car and Driver* magazine with envy... noting their many interesting editorials. I do wish that more readers with interesting ideas and experiences would write in. With the color we are able to use in the magazine these days, we can do a much better job on DXpedition reports. So keep those cards and letters coming.

HAM HELP

I wish to convert a Lafayette model HB-740 CB rig to 10 meters. I need a schematic for this rig since Lafayette has gone out of business. Any hints or suggestions for converting the HB-740 to 10 meters will be greatly appreciated. I'll be glad to pay all costs.

Chris Van Veen N1AUD
440 Main Street
Concord MA 01742

I am in need of an ac power supply for a Collins KWM-2A.

H. F. Schnur
115 Intercept Ave.
N. Charleston SC 29405

I have a James Thomas HCV-3KB-1 keyboard for SSTV. I would like to hear from anyone who knows of a successful way to superimpose lettering over other video SSTV pictures generated by the Robot 400 scan converter. I'm also looking for any information on the RTTY and CW add-on boards for the HCV-3KB-1.

Any and all information and/or ideas would be greatly appreciated and passed on to other James Thomas owners. Thank you.

Michael Larson WD0EZK
RR2, Box 57
Jewell IA 50130
(515)-539-4345 (collect)

CONTESTS

from page 14

ble on 160-meter phone in a maximum of 30 hours allowable contest time. Multi-operator stations may operate the entire 48-hour contest period. Entry categories include single- and multi-operator, both with single transmitter on phone only.

EXCHANGE:

Stations within the Continental USA and Canada transmit RS report and state or province. All others transmit RS report and DX country.

SCORING:

All valid two-way contacts score 5 points per QSO. A station may be worked only once for contest credit! Multipliers are as follows: 1 multiplier point for each of the Continental US states (48 max.); 1 multiplier point for each of the Canadian provinces (13 max.); 3 multiplier points for each DX country outside the Continental US and Canada.
The final score is the total QSO points times the total multiplier points.

DX WINDOW:

Stations are expected to observe the DX window from 1.825 to 1.830 MHz as mutually agreed by Top Band operators. Stations in the US and Canada are asked not to transmit in this 5-kHz segment of the band.

AWARDS:

Contest awards will be issued in each award category in each of the Continental US states, each Canadian province, and each DX country.

DISQUALIFICATIONS:

Disqualifications may result if contestant omits any required entry forms, operates in excess of legal power authorized for his given area, manipulates operating times to achieve a score advantage, or fails to omit duplicate contacts which reduce the overall score more than 2%.

ENTRIES:

Each entry must include log sheet, dupe sheet for 100 or more contacts, a contest summary sheet, and a multiplier checklist. All entries must be postmarked no later than February 21st. To request contest forms or submit your entry, write: Dan Murphy WA2GZB, PO Box 195, Andover NJ 07821 USA. Please include an SASE!

FREEZE YOUR ARCTIC OFF EXPEDITION

Starts: 2000 GMT January 17
Ends: 1500 GMT January 18

The Ford Tin Lizzy Club's North Metro Chapter will endure their third expedition out on the frozen wastes of Lake Saint Clair. Operating frequencies will be 7275, 21380, 146.52, 146.55, and 146.58, as propagation allows. One station will always be active on 7275! The callsign is AD8R/8 and, as usual, a handsome certificate will be awarded to all contacts. QSL to Box 545, Sterling Heights MI 48078. No SASE is needed!

MICHIGAN QRP CLUB CW CONTEST

Starts: 1500 GMT January 17
Ends: 1500 GMT January 18

This is a CW-only allband (160-10 meters) QRP contest in conjunction with the dates of the AGCW-DL QRP contest. This contest is open to all amateurs and all are eligible for the awards. Each station will be competing within own state, province, or country in the three categories listed: (1) one Watt or less of output power; (2) five Watts or less of output power; (3) over five Watts of output power. A station may be worked only once per band for point credit.

EXCHANGE:

RST, QSO number, and power output.

SCORING:

Each contact is worth one point.

AWARDS:

Certificates awarded to the highest-scoring station in each state, province, and country.

ENTRIES:

Log information must include full log data, name, address, equipment used, and power output. Logs must be received by the contest manager no later than 6 weeks after the end of the contest. US and Canadian entries please include an SASE. All others please include one IRC for contest results. Send all logs to: Contest Manager, Michigan QRP Club, 281 Crescent Drive, Portland MI 48875.

QRP ARCI JANUARY SSB PARTY

Starts: 2000 GMT January 17
Ends: 0200 GMT January 19

The contest is open to all amateurs and all are eligible for the awards. Stations may be worked once per band for QSO and multiplier credits. No repeater contacts are allowed. VHF/UHF contacts must be direct.

EXCHANGE:

Members—RS, state/province/country, and QRP number. Non-members—RS, state/province/country, and power input.

SCORING:

Each member QSO counts 3 points. Non-member QSOs are 2 points, and stations other than W/VE count 4 points each. Multipliers are as follows: more than 100 Watts input—×1; 25.1-100 Watts input—×1.5; 5.1-25 Watts input—×2; 1.1-5 Watts input—×3; less than 1 Watt input—×5.
Final score is total QSO points times total number of states/provinces/countries per band times the power multiplier. Any bonus points are then added to the final score. Stations powered by solar or wind power can add 300 bonus points. Stations powered by other emergency-type power (batteries, generator, etc.) can add 100 bonus points.

FREQUENCIES:

SSB—1810, 3985, 7285, 14285, 21385, 28885, 50385.

AWARDS:

Certificates to the highest-scoring station in each state, province, or country with more than two entries.

LOGS & ENTRIES:

Send full log data, including full name, address, and bands used, plus equipment, antennas, power used, and method used for determining bonus points. Members should include their QRP number on the summary sheet with the scoring. Entrants desiring results sheet and scores, please enclose a business-size envelope with sufficient return postage. Logs must be received by March 25th to qualify. Logs arriving after this date will be used as check logs. Finally, in case of disputes with scoring, the decision of the contest chairman shall be irrevocable. Send all logs and data to: QRP ARCI Contest Chairman, Edwin R. Lappi WD4LOO, 203 Lynn Drive, Carrboro NC 27510.

FRACAP WORLDWIDE CONTEST

Starts: 0000 GMT January 18
Ends: 2400 GMT January 18

Use all bands, 10 through 160 meters, on SSB only. Operating categories include single-operator, one band, and all bands.

EXCHANGE:

RS report plus a three-figure contact number starting with 001.

SCORING:

Stations in FRACAP: Each contact with another FRACAP country counts 3 points; others count 1 point.
Stations in the rest of the world: Each contact with a FRACAP country counts 5 points; others count 1 point.
The multiplier is the total number of FRACAP countries plus all call areas in the 6 FRACAP countries worked. Final score is then the total QSO points times the sum of the multipliers.

AWARDS:

Certificates to all stations with at least 20 contacts with FRACAP countries. Plaque for the first-place station in each FRACAP country in each category, and for the winner outside FRACAP. Other awards according to participation.

ENTRIES:

Entries must be postmarked no later than February 28th and addressed to: PO Box 2412, San Jose, Costa Rica, C.A. For additional information, write to the same QTH.

TEXAS QSO PARTY

Starts: 0000 GMT January 24
Ends: 2400 GMT January 25

Sponsored by the West Texas Amateur Radio Club of Odessa TX. Use all bands and modes.

Each station may be worked on each band and each mode. Mobiles may be worked again upon each county change.

EXCHANGE:

QSO number (beginning with 001) and state, province, country, or Texas county.

FREQUENCIES:

Novice—3710, 7110, 21110, 28110.
Phone—3940, 7260, 14280, 21370, 28600.
CW—3575, 7055, 14070, 21070, 28090.

SCORING:

All non-Texas stations score points as follows: Phone contact with fixed station in TX = 1 point; CW contact with fixed station in TX = 2 points; phone contact with mobile station in TX = 5 points; CW contact with mobile station in TX = 7 points. Multiply by the number of Texas counties worked (254 max).

All Texas stations score 1 point per contact on phone, 2 points on CW regardless of fixed or mobile. Multiply by the number of state, countries, and Canadian provinces worked.

AWARDS:

Plaques to top scores: US, US Novice, DX, Canada, Texas fixed, Texas mobile, Texas Novice. Certificates to top score in each state, country, and province. Special awards as activity dictates.

ENTRIES:

All logs must be received by March 15th. Mail entries to: Tom Horton K5IID, 2708 Halifax, Odessa TX 79762.

SNOWFLAKE MADNESS

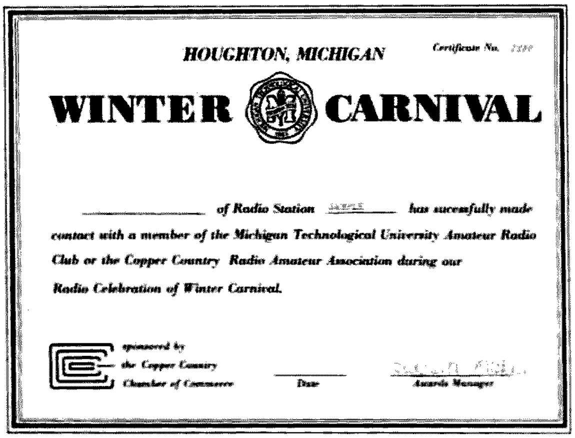
The Michigan Technological University Amateur Radio Club and the Copper Country Radio Amateur Association announce a radio celebration of our Winter Carnival festivities in the northernmost part of Michigan's Upper Peninsula.

Tech's Winter Carnival is probably the most spectacular winter festival in America with fantastic snow sculptures, dog-sled races, lots of skiing, and other festive events.

In association with the Copper Country Chamber of Commerce, we are issuing a certificate to all amateurs who make contact with any ham in the Copper Country between 0000Z February 2 and 0000Z February 9. Only one contact is required for the certificate.

Suggested frequencies are: 3.705, 3.975, 7.085, 7.105, 7.285, 14.085, 14.305, 21.085, 21.185, 21.385, 28.185, and 28.685. On CW, listen for "CQ Winter Carnival."

Send your QSL along with two 15¢ stamps (for postage and handling) to: Debbie Nietzke WD8JPX, 2005D Woodmar Dr., Houghton MI 49931.


HOUGHTON, MICHIGAN
Certificate No.
WINTER CARNIVAL
of Radio Station has sucessfully made contact with a member of the Michigan Technological University Amateur Radio Club or the Copper Country Radio Amateur Association during our Radio Celebration of Winter Carnival.
sponsored by the Copper Country Chamber of Commerce
Date
Awards Manager

NEW PRODUCTS

from page 35

The SC-422 is housed in a 12- × 4- × 7-inch aluminum cabinet. The US distributor for the SC-422 is *KW Control Systems, Inc., Box 114C, RD#4 South Plank Road, Middletown NY 10940.* Reader Service number 479.

1750-METER TRANSMITTER

Palomar Engineers has announced a new transmitter kit for the 160-190-kHz experimenters' band. Operation at one Watt input power and with a 50-foot maximum antenna length is permitted by the FCC with no license required.

The transmitter is in two parts. The main transmitter assembly and wiring (including winding the Litz wire coils) is factory-completed. Wiring of the kit takes about an hour with simple tools. Complete assembly and operating instructions are supplied. The transmitter is for CW operation but easily can be AM-modulated if desired. For further information, contact *Palomar Engineers, Box 455, Escondido CA 92025.*

Palomar Engineers' 1750m transmitter.

NEW NLS TOUCH TEST 20 DMM

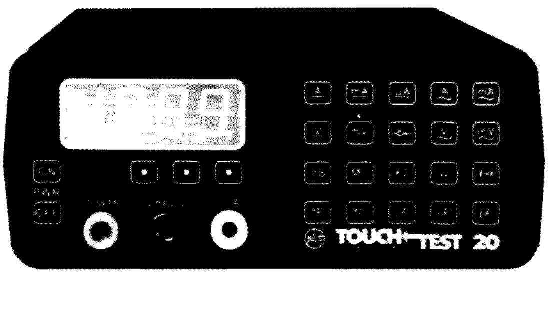
Futuristic touch controls and a multitude of test functions are featured in Non-Linear Systems' new Touch Test 20 digital multimeter.

The 3½-digit Touch Test 20 measures 10 parameters and 20 functions and includes 44 ranges. Test parameters include ac and dc volts, ac and dc current, resistance, capacitance, temperature, continuity, conductance, and diode test. The package size is a small 2.9 inches high by 6.4 inches wide by 8 inches deep. Weight is less than 3 pounds. Touch Test 20 may be purchased as a line powered unit or (optionally) comes equipped with rechargeable batteries for battery or line operation.

Accessories included with the instrument are OSHA-style test leads, a temperature probe, and a component test adapter for radial lead components.

An optional leather carrying case allows the Touch Test 20 to be operated while worn around the neck or on the belt, providing hands-free operation.

For further information, contact *Non-Linear Systems, Inc., PO Box N, Del Mar CA 92014; (714)-755-1134.* Reader Service number 481.



NLS's Touch Test 20.

REVIEW

from page 39

only this time you hold down the "6" button. When you think about it, this is pretty much the same way that a traditional keyer is adjusted, except that AEA has taken out the knob-twiddling.

If variable speed doesn't suit your taste, the CK-1 offers two preset speeds as well. You simply press the " * " button twice, and then press the "8". Following that, you enter the exact speed you desire. If that happens to be, say, 15 wpm, you press the "1" and then the "5". Presto! You're now operating at exactly 15 wpm. And just in case there is another CW fan in the family, you can preset another speed in the same manner, this time using the "9" key instead of the "8". Either memory can then be recalled. In either the variable mode or the preset, you can select speeds from 2 wpm all the way up to 99 wpm.

Well, so far we've discussed a lot of interesting features, but nothing of exceptional interest. Don't worry, it gets better! When AEA called this a memory keyer, they weren't joking. The CK-1 has a total capacity of about 500 characters, and this capacity is soft-partitioned, allowing you to divide the memories into up to ten messages of any length as long as the total does not exceed the storage capacity. If you want to put 400 characters in memory location "1" and 50 characters each in memory locations "2" and "3", it's perfectly possible. 50 characters in each of the ten memories? Fine. There aren't too many keyers that offer this flexibility. No matter how you juggle those memories, five hundred characters is a lot of memory. Get out your calculator and figure out how long it would take to send that at your usual speed, and you'll see what I mean. You'll have a blast loading it up with all the name, QTH, rig, and antenna information you can think of—and there still will be room for more!

"Aha," you say. "How hard is it to load?" Loading the memories couldn't be easier. Select the memory-load mode with the switch on the side of the keyer, push any button "1" through "0" to select a memory location, and start sending. This loading mode has automatic character- and word-space loading. If you pause for a normal word space or longer between characters, it will insert a normal word space in the memory and no more, so you can sit and think about what you are going to say next without filling up your memory with empty space. This provides a distinct advantage over most keyers that limit you to a real-time method of loading memory.

Admittedly, it sometimes is useful to be able to load in real time. For instance, if you are going to make a sally into the Novice bands, you may want to send at about 18 wpm but space your characters and words out so that actually you are sending at 10 wpm. Surprise! The CK-1 can do this, too. Just remember that like any real-time loading keyer, it then will eat up your available memory a lot quicker than if you send with "correct" spacing.

As you contemplate filling up that vast memory with seamless CW, the awful specter of *mistakes* rears its ugly head. Don't fret; the CK-1 has full editing capability, so when you err, you won't have to start all over again. If you get completely fed up with a particular message, it is a simple matter to erase the whole thing. You just press the memory location number (say "2") and the " * ". Whatever was in location "2" is gone forever. Naturally, if you shut the keyer off completely, *everything* goes. It is more blessed to leave the CK-1 on all the time than to reload its memories every time you operate.

By now, all the CW contesters are jumping up and down and yelling, "But does it do serial numbers?" Suffice it to say that the CK-1 will send and automatically increment any numbers between 01 and 9999, starting with the number of your choice. If you work more than 9999 stations in any single contest, you are either cheating or hallucinating.

There are a lot more things that the CK-1 can do, but I think I'll leave you to discover them on your own. All in all, I have only one complaint regarding the CK-1, and this involves the audio confirmation it gives you on each entry. I think this is a wonderful idea, but for various reasons I prefer to use the sidetone in the transceiver rather than the sidetone in the keyer. When you turn down the sidetone on the keyer, you lose the audio confirmation feature. Perhaps AEA could provide the option of having audio confirmation without the sidetone. This is, or course, a very small complaint, particularly in light of the fact that the CK-1 provides an excellent tactile response to each entry.

A commonly asked question is, "How do you remember which buttons to push?" I must confess that I was a little worried about this at first, but after about an hour with the thing I found myself handling the touchpad automatically. It's as though the keyer becomes an extension of your mind, and you suddenly realize that you are making it do what you want it to, without even thinking about it. I can't tell you exactly why, but the touchpad entry is much easier to handle than the knobs and switches on more traditional keyers. If you do forget how to make the keyer perform a particular function, you can simply refer to the clear and straightforward chart that AEA provides on the back of the instruction book.

Perhaps the most amazing thing about the CK-1 is its price. At the time of this writing, the list price is $129.95. A memory keyer with the features of the CK-1 can be a very useful tool for the CW operator; at the price, a lot of hams will be able to afford one. The CK-1 may well become the standard against which all other keyers are measured.

For further information, contact *Advanced Electronic Applications, Inc., PO Box 2160, Bldg. O & P, 2006-196th SW, Lynwood WA 98036; (206)-775-7373/524-7374.*

Paul Grupp KA1LR
73 Staff

KRECO MODEL CO2A COAXIAL ANTENNA

When hams decide to put up a base station antenna for two meters, thoughts often turn to the ubiquitous quarter-wave ground plane. The usual approach is to mangle some coat hangers and solder the results to an SO-239 chassis-mount connector. This might be the cheapest solution, but it is not necessarily the best. This configuration has a relatively high angle of radiation and is not what could be referred to as a neighbor-pleasing design. Worse, the antenna-to-coax connection is exposed to nature; if your area receives a lot of precipitation, all you can do is buy lots of plastic tape and hope for the best.

The Kreco coaxial antenna makes up for all these deficiencies, and more. As suggested by its name, this antenna uses the coaxial method of achieving a ground plane. Instead of radials, a sleeve or skirt made of aluminum is connected to the shield of your 50-Ohm coax. The sleeve fits over the support pipe, and attaches to the antenna with a reassuringly large number of hefty sheet metal screws.

All this provides several advantages over the mangled-coat-hanger approach. The angle of radiation is lowered somewhat, and the coax feedline is effectively decoupled from the antenna, allowing your transmitter's power to be put to work where it will do the most good. Best of all, since the sleeve completely covers the coax connection, you don't have to worry about water getting into your expensive coax. Finally, the whole thing screws securely onto a 3/4-inch threaded pipe. If the pipe is well supported, the Kreco antenna will survive anything short of a tornado.

So how does it work? Very well indeed. Kreco makes no claims for spectacular gain; what they offer is good basic performance in a sleek package that can be put up and left up for years and never require attention. I'll never mangle another coat hanger again!

For further information, contact *Herb Kreckman Company, Cresco PA 18326.* Reader Service number 478.

Paul Grupp KA1LR
73 Staff

LETTERS

from page 20

I'm sure that hams could come up with some pretty good ideas.

Mike Desharnais WA1IPD
Somersworth NH

IT'S YOUR FAULT

Some observations: *73 Magazine* is the only ham radio magazine that I have subscribed to since 1963. Before then, I was an ardent supporter of *QST*, but when they got whole-hawg behind this incentive licensing and helped snatch away privileges I had earned fair and square and enjoyed for ten years, then the hell with them. They couldn't *pay* me to become an ARRL member—now or ever!

I don't go out of my way to bad-mouth the ARRL, but I don't hesitate to voice my own opinions on the air when asked, either. My philosophy has always been "the first time they do it to you is their fault, but if you go back for more and they do it to you again, then it's *your* fault!"

If anyone can show me where the incentive licensing change of 1968 helped amateur radio more than it devastated it, then I'll be the first to back-paddle, but first I'll need a satisfactory answer to why today—twelve years afterward—one must tune and search across the Advanced- and Extra-class portions of the bands, especially 40 and 75 meters, to find a QSO in progress while the General part is overflowing with nets and, yes, Advanced- and Extra-class hams, all bitching about the QRM!

Oh, I know the theory behind incentive licensing—everyone does. But it hasn't really worked out, has it? The way I see it, about all it accomplished was to crowd all the activity into the upper ends of the phone bands and leave the lower ends sparsely used. And this in present-day overcrowded bands! Well, there! That's off my chest. Oh, I don't expect it to do a bit of good, but it helps to relieve the pressure inside. Thanks for listening.

Bill Skipper K0ARG
Greeley CO

THANK YOU, DICK

I have enjoyed your magazine for several years but best of all was the article on Dick Bash. It gave me the idea to upgrade to Advanced, so I sat down and ordered the "Bash cheat sheet."

I want to tell you that the Final Exam is not something to "just memorize." I followed his advice and read the guide over 10 times, but, when I came to a question that I didn't understand, I would look it up in other books.

By the time I had finished the guide, I had read many articles pertaining to electronics. When I did go to the FCC to take the test, I actually knew much more than when I started the Bash system. I also found one question in the FCC test that was exactly as Bash stated it would be. But, I knew enough to pass with flying colors.

Thanks to Dick Bash and the Final Exam, I got the shot in my arm to get off my duff and study enough to pass one more exam. Now I am looking forward to sending for the *Final Exam* for Extra and trying to upgrade for the final time.

Thank you, Mr. Bash, for not giving me anything except the incentive to learn something.

Leo Mercer N0AHH
Albert Lea MN

AWARDS

from page 16

There are no band or mode restrictions; however, I am told if the applicant wishes to be recognized for single band or mode accomplishments, the preference should be stated when making application.

The Onion Award is issued on a point basis. Stations in Belgium need to total 10 points for the award; Europeans need 5 points; other DX stations must accumulate a total of 3 points. These points are earned as follows: one (1) point for a contact with an amateur located in the Aalst section of Belgium and two (2) points for a club station within Aalst.

To apply, have your list verified by two amateurs or a local radio club official. Enclose your confirmed list with 10 IRCs and send to: Onion Award Manager, Beulens Annemie, Ravenakkerstraat 52, 9390 Moorsel, Aalst, Belgium.

Stations which qualify for points are: ON1CH, ON1JA, ON1MC, ON1MV, ON1MW, ON4JT, ON4MS, ON4NJ, ON5HZ, ON5KC, ON5NM, ON5QT, ON5SU, ON5VP, ON5VW, ON6AZ, ON6BA, ON6BN, ON6BP, ON6CW, ON6EE, ON6ED, ON6EJ, ON6HW, ON6HX, ON6IR, ON6NN, ON6NV, ON6OX, ON6PZ, ON6RK, ON6SM, ON6VW, ON6WA, ON6WS, ON6YZ.

WAC YL AWARD

The Young Ladies Radio League issues the Worked All Continent Young Ladies Award to any licensed amateur who can meet the requirements of their program.

Two-way communications must be established with Young Lady amateurs in each of the six continents of the world: North America, South America, Europe, Asia, Africa, and Oceania. The applicant may utilize any band or mode of operation; however, crossband contacts will not be valid. There is no date limitation.

While all contacts with the six continents must have been made with duly licensed women operators, your contacts must have been made from the same QTH or community not to exceed a 25-mile radius.

To apply, applicant must prepare a list of contacts and also submit QSL cards or written proof of each contact along with the application.

While there is no charge for the award, applicants are requested to forward sufficient postage to cover first class return of your QSL cards. The YL Radio League assumes no responsibility for damaged or lost cards.

Forward your applications to the Award Custodian: Miriam Blackburn W3UUG, Box 2, Ingomar PA 15127.

While on the subject of YL awards, the YL Radio League also sponsors a Worked All States effort as well.

WORKED ALL STATES—YL

If you thought for one minute that the Worked All USA Award was fairly simple, try your luck at working each state with a YL contact! Not so easy, is it?

The Young Ladies Radio League makes available the WAS-YL Award to any licensed amateur who can establish two-way contact with a YL in each of the 50 US states.

While there are no date, band, or mode restrictions, you can request single band or mode recognition at the time application is made.

To qualify, all contacts must have been made within 25 miles of your QTH and any call you possess may be used to make contact with the 50 state YLs.

To apply, place your contacts in order by state beginning with Alabama and working alphabetically through your list. Include QSL cards or other forms of written confirmation for each contact claimed.

Forward your QSL cards, your application, and the list of claimed contacts to: Stella McPherson WA4WPN, 2029 Elbow Road, Chesapeake VA 23320. Be sure to include sufficient postage for first class mail return of your QSL cards. While there is no award fee, the League will not assume responsibility for the loss or damage of your cards.

WORKED ALL TRANSKEI

Early this week I received a very nice letter from Len S8AAT and he told of the very popular

Transkei Amateur Radio League Award now being offered.

The Transkei Amateur Radio League has formally announced the Worked All Transkei Award hich is made available to licensed amateurs throughout the world.

To qualify for the award, stations within Zone 38 must log a total of 4 Transkei (S8 prefix) stations since October 26, 1976. Stations outside of Zone 38 need only log two stations in Transkei.

There are no restrictions on bands or modes and even crossband contacts are permitted. Stations wishing to be recognized for single band or mode achievements may request recognition at the time application is made.

To apply for this award, prepare a list of claimed contacts and have it verified by at least two fellow amateurs or a local radio club official. Forward this list and an award fee of $1.00 or 10 IRCs to: The Transkei Amateur Radio League, PO Box 750, UMTATA, Republic of Transkei, South African Coast.

DIPLOMA DOS CONCELHOS PORTUGUESES

Sponsored by Associacao de Radioamadores Portugueses, this Portuguese County Award is available to licensed amateurs of the world under the following rules and conditions.

First of all, the DCP (Diploma of Portuguese Counties) is issued in four (4) classes: Class A —fixed HF; Class B—HF mobile; Class C—fixed VHF; Class D—VHF mobile. According to the number of Portuguese counties confirmed, the applicant may achieve one of the following grades of award: Grade I—75 counties; Grade II—125 counties; Grade III—175 counties; Grade IV—200 counties; Grade V—255 counties; Grade VI—250 counties; Grade VII—the maximum of 274 counties.

When making application for the DCP Award, the applicant is advised first to obtain the special awards booklet available from WB9RLY, who is the Canadian and US associate of the Amateur Radio Club of Portugal. This booklet will be extremely helpful to the applicant in establishing county locations and for finally submitting his or her application.

Do not send QSL cards! Have your list of confirmed contacts verified by at least two fellow amateurs or a local radio club secretary. Forward your application and an award fee of $2.50 or 7 IRCs to: ARP, PO Box 2145, 4021 Porto Codex, Portugal.

RCCI DX AWARD

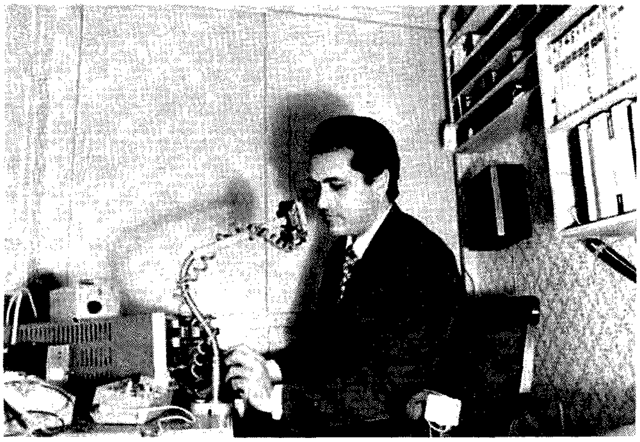
This week I was very happy to hear from my dear friend Professor Giulio Nardona, the President of the Radio Club Ciechi d'Italia. Giulio and his fellow amateurs are particularly proud of the following two awards.

The Radio Club of Blind Radio Amateurs of Italy has organized a new award entitled the RCCI DX Award. Starting from December 25, 1975, this award is open to all radio amateurs who can accumulate a total of 350 points as prescribed by the rules of the award.

Increments of 400, 500, and 600 points are earned with the delivery of blue, silver, and gold cockades to be fixed to the basic RCCI Award. In addition, every year prizes will be given to the first three amateurs better classified according to the points totaled during that year. Applicants scoring 600 points in the maximum of 10 years will be listed in the Honor Roll and will become Honorary Members of RCCI and will become "Jolly Stations" for this award.

To determine points, each country listed on the DXCC list of 1975 will have a value of one (1) point if worked on 15 and/or 20 meters. For contacts on 10, 40, or 80 meters, two points may be credited. A country may be worked only once on a band and contact with a Jolly Station may earn you 15 points; however, a Jolly Station may only be worked once.

Do not send QSL cards! Prepare a list of contacts, including date and time worked in GMT, band and mode of operation, and the points claimed for each contact. Have this list verified by at least two amateurs.



I0LL, the chairman of RCCI (Italian Radio Club for Blind Operators), in his shack. He is showing some of the instruments specifically manufactured by RCCI for blind amateurs.

Forward your application and an award fee of $4.00 or 10 IRCs to: RCCI Awards, I8KUT, PO Box 2011, 80100 Napoli, Italy, Europe.

The following stations earn the applicant 15 points: I0LL, I0PNK, I0SUQ, I0WFI, I0WHY, I1KJ, I3ANE, I4LDY, I8DOE, I8FTV, I8KUT, I8NMM, I8SRP, I8YRK, I0OGT, IT9VQC, and GM4ELV.

WORKED ITALIAN PREFIX AWARD

In remembrance of Pietro Spriano I0KA, founder and first President of the Radio Club of Blind Radio Amateurs of Italy, the organization has organized the Worked All Italian Prefix Award which becomes available to amateurs worldwide.

To qualify, all contacts must have been made on or after June 5, 1977. Contacts must be made with the following Italian prefixes: I1 through I0, IS0, IT9, one of the special ARI stations (IZ0ARI or I3ARI as examples), or one of the special memorial stations such as II4FGM or IY4FGM.

As with the RCCI Award, do not send QSL cards. GCR apply. Forward your application and an award fee of $4.00 or 10 IRCs to: I8KUT, PO Box 2011, 80100 Napoli, Italy, Europe.

Congratulations to Vernon G. Dameron, Jr. K1DRN of Bedford MA. He was the winner of a lifetime subscription to *73 Magazine* at the New England Division Convention, October 4 and 5, at Boxboro MA.

HAM HELP

I would like to obtain the service or instruction manual for a Wavetek VCG (generator), model 155. I will gladly pay a reasonable amount for a copy or the manual itself.

Arthur Hagopian W6LGQ
34 Laurel Ave.
Petaluma CA 94952

I need a copy of assembly instructions for a Hy-Gain tri-band beam, circa 1960. Commonly called the eggbeater because of the 23" loops on each end of the three elements, it has four open coils on each element and an 18' boom. I will pay for a copy.

Leslie Hogg WB8NVJ
28423 Kendallwood Dr.
Farmington Hills MI 48018

I am in need of operating manuals and schematics for the following test equipment: H-P model 520 high-speed decade scaler and model 500BR frequency meter and Sweep-Systems, Inc., model 950 oscilloscope. I will buy or reproduce and return and pay shipping costs. Thank you.

Stan Boler WD9BBV
116 S. Washington
Knightstown IN 46148

I need a manual for an AN/USM 106 video voltmeter made by Ballantine. I will pay postage and copying costs and prefer to copy here and return.

John Weber K4JW
102 Southgate Blvd.
Melbourne FL 32901

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received two months prior to the month in which the event takes place. They should be sent directly to Editorial Offices, 73 Magazine, Pine Street, Peterborough NH 03458, Attn: Social Events.

SOUTH BEND IN
JAN 4

A hamfest swap & shop will be held on Sunday, January 4, 1981, at New Century Center, across from St. Joseph Bank building, US 33 north, South Bend IN. Tables are $3.00 each. There is a half acre of carpeted floor in the same building as the industrial history museum. Talk-in on 146.52/.52, .04/.64, .34/.94 and 147.99/.39, .93/.33, .78/.18, .69/.09.

OAK PARK MI
JAN 11

The Oak Park ARC will hold its annual indoor Swap & Shop on January 11, 1981, al the Oak Park High School, Oak Park Boulevard (9½ miles west of Coolidge Highway), Oak Park MI. Doors will be open from 8:00 am to 3:00 pm and admission is $2.00 per person. Features will include an ARRL table, a door prize, a YLRL table, food, refreshments, and free parking. Talk-in on 146.04/.64 and 146.52. For more information, send an SASE to Rob Numerick, 23737 Couzens, Hazel Park MI 48030, or call (313)-398-3189.

CHESTERFIELD VA
JAN 11

The Richmond Amateur Telecommunications Society will hold Frostfest 1981 on Sunday, January 11, 1981, at the Chesterfield County Fairgrounds, Chesterfield VA, from 8:00 am to 4:00 pm. New and large facilities include spacious aisles, and plenty of on-site parking, with charter buses welcome. Admission is $3.00 for each four-foot long flea market table, and $2.00 for each tailgating vehicle. Features will include commercial exhibitors, a flea market, an auction, and prizes consisting of a color TV, a Bird Wattmeter with slug, a digital VOM, and many more. Talk-in on 146.34/.94 and 146.28/.88. For further information, contact the Richmond Amateur Telecommunications Society, PO Box 1070, Richmond VA 23208.

ARLINGTON HEIGHTS IL
JAN 25

The Wheaton Community Radio Amateurs' hamfest will be held on January 25, 1981, at the Arlington Park Race Track EXOP Center, Arlington Heights IL. Doors open at 8:00 am. Tickets are $2.00 in advance and $3.00 at the door. There will be 300 free flea market tables available, plus 100 commercial booths and clear paved parking. Prizes will be awarded. Talk-in on 146.94 and 146.01/.61. For advance tickets, send an SASE to WCRA, PO Box QSL, Wheaton IL 60187. For information, call (312)-766-1684 or (312)-629-3296.

MIAMI FL
FEB 7-8

The 21st *annual* Tropical Hamboree and 1981 ARRL Florida State Convention will be held on February 7-8, 1981, at the Flagler Dog Track, Miami FL. Registration is $3.00 in advance and $4.00 at the door. Swap tables are an additional $12.00 for both days, $7.00 for Saturday only, and $6.00 for Sunday only. Events will include tech talks and forums, over 100 exhibit booths, 400 swap tables, ladies' programs, group meetings, and many awards. There will be free overnight RV parking for self-contained units at the site (advance registration is recommended). Special gatherings are planned for QCWA/OOTC/SOWP and DXers. For further information and special hotel rates, write Dade Radio Club, PO Box 350045 Riverside Station, Miami FL 33135.

MANSFIELD OH
FEB 15

The Mansfield midwinter hamfest auction will be held on February 15, 1981, at the Richland County Fairgrounds, Mansfield OH. Doors will open to the public at 8:00 am. Tickets are $1.50 in advance and $2.00 at the door. Features will include prizes, an auction, and a flea market, all in a large heated building. Talk-in on 146.34/.94. For additional information, advance tickets, and/or tables, send an SASE to Harry Frietchen K8HF, 120 Homewood Road, Mansfield OH 44906, or phone (419)-529-2801.

LIVONIA MI
FEB 22

The Livonia Amateur Radio Club will hold its 11th annual LARC Swap 'n Shop on Sunday, February 22, 1981, from 8:00 am to 4:00 pm, at Churchill High School, Livonia MI. There will be plenty of tables available. Other features include door prizes, refreshments, and free parking. Talk-in on 146.52. For further information, send an SASBE (4" × 9") to Neil Coffin WA8GWL, c/o Livonia Amateur Radio Club, PO Box 2111, Livonia MI 48150.

DAVENPORT IA
MAR 1

The Davenport Radio Amateur Club will hold its tenth annual hamfest on March 1, 1981, from 8:00 am to 4:00 pm at the Davenport Masonic Temple, Highway 61 (Brady Street) and 7th Street, Davenport IA. Tickets are $2.00 in advance, $3.00 at the door. Tables are $4.00 each with a $2.00 additional charge for an electrical hookup (limited number). Features will include over $2,000 worth of major prizes. Hotel discounts and refreshments will be available. There will be a pre-hamfest Saturday night banquet with Paul Graver, midwest ARRL SCM, as guest speaker. Banquet tickets are $8.00 and reservations must be paid by February 18, 1981. Talk-in on 146.28/.88, WØBXR. For advance tickets, dinner, and table reservations, write Dave Johannsen WBØFBP, 2131 Myrtle, Davenport IA 52804.

STERLING IL
MAR 8

The Sterling-Rock Falls Amateur Radio Society will hold its 21st annual hamfest on Sunday, March 8, 1981, at the Sterling High School field house, 1608 4th Avenue, Sterling IL. Advance tickets are $2.00 and tickets at the door are $2.50. A large indoor flea market will be restricted to radio and electronic items only. Tables are available for $5.00 for commercial and $3.00 for others. Plenty of free parking will be available, including an area to accommodate campers and mobile trailers. Many prizes will be given away, including a first prize of a minicomputer. Doors open at 7:30 am. Featured will be a movie, "The World of Amateur Radio," to be shown throughout the day, bargains, good food, and plenty of close-by activities for XYLs and kids. Talk-in on .52 and WR9AER .25/.85. For advance tickets and tables, write Sue Peters KA9GNR, 511 8th Avenue, Sterling IL 61081. Make checks payable to Sterling-Rock Falls Amateur Radio Society and enclose an SASE.

CORRECTIONS

In "Single-Tone Paging for Wilson HTs," December, 1980, pp. 112-114, several errors managed to creep in, not the least of which was the author's old callsign. Fred's call *is* W4CK.

On page 112, zener D2 in Fig. 1 should be a 1N751A. This change should be reflected in the parts list on page 114, too. Also, on page 113, column 1, at the beginning of the bottom paragraph, the opening line should read "There is no *dis*advantage in..."

An improvement over the insulation technique described on page 114, column 2, lines 19 through 25, would be to use nonconducting styrofoam cut to the shape of the PCB.

Finally, at the bottom of the parts list, time and inflation have had their effect. Microsizer Co. (at the same address) now offers the kit for $17.95 and the PCB alone for $4.50.

Gene Smarte WB6TOV
News Editor

HAM HELP

I am in need of a Galaxy III schematic and owner's manual. I will pay for original or copy. Thank you.

Phillip R. Lofton WA4NVE
349 Quinn Rd.
Collierville TN 38017

I am in need of the manual(s) for two Gonset, Inc., FM 150-175-MHz radios. One is a model 960A, series (G40033), while the other lacks a model number but is stamped with the series (G40019). The two are identical but for power supplies and number of channels.

I would, of course, be willing to pay for any costs involved in obtaining the paperwork for these radios.

Zak Hargraves, KA0EGW
550 East 30th Street
Durango CO 81301

I came across a few schematics the other day and started to destroy them and then I thought that someone might want them.

I have schematics available for the following: HT-33-B linear amplifier, Globe DSB-100 Sidebander, Heathkit® V-2 VTVM, typical Command Set transmitter, with power-plug connections for "BC" series, modification of Heath HP-10 for use with Collins KWM series, and the popular Command Receiver.

These are free for the asking—an SASE would be appreciated, however.

Reid Martin W4BP
Rt. #3 Box 250
Tavares FL 32778

I need very badly a noise blanker for a Drake TR-4C. The unit Drake made for this rig was numbered 34-PNB. I would like to buy an original unit or obtain photocopies of printed information pertaining to it (schematics, photos, etc.). I will pay a reasonable price for either or both, and, of course, all shipping costs.

If you have a 34-PNB that you are willing to sell, or have information (or know where I can get either), please drop me a note at the address given below. Please state condition of unit, nature of information, and a price (please exclude shipping costs from this figure). Your time and attention is greatly appreciated.

Keith Inman, President
Bucknell Amateur Radio Club
Box C-281
Bucknell University
Lewisburg PA 17837

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Denver CO

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Cushcraft, Bencher, Hy-Gain, Telex, Barker & Williamson, Nye-Viking, Hustler, MFJ, Callbook, Murch, Unadilla, OK, Saxton, ARRL Books, Used equipment, Electronic parts and accessories, free catalog. **Donovan Electronics, Inc., 2510 Norwich, New London Tpke, Uncasville CT 06382, 848-3434.**

Columbus CA

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The world's most fantastic amateur showroom! You gotta see it to believe it! **Radio Wholesale, 2012 Auburn Avenue, Columbus GA 31906, 561-7000.**

Boise ID

Adzen, Amidon, Ameco, ARRL, B&W, Callbook, Collins, CushCraft, Dentron, Hustler, ICOM, Jim-Pak, KDK, MFJ, NPC, Nye, Sams, SST, Swan, Ten-Tec, Wanzer, Wilson. **Custom Electronics, 1209 Broadway, Boise ID 83706, Bob W7SC 344-5084.**

Preston ID

Ross WB7BYZ, has the Largest Stock of Amateur Gear in the Intermountain West and the Best Prices. Call me for all your ham needs. **Ross Distributing, 78 So. State, Preston ID 83263, 852-0830.**

Terre Haute IN

Your ham headquarters located in the heart of the midwest. **Hoosier Electronics, Inc., 43B Meadows Shopping Center, P.O. Box 2001, Terre Haute IN 47802, 238-1456.**

Littleton MA

The ham store of N.E. you can rely on. Kenwood, ICOM, Wilson, Yaesu, DenTron, KLM amps, B&W switches & wattmeters, Whistler radar detectors, Bearcat, Regency, antennas by Larsen, Wilson, Hustler, GAM. **TEL-COM Inc. Communications & Electronics, 675 Great Rd., Rt. 119, Littleton MA 01460, 486-3040.**

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Kenwood, Drake, ICOM, Ten-Tec, Swan, Dentron, Tempo and many ham accessories. Also computers by Apple and Exidy. **The Comm Center, Inc., Laurel Plaza—Rt. 198, Laurel MD 20810, 792-0600.**

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Waveguide & coaxial microwave components & equipment. Laboratory grade test instruments, power supplies. Buy, sell & trade all popular makes, HP, GR, FXR, ESI, Sorensen, Singer, etc. **Lectronic Research Labs., 1423 Ferry Ave., Camden NJ 08104, 541-4200.**

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Quality Service, reasonable rates, all brands. Now USA KDK repair center. **Amateur Radio Repair Center of IEC, Inc., 79 Town Square, Mocksville, NC 27028, 998-2627.**

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San Antonio TX

Complete 2 way service shop. Call Dee, W5FSP. Selling Antenna Specialists, Avanti, Azden, Bird, Hy-gain, Standard communications, Genave, Henry, CushCraft, Dielectric, Hustler, ICOM, MFJ, Nye, Shure, Swan, Tempo, Ten-Tec and others. **Appliance & Equipment Co., Inc., 2317 Vance Jackson Road, San Antonio TX 78213, 734-7793.**

DEALERS

Your company name and message can contain up to 25 words for as little as $150 yearly (prepaid), or $15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the March issue must be in our hands by January 1st. Mail to 73 Magazine, Peterborough NH 03458. ATTN: Nancy Ciampa.

PROPAGATION

J. H. Nelson
4 Plymouth Dr.
Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	21	7A	7	7	7	7	7	7	7A	14A	21A	21A
ARGENTINA	14	14	7	7	7	7	14	21	21A	21A	21A	21
AUSTRALIA	21	14	7B	7B	7B	7B	7B	14	21	21	21A	21A
CANAL ZONE	14A	14	7	7	7	7	14	21	21A	21A	21A	21
ENGLAND	7	7	7	7	7	7	14	21	21A	21	14	14
HAWAII	21A	14	7B	7	7	7	7	7B	14	21	21A	21A
INDIA	7	7	7B	7B	7B	7B	14	14A	14	7B	7B	7B
JAPAN	14A	14	7B	7B	7B	7	7	7	7B	7B	7B	14
MEXICO	14A	14	7	7	7	7	7	14	21A	21A	21A	21
PHILIPPINES	21	14	7B	7B	7B	7B	7B	7	7	7	7B	14
PUERTO RICO	14	7	7	7	7	7	14	21	21A	21A	21	14A
SOUTH AFRICA	14	7	7	7B	7B	14	14A	21A	21A	21A	21	21
U.S.S.R.	7	7	7	7	7	7B	14	21A	14A	7B	7B	7
WEST COAST	21A	14	7	7	7	7	7	14	21	21A	21A	21A

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	21	14	7	7	7	7	7	7	14	14A	21A	21A
ARGENTINA	21	14	7A	7	7	7	14	21	21A	21A	21A	21
AUSTRALIA	21	14A	14	7B	7B	7B	7B	7B	14A	21	21A	21A
CANAL ZONE	21	14	7	7	7	7	14	21	21A	21A	21A	21
ENGLAND	7B	7	7	7	7	7	7B	14	21A	21	14	7B
HAWAII	21A	14A	14	7	7	7	7	7	14	21	21A	21A
INDIA	7B	14	7B	7B	7B	7B	7B	7B	14	7B	7B	7B
JAPAN	21A	14	7B	7B	7	7	7	7	7	7B	7B	14
MEXICO	14	14	7	7	7	7	7	14	14A	21A	21A	21
PHILIPPINES	21A	14	7B	7B	7B	7B	7B	7	7	7	7B	14
PUERTO RICO	21	14	7	7	7	7	14	21	21A	21A	21A	21
SOUTH AFRICA	14	14	7	7B	7B	7B	14	14A	21A	21A	21	21
U.S.S.R.	7	7	7	7	7	7B	7B	14	14A	7B	7B	7B

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	21	14	7	7	7	7	7	7	7	14	21A	21A
ARGENTINA	21	14A	14	7	7	7	7B	14	21	21A	21A	21A
AUSTRALIA	21A	21	14	14	7B	7B	7B	7B	14	21	21A	21A
CANAL ZONE	21	14	14	7	7	7	7	14	21	21A	21A	21A
ENGLAND	7B	7	7	7	7	7	7B	7A	21A	21	14	7B
HAWAII	21A	21	14A	14	7	7	7	7	14	21	21A	21A
INDIA	14B	14	7B	7B	7B	7B	7B	7B	7A	7B	7B	7B
JAPAN	21A	14A	14	7B	7	7	7	7	7	7B	14	21
MEXICO	21	14	7A	7	7	7	7	14	14A	21A	21A	21A
PHILIPPINES	21A	14A	14	7B	7B	7B	7B	7	7	7	7B	14A
PUERTO RICO	21	14	7A	7	7	7	7	14	21	21A	21A	21A
SOUTH AFRICA	21	14	7	7B	7B	7B	7B	14	14A	21A	21	21
U.S.S.R.	7B	7	7	7	7	7B	7B	7B	14A	7B	7B	7B
EAST COAST	21A	14	7	7	7	7	7	14	21	21A	21A	21A

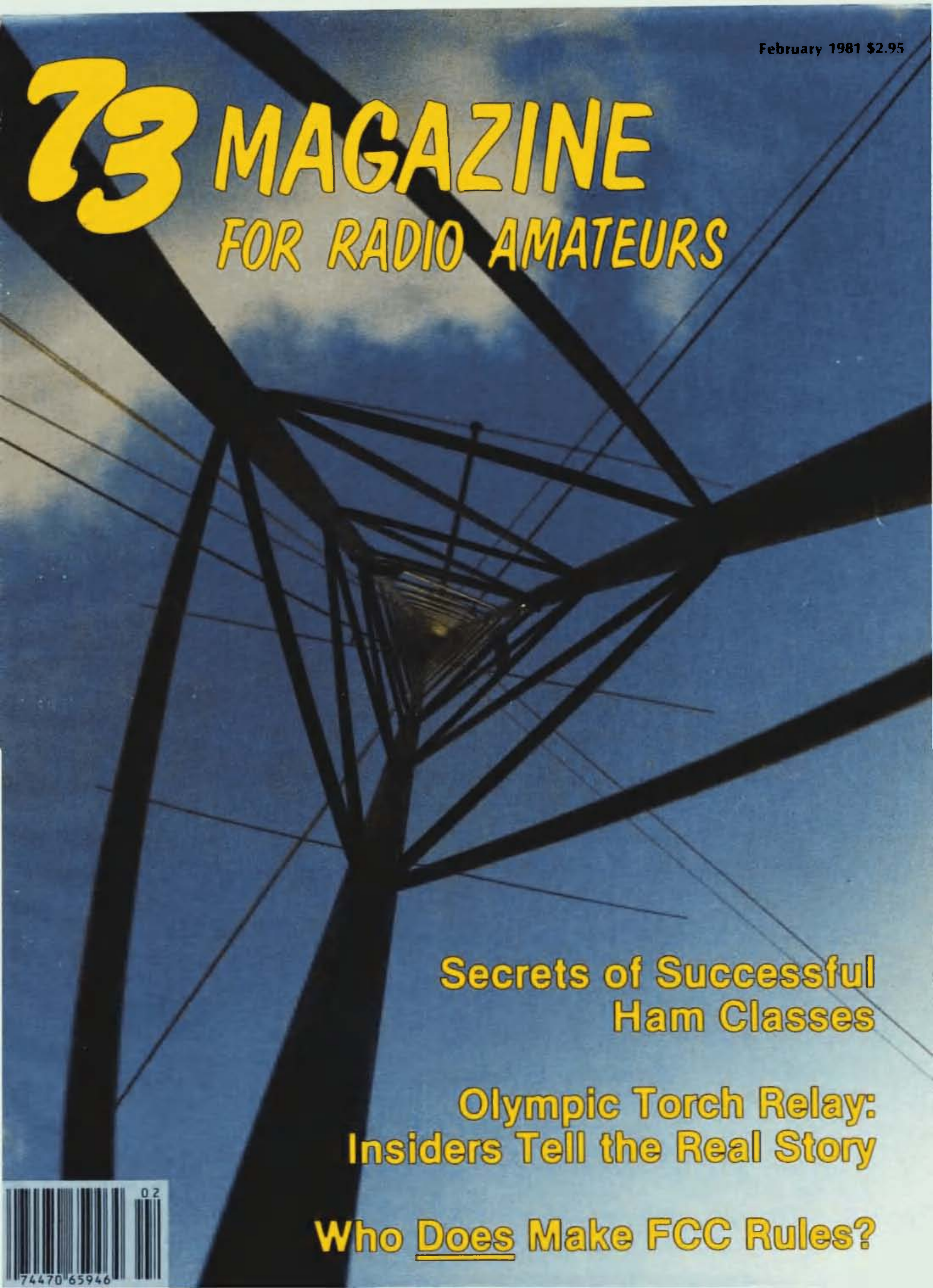
A = Next higher frequency may also be useful
B = Difficult circuit this period
F = Fair G = Good P = Poor
SF = Chance of solar flares

january

sun	mon	tue	wed	thu	fri	sat
				1 F	2 G	3 G
4 G	5 G	6 G	7 G	8 G	9 G	10 G
11 G	12 F/SF	13 P	14 F	15 G	16 G	17 G
18 F	19 G	20 G	21 G	22 F	23 F	24 F
25 F	26 G	27 G	28 G	29 F	30 F	31 F

February 1981 $2.95

73 MAGAZINE FOR RADIO AMATEURS



Secrets of Successful Ham Classes

Olympic Torch Relay: Insiders Tell the Real Story

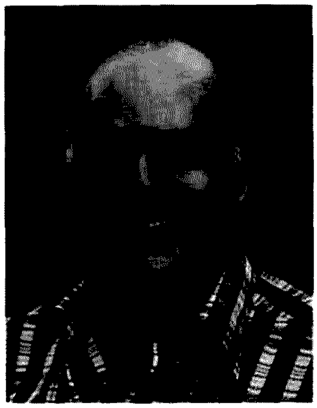
Who Does Make FCC Rules?

feb. 81
73 MAGAZINE

Cover: Photo by James Boesch WB3DBV, East Greenville PA.

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green



HARC BOMB

That's the Hudson Division ARRL Convention...an almost complete disaster according to the few survivors. Hardly any exhibitors and one of the most scant attendances of any HARC Convention. Lest I be given a hard time for just reporting the debacle without making some suggestions for the improvement of the show, I'd like to suggest that the event be put in the hands of someone competent ...that a decent program be devised which features someone who will attract attendance ...that manufacturers and dealers be provided with low-cost exhibit facilities...that the event be advertised in more than just one ham magazine...and be run near New York City.

A ham convention is a show which has costs running into the tens or even hundreds of thousands of dollars. In the hands of someone with no experience in promoting a show and with no ease in handling large sums of money, it is going to be screwed up. A show promoter has to know how to organize local clubs to get the work done...he has to be experienced in wheeling and dealing with hotels and exhibition centers...with caterers...with entertainment. He has to already know about advertising, PR, mailing lists, direct-mail work, mail order... etc. In other words, you do not turn a big business over to someone who has spent a lifetime working for the telephone company.

HARC has over 40,000 hams in the area, so they should be able to put on the biggest hamfest or convention in the country. They should be able to make even Dayton look sick. With that kind of an attendance prospect a convention that draws under 1,000 is ridiculous.

How about turning to a show promoter...a professional? Well, maybe, but I've seen these birds work and they can screw you all ways to Sunday. They know all about skimming the gate, running up fake expenses, double billing...etc. I've seen some shows where it was obvious that $50,000 or more was being skimmed off the top.

Hamfests and conventions can draw well if they are run right and well advertised. Our hobby is in desperate need of more successful hamfests, for these events help bring out prospective hams and build up their enthusiasm. They can also make a lot of money for those who do the work.

KENWOOD

Visitors to Japan often arrive with a distorted idea of how terribly expensive the visit is going to be. Hotels *are* on the high side, but certainly are no worse than in London and much of Europe. A visit to Tokyo *can* be an expensive experience if one is not wily unto the ways of the natives. I found it much like New York City, where meals come in all price ranges.

A busy production line at Kenwood in Tokyo.

Not being able to completely overcome my frugal Yankee heritage, I tend to oscillate between a sort of fatalistic acceptance of the need to both give and enjoy lavish business entertainment and a lifetime of being thrifty. Thus, one evening I may be the guest (or even the host... aargh) of a fellow businessman and the next cadging free snacks in the food section of a Tokyo department store, armed with my best "I *may* buy some of this if I like it" smile.

The practice of almost all restaurants of having the food on display (plaster replicas, actually) in the front window, along with the price, makes it easy for the chintzy to shop for a cheap, but delicious meal. You can do nicely for $6 or $7, leaving the $200 dinners for more important evenings. If you get desperate, there are a number of American fast-food chains waiting for you. McDonalds is just about everywhere in Japan, ready when your Big Mac attack comes... and it eventually comes to everyone visiting a truly foreign country.

If a Big Mac doesn't get you, then you'll be able to get a reasonable and familiar meal at a Kentucky Fried Chicken, a Dairy Queen, or a Shakey's ("All the pizz and flies you can eat"). There's even a Wendy's...right there on the Ginza (Broadway) in Tokyo, complete with a standard Frosty. I'm a very big fan of the Wendy's salad bar, but that has not yet been exported... and I've checked 'em out in Brussels, too.

This trip to Tokyo had three major purposes. That was enough to keep me busy day and night, rushing to a computer show to see what the latest in Japanese microcomputers might be like...then talking with prospective trading partners about Instant Software... and meeting hams and ham equipment people. With quite a number of the Japanese firms promising to start exporting microcomputers to the US in 1981, I wanted to see what they had to offer and get an idea of what the

American firms are really up against. I found out and the news is not good for the American firms.

Since the US is quite a bit ahead of Japan in the development of programs for microcomputers, I was interested in developing a market in Japan for the nearly 1,000 programs which my firm, Instant Software, has either released or has ready for release. I needed a good sized firm which could translate our programs and distribute them in Japan. Despite the shortness of my visit to Tokyo, both of these objectives seem to have been accomplished. Time will tell.

The way for a visit with the people at Kenwood was paved by Ken Bourne W6HX, their US marketing manager. Everything went off in style, from being picked up at the hotel and driven to the factory to my talks with their engineers and a look at their production and research departments.

In the last few months I've written a good deal about some ideas I have for advancing ham equipment. I was hoping Kenwood might be interested in some of these ideas and perhaps put them through their research lab and end up with some practical equipment for us. Some of these ideas were first discussed at the 1980 Ham Industry Conference in Aspen and others have evolved since then. I find that I brainstorm the best with a group of ham engineers so I was really looking forward to the session.

All of the top people at Trio-Kenwood whom I met were accomplished in English, so our talks were not slowed down by the need for translations. The meeting started off with a presentation to me by Mr. Toshio Okuhara, the managing director, of a complete TR-2400 system. This a wonderful Japanese custom and one which I'm going to try to import.

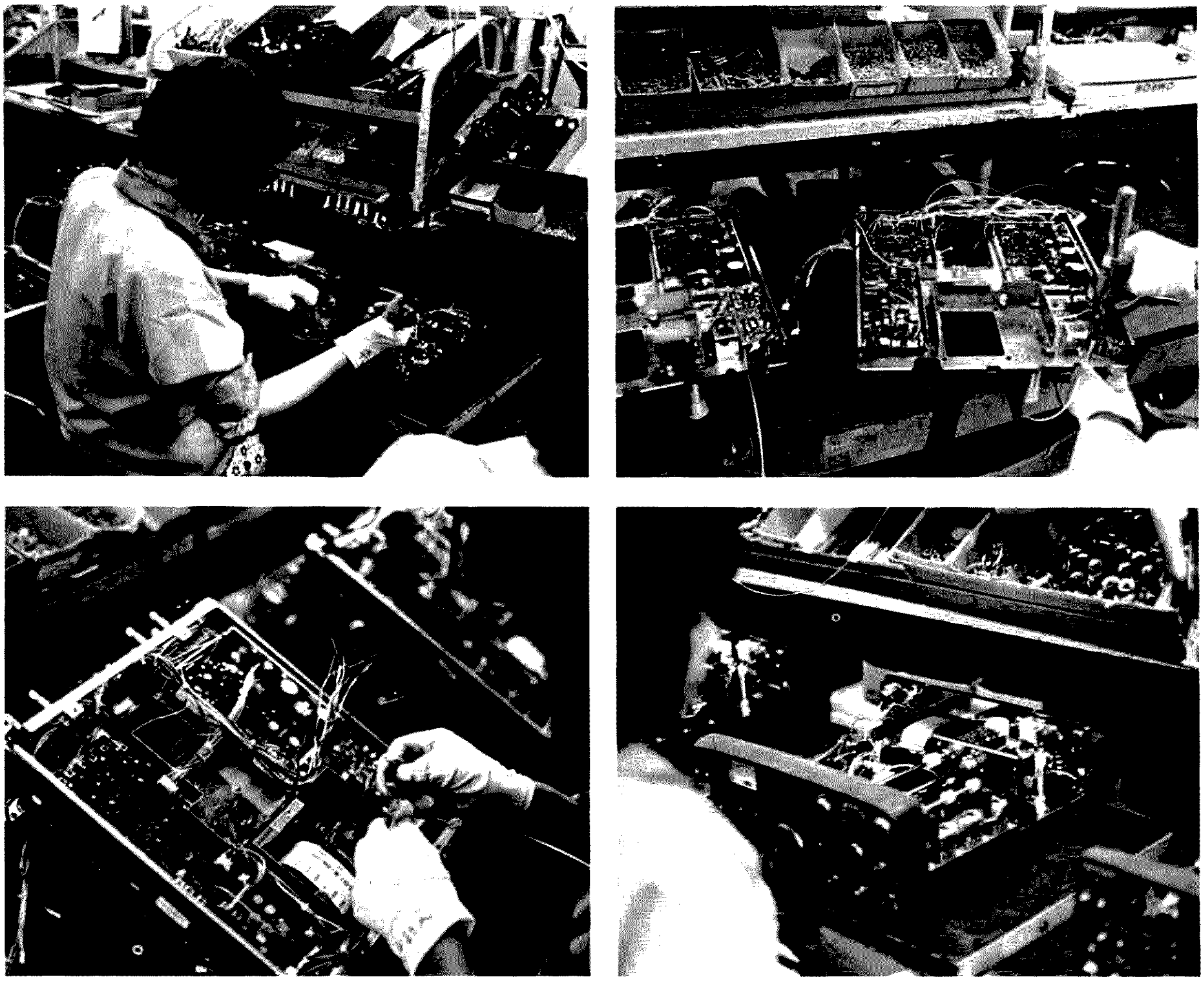
The Kenwood factory, while obviously efficient and well organized, was not remarkably different from some American firms I've visited. The quantities of units made is not large enough for the use of really automated systems such as I saw in Korea, where they were turning out color television sets with hardly any manual labor at all. No, the big difference between Kenwood and the American firms I've visited lies in their research laboratory. This was big, busy, and packed with avid hams.

The idea for a subaudible tone for automatic identification of ham rigs, which I have discussed in my editorials, certainly intrigued them. I think this one development alone could bring about major changes (for the better) in amateur radio. Obviously it would spark a whole new generation of transceivers . . . plus a lot of adapters for older rigs. This is just one more

Well . . . I Can Dream, Can't I?

by Bandel Linn K4PP

"And under the terms of the will, your uncle is leaving you $750,000—of which $50,000 must be spent for ham gear."



The empty chassis starts at one end and comes out with everything ready for testing.

A custom which is curious to Japan is one of presenting a gift to a visitor. While I'm usually good for a free lunch, here you can see Mr. Okuhara, the managing director of Kenwood, presenting me with a complete TR-2400 hand transceiver system . . . in return for a measly magazine.

marriage of digital electronics and amateur radio.

We also discussed some of the recent developments in narrowband single sideband which are promising us 5-kHz-wide repeaters for our VHF bands. Of course, if we are unable to get amateur radio back into a growth mode, we really won't need room for a whole lot more repeaters. I'm hoping that something can be done to get our growth back up over 10% so that eventually we'll be hurting for more repeater channels.

This meeting occurred before I'd bought one of the new Sony TC-300S stereo cassette recorders, so I hadn't yet come up with the idea for stereo double sideband. I did discuss DSB and its promise for providing up to 25 to 30 times more possible occupancy on our HF bands. I sure wish someone would start some work along that line. Will stereo be even better? We'll see.

Our talking ran on into dinnertime, so they took Sherry and me to Tokyo's famous garden restaurant, Chinzan-So, a place for entertaining honored guests (I got that from the brochure I picked up at the restaurant). The food, the service, and the location were spectacular.

Sometimes I get a bit depressed over not having the time and the facilities which I wish I had. I'd love to get into a lab for a few weeks and come up with a working piece of hardware for automatic identification. During these moments I suffer from flights of fancy about starting a lab and peopling it with ham experimenters. Then practicality sets in and I recognize that even if I was able to find people like that, there would be no way I could afford them. No, that sort of lab will have to be run by our manufacturers . . . for now.

You've heard about the high food prices in Tokyo? This is the menu at a food stand concession at the Consumer Electronic Show. Two hundred Yen is equal to $1 US, so you can see that the prices are not at all out of line with what you would pay at a concession stand in America. Soup needle, by the way, is noodle soup.

Here's Sherry working on the bowl of tempura soup needle ($1.75), which did a fair job of feeding both of us. In addition to the bowl of noodles and soup, there were a couple good-sized shrimp tempura.

Wendy's is not much different from anywhere else, with a double hamburger weighing in at around $3.15 with all the trimmings. One unusual item was a shrimp sandwich at $1.10.

I'll let you in on a secret. . . Wayne really likes the Wendy's Frosty.

A recent television show discussed the Japanese approach to driving: They make a big deal out of driving school. Here is a practice driving course laid out on the top of a garage. It is busy all day long. Does this extra training pay off? You bet! Per capita, the Japanese have less than 3% as many accidents as we do. You rarely see a car with dents or signs of body work. It is almost enough to make a politician think. . . but not quite.

For about $6 you get a lacquer tray full of food. Delicious, and identical to the beautifully made plaster model in the restaurant window. All I had to do was take the waiter out and point and we got our meals.

Continued on page 110

LOOKING WEST

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They're at it again. The spectrum thieves, I mean. Those who view the 220-to-225-MHz band with an acquisitive eye, envisioning huge corporate profits if they can find a way to steal the band from those of us who now occupy it. Maybe 220 CB is dead, and maybe "the ARRL slew it" as it is claimed. Anyway, the ARRL has not been all that successful in convincing other potential spectrum thieves that they mean business. Nor do I think they can. No, guys and gals, I don't think we can count on Newington to pull us out of this one. We are going to have to conquer this one on our own. It means pulling together and taking the offensive once and for all. You and I are going to have to fight hard to save 220. Don't look for help anywhere else.

It seems that the latest attack is coming from Inland Waterways again. That's the same group we thought we had trounced last year. I guess some people never learn, because they are again eyeing 220 to 225 MHz to relieve the purported congestion in the 160-MHz marine band. Last year they wanted to construct an "Inland Waterways Automated Data Relay" system along the Mississippi and connecting waterways. Now they want more room for boats to talk, and pass the time of day. What next?

Well, there is a "next." It seems that the manufacturers of cordless telephones are also eyeing 220. Cordless phones are becoming very popular these days, and the people who make them are running out of room on 72 MHz. So they are reported to be looking at new spectrum in both the 27-MHz CB band and the 220-MHz amateur band for their exclusive use. The December, 1980, issue of *Popular Electronics* carried a rather interesting article on the subject. If you are a 220-MHz user, I suggest you read it and respond to the editors. Maybe they can help get the word back to industry that there are several thousand of us who are not willing to just go away. You can kind of discount the 27-MHz idea as there is no way for the cordless phones to be compatible with current CB activity, either within 27 MHz or on either side. So in reality I think we can assume that it's 220 they will go after. We have a two-pronged attack on us it seems, and it might wind up to be one heck of a fight. Why? Because both of these entities seem to believe that 220 to 225 MHz is vacant spectrum, that it is not in use by anyone, and is, therefore, ripe for the taking.

There are many ways in which we can fight the problem. In the past we have always taken the nice-guy approach, and year after year we face the same threat. Maybe it's time to forget that we are usually ladies and gentlemen and take a hard line: that 220 to 225 MHz is amateur, and that it will always remain amateur. Sounds like a challenge to war, you say? I prefer to think of it as a response to a challenge. A response which will educate spectrum thieves with respect to the abundant amateur activity on 220 and the fact that this activity is there to stay. That we as amateurs learned our lesson well when the FCC took 11 meters and created the CB fiasco. That we will never permit this to happen again. That the band is ours, that all of our bands are ours, and that we are prepared to fight to retain every last kilohertz.

Frankly, most of the VHF/UHF experts I have spoken with agree that it would be impossible to share the 220 band with any other service, be it Inland Waterways, cordless telephones, or what have you. The way we have structured the band in its development over the past 5 or 6 years precludes this. It might be possible if we did not have repeaters sitting atop mountains with the ability to talk over several hundred miles. Even in areas where repeaters talk over only 50 or 60 miles, the mutual interference would be massive and intolerable. In the end you would have another 27-MHz fiasco and no way to solve the problem. One or the other would have to go, and I know that the amateur community would stand pat and not budge. This could and would lead to an ongoing confrontation between the business community and the amateur. It would be a war that neither side could win, so why have it in the first place?

There is no way that FCC regulation could help make this spectrum sharing work. Look at the record, look at the present mess, called 27-MHz, Class D CB. Here you are dealing with technologically-incompetent people, for the most part. Appliance operators who buy a legal radio, an illegal amplifier, and talk worldwide. Has the Commission been able to solve the regulatory enforcement problem? Has the linear amplifier ban worked? Has *any* regulation or attempted enforcement of the 27-MHz problem worked? The answer is a resounding no! The FCC says it lacks the funds to do an effective job of enforcement on 11 meters, but even if they had the monies, I doubt if they could catch any but the most hard-core offenders. And, of those already caught, how many turn out to be repeat violators who care little or nothing about the rules to begin with?

Until now, industry and others have viewed the radio amateur as the tinkerer who is given the cast-off frequencies until such time as they are needed by someone else. It is thought that once a need arises, we amateurs will simply vanish as mysteriously as we came. This is a stereotype upon which we are viewed and judged. In part, the stereotype is justified because we have projected this image for so many years that it has become the thinking of today's society. What many fail to recognize is that another type of amateur has emerged in recent times. He may or may not be a technical whiz kid, but no longer is he a back-room boy; he has social awareness. He is the kind of guy who will not be trampled on by others. In some cases, this may have manifested itself in contemptuous behavior—jamming, foul language, or what have you. But the majority are well-respected professionals. Doctors, lawyers, broadcasters. You name it. People with an ear to the ground and an eye on society. Activists with strong beliefs and ideals. Slowly but surely these people became dedicated to the preservation of the amateur service and to its continued vitality.

The spectrum thieves seem unaware that this has happened. They are used to dealing with the Newington types that they usually can walk all over. What they have yet to catch onto is that in the battle over 220 they will not be dealing with Newington but rather with the people now on the band. People who long ago turned a deaf ear to the ARRL and have fought and won wars for themselves. Most of the 220 people in my part of the nation turn to Newington the same deaf ear they turn to VHF. So, "Mr. Businessman," in this one you must face the angry mob alone. For the first time in its long history, the amateur service is ready to break out of its traditional good-guy role to do battle with what they consider to be the enemy. You, "Mr. Cordless Telephone" and you, "Mr. Inland Waterways," you're far from being our "good buddy." We know what you spectrum thieves want, and believe me when I tell you to look elsewhere... like 800 or 900 MHz. We don't want you on 220 or near 220. From us to you: Go play in the bathtub with a toy boat.

You can't say you weren't warned.

A BOOK REVIEW

Well, he's done it again. One never knows what to expect next out of Bob Heil K9EID. Just when the effects of his previous amateur-radio-related escapade seem to begin fading, Bob goes ahead and pulls another rabbit out of his bottomless hat and hits home once again. Bob's latest creation is a book titled *The 10-Meter FM Handbook*. I've got a better title: "Everything and Anything You Ever Wanted to Know About 10-Meter FM When You Didn't Know Whom to Ask the Questions Of." It's that inclusive.

For those of you who may not be familiar with Bob, he is the founder and president of Heil Sound Ltd., an electronics manufacturer of professional audio equipment for the entertainment industry. Since 1956, he has been one of the pioneers of VHF, SSB, and he spends a

Continued on page 106

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
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Randallstown MD 21133

In all the years that I have been writing this column, I have always tried to keep the tone light and cheerful. It is with some regret, therefore, that I must alter the tone this month, as I begin with an obituary.

Although not involved with amateur radioteletype at its inception, being only twenty-eight years old, this youngster played an important role in the introduction of new features in RTTY operation, such as selective calling, that we still appreciate today. Most of us became acquainted with this relative newcomer after getting involved in RTTY, and many remain attached, even to this day.

Several siblings have been quite influential in the growing computer field and, in a wanton act of genocide, they also are being dispatched. Yes, we'll miss them. But have no fear, for in the surplus market they shall live on to be resurrected time and time again as this part and that is replaced, much as those long gone have done before.

What am I talking about? Why, the Model 28 Teletype®, of course! The Teletype Corporation will cease production of this venerable machine soon. Others in the line, most notably the ASCII Model 33, also will go out of production. While spare parts will be maintained, and most of us did not get ours new anyway, it feels like another era is passing by.

If one era passes, though, then another arrives—and that's just what I am going to write about this month. One of the most exciting new developments in ham RTTY is the introduction of the computerized RTTY terminal. It is hard to pick up a magazine and miss the ads for the many complicated boxes which seem to do everything but turn off the shack lights when you are done operating. And now, RTTY Loop will take a close look at one of them: the Microlog ATR-6800.

About three years ago, the Microlog Corporation, located here in Maryland, introduced a video RTTY system. Based on the Motorola 6800 microprocessor, the system featured separate transmit (AKB-1) and receive (AVR-1) units, a video monitor, and a raft of options. Buying one fully stocked would have cost you about twelve hundred 1978 dollars. As experience has been gained, new features have been devised and the company's latest offering, the ATR-6800, packs it all into one box only slightly larger than the keyboard of three years ago. For a shade under two thousand 1981 dollars, it runs rings around the old system. Unfortunately, some compromises had to be made to fit everything in there, and I will cover some of them after going over the highlights of the unit.

First off, what can it do? Well, the basics of the unit include a 6800 microprocessor supported by a monitor program in 2716 PROM, about 4K of RAM, and one and one-half PIAs. Into all of this is stuffed enough programming to satisfy almost any operator. Data exchange is by any of three modes: Morse code, Baudot code, or ASCII. Transmission rates are available for any common, and a few not so common, speeds. From the user's point of view, operation is remarkably constant no matter what the code, so let's look at that first.

The video display is a black and white 24-line-by-40-character display. At the top of the display, a dedicated line shows the current transmit/receive status, mode, speed, and time. The time is maintained in an internal twenty-four hour clock set from the keyboard. The display is selectable as white on black or black on white, and a zoom command produces a twelve-line-by-twenty-character display that can be read from across the room—even on the small Sanyo, nine-inch monitor. The display is normally maintained in a split-screen format with the transmit buffer on top and the received data below a dashed line. The transmit buffer display may be removed entirely or its size varied from one to twenty lines (seven lines maximum in the zoom format).

There are several outputs available from the ATR-6800 that allow interfacing to a wide variety of devices. Standard video goes to the monitor, of course. A high-speed mercury relay is available to insert in a loop supply to allow hard copy on a teleprinter. Computer-compatible RS-232 levels also are provided so that devices using this transmission standard may be connected. For turning the transmitter on and off, voltage keying is available for both positive and negative circuits. AFSK tones also are generated, and their frequency and shift may be specified from the keyboard. Options are available to either silence the output tones during receive or leave them on, thus allowing VOX keying, if desired.

Inputs include speaker audio as well as TTL or dry contacts for a hand key or whatever. Again, RS-232 interfacing is provided for users of this standard. Now, not only can you connect the receiver, transmitter, and old clunker printer, but interfacing is provided also for a standard cassette recorder. Why? To save pictures, messages, or whatever, and send these plus your own "brag tape." Keyboard controlled, of course. To aid in tuning, outputs are provided also for an oscilloscope which will display a "cross" type of tuning pattern on received signals.

The operating system provides several features which may be used no matter what the mode. An ID key may be programmed to send the station's identification whenever pressed, and an alternate (SHIFT-ID) can send another one, perhaps including an automatic CW ID for RTTY operation. Ten messages may be stored and recalled actively during a QSO. A test signal may be sent appropriate to the mode in use: RYRYRY in Baudot, U*U*U*U* in ASCII, or VVV in Morse. We've all heard of diddle, that familiar sending of LETTERS when not sending anything else. Well, when you select this mode in Morse, the time is filled with BT (-. . . -) so that the other guy does not think you died.

Let's see, what else can I tell you? You can tell the thing to send each letter as you type it, to delay sending a word until you type a space, or to send the whole line after a carriage return only. Makes editing nice and easy, especially on Morse. (I can type faster than I can send Morse—much faster!)

What's that you say, "the modes"? Ah, yes, the modes. Well, you see, you have your Morse, your Baudot, and your ASCII. Now, when you are in Morse, the transmit speed may be adjusted in one-word-per-minute increments from five to 199 words per minute. The receive speed is self-tracking to the speed of the sending station. All of the special Morse signs, such as SK, AR, BT, KN, and varied and sundry punctuation marks are supported. And, of course, all of the general features mentioned above work just fine. When you are in Morse, the front end of the ATR-6800 functions as a direct detector, looking for an 800-Hz tone. When it finds that frequency, it locks on and the fun begins.

Now, in Baudot you have a choice of 45.45 baud (also known as the 60-word-per-minute standard) as well as 50, 57, 74, and 100 baud, corresponding to 66, 75, 100, and 132 words per minute. All kinds of RTTY niceties can be called into play here, such as downshift (or non-downshift) on space, automatic carriage return, line feed after so many characters, or remoting to an external printer. In this mode, the input is routed through a computer-enhanced demodulator, which detects the usual 2125 Hz-2975 Hz pair, with other tones selectable from the keyboard.

By selecting one of the standard ASCII transmission rates, 110 or 300 baud, the encoding is switched to ASCII with the full character set supported. Much as with many other primarily uppercase machines, you must shift to get lowercase, but this is a minor inconvenience as text editing is not one of the primary applications of the machine. Although the full ASCII appears to be generated, the display ROM does not have all of the appropriate symbols in it. It uses, rather, several patterns of dots for several of the codes. This causes no real problem unless you are fond of braces instead of parentheses, or tildes, or several other of the less-used symbols.

Besides communicating on the air, the ASCII capability can be directed through a "computer" mode in which the ATR-6800 becomes essentially a stupid

Continued on page 122

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

CWSP INTERNATIONAL DX COMPETITION
0000 GMT February 7
2400 GMT February 8

Amateurs throughout the world are invited to participate in the annual CWSP contest using all bands on CW only. Entry classes include a) single operator, b) multi-operator (only club stations, single transmitter), and c) QRP limited to 10 Watts with a single operator.

EXCHANGE:

RST and QSO number starting with 001. CWSP members will add "/CWSP" after the report. QRP operators will add "/power." Example: 579015/5.

SCORING:

QSOs with same country = 1 point, other countries in same continent = 2 points, and other continents = 3 points each. Multipliers are ARRL DXCC countries and each Brazilian prefix (PY1, PT7, PS8, etc.). Multipliers are counted only once regardless of band. Final score is total QSO points times the total multiplier.

AWARDS:

Cup and award to 1st place worldwide. Medal and award to 1st place in each continent. Awards to 1st place in each country. Special awards to 1st and 2nd CWSP members. Other special awards for clubs and QRP 1st worldwide and 1st Brazil.

ENTRIES:

Logs must contain data and time in GMT, station worked, exchange, multipliers, and points per band. Please use separate logs for each band. Logs and summary sheet must be mailed not later than March 15, 1981, to: CWSP Contest Committee, PO Box 15098, 01000 Sao Paulo, SP —Brazil.

1980 RESULTS:

1st World = PY1ARS/4; 1st South America = PY8BI; 1st North America = WA4OML; 1st USA = W1OPJ.

NEW HAMPSHIRE QSO PARTY
2000 GMT February 7 to
0500 GMT February 8
1400 GMT February 8 to
0200 GMT February 9

Sponsored by the Concord Brasspounders, the contest is open to all radio amateurs. Each station may be contacted once per band, per mode.

EXCHANGE:

RS(T) and NH county/ARRL section or country.

FREQUENCIES:

CW—1810, 3555, 3730, 7055, 7130, 14055, 21055, 21130, 28130.

Phone—1820, 3935, 3975, 7235, 14280, 21380, 28575, 50.115, 145.015.

SCORING:

Score 5 points for each NH station contacted and multiply by the number of NH counties worked. NH stations score 1 point for each QSO and multiply by the total number of ARRL sections, countries, and NH counties.

ENTRIES:

Logs with summary sheet and dupe sheet should be mailed not later than March 16, 1981, to: O. W. H. Johnson, Box 63, Bristol NH 03222.

VERMONT QSO PARTY
2100 GMT February 7
0100 GMT February 9

Sponsored by the Central Vermont Amateur Radio Club, stations may be worked once per band and mode. VT mobile stations may be worked again considering each new county they enter as a new station.

EXCHANGE:

QSO number, RS(T), and VT county or ARRL section.

FREQUENCIES:

3685, 3909, 3932, 7060, 7265, 7290, 14060, 14290, 14345, 21060, 21375, 28100, 28600, 50.260, 50.360, 144-144.5, 145.8.

SCORING:

Score 3 points per contact and multiply by the number of VT counties worked on each band. VT stations score 1 point per QSO and multiply by the number of ARRL sections and countries worked.

AWARDS:

Certificates to highest scoring station in each ARRL sec-

CALENDAR

Feb 7-8	New Hampshire QSO Party
Feb 7-8	Two-Land QSO Party
Feb 7-8	RSGB 7-MHz Contest—Phone
Feb 7-8	CWSP International DX Competition
Feb 7-9	Vermont QSO Party
Feb 9-10	Land o' Lincoln QSO Party
Feb 14-15	QCWA QSO Party—CW
Feb 14-15	YL-OM Phone Contest
Feb 21-22	ARRL DX Contest—CW
Feb 27-Mar 1	CQ World Wide 160 Contest—Phone
Feb 28-Mar 1	G-QRP-Club CW Activity Weekend
Feb 28-Mar 1	French Phone Contest
Feb 28-Mar 1	RSGB 7-MHz Contest—CW
Feb 28-Mar 1	YL-OM CW Contest
Mar 7-8	1981 SSTV Contest
Mar 7-8	ARRL DX Contest—Phone
Mar 14	Boy Scout Exhibition Station
Mar 14-15	QCWA QSO Party—Phone
Mar 21-22	Bermuda Contest
Mar 21-22	CARF Phone Commonwealth Contest
Mar 21-23	BARTG Spring RTTY Contest
Mar 28-29	Spring VHF QSO Party
Mar 28-29	CQ World Wide WPX—SSB
Aug 8-9	European DX Contest—CW
Sep 12-13	European DX Contest—Phone
Sep 12-13	G-QRP-Club CW Activity Weekend
Sep 12-14	Washington State QSO Party
Nov 14-15	European DX Contest—RTTY
Dec 26-31	G-QRP-Club Winter Sports

RESULTS

Third DARC Corona 10-Meter RTTY Contest

Class A

N8ES	2340
DL5GAS	1739
WB2UEF	1548
OZ1CRL	1209
DF6ZV/A	1120
WA6WGL	962
AD0V	945
G3HJC	851
I5CBF	851
SL5AR	828
EA3BQQ	608
I0WBX	580
OK3KII	400
OK1WEQ	375
DL4GJ	364
G4HYD	325
EA3BLQ	322
DF8FD	231
W5TZB	084
DF6ZY	063
LA2IJ	050
LA7QM	025
Y32ZF	018
Y53UA	002

Class B

H. BALLENBERGER	972
WERNER LUDWID	580
OK1-20677	252
Y2-7111/A	144

tion and country. Trophy to highest scoring single-operator station in VT. Additionally, their names will be added to the Doris McGrath memorial plaque. Donated in memory of W1EOB, this award will be awarded in this manner for a 10-year period. The operator winning the QSO party the most times or the station with the highest score during the period will receive the plaque. Other certificates for 2nd, 3rd, and 4th highest scoring stations in VT. The W-VT (Worked Vermont) Award will be issued to stations working 13 out of Vermont's 14 counties, provided the station has not previously received this award. A special certificate will also be awarded VT multi-operator stations.

ENTRIES:

Send logs or facsimiles together with an SASE no later than March 31, 1981, to: Gerald W. Benedict, W1BD, 23 Foster Street, Montpelier VT 05602.

LAND O' LINCOLN QSO PARTY

0000 GMT February 9
2400 GMT February 10

The contest is sponsored by the Land o' Lincoln chapter of 10-X International in cooperation with the Central Illinois Radio Club. Operating throughout the 10-meter band on CW and phone, LOL and CIRC members will call "CQ LOL" in an effort to contact as many stations as possible.

EXCHANGE:

Name, QTH, RS(T), serial number, 10-X number if any, and LOL certificate number if any.

SCORING:

LOL certificate holders worldwide and CIRC members score 1 point per QSO, 2 points per QSO with 10-X number exchange, and 3 points per QSP with LOL number exchange. Multiply total QSO points (3 max per QSO) by number of different states, Canadian provinces, and DXCC countries worked.

All others, score 1 point per QSO with LOL certificate holders, 2 points per QSO with local LOL and CIRC members. Multiply total QSO points (2 max per QSO) by number of different states, Canadian provinces, and DXCC countries worked.

Achievement certificates will be awarded to the top scorers in each state, Canadian province, and DXCC country. A special Novice certificate will also be awarded. Make sure to denote Novice on your entry!

ENTRIES:

Logs, fully duped and summarized, to be submitted no later than March 15, 1981, to: AG9E, Dave Meiser, 1112 Andover, Bloomington IL 61701. Please include an SASE for special QSO and/or results.

QCWA QSO PARTY—CW

0001 GMT February 14
2400 GMT February 15

This is the 24th annual QCWA QSO party with separate weekends for CW and phone. Contacts with the same station on more than one band can be scored only once. Contacts made with "captive" stations, such as when operating in local nets, are not valid.

EXCHANGE:

QSO number, operator's name, and QCWA chapter identification (official number or name). Members not affiliated with a chapter should use "AL." If a member belongs to several chapters, then *one* must be chosen and used for the QSO Party. If desired, you may use one chapter for the CW Party and another one that you belong to for the Phone Party.

FREQUENCIES:

Any authorized amateur frequency is permissible. The following suggested frequencies have been selected to minimize interference to others:

Phone—3900-3930, 7230-7260, 14280-14310, 21350-21380, 28600-28630.

CW—3530-3560, 7030-7060, 14030-14060, 21040-21070, 28040-29070.

SCORING:

Each contact made with another QCWA member will count as a single point. Add up the contacts with QCWA members and then multiply this number by the number of Chapters represented.

AWARDS:

Plaques for the top phone and top CW scorers. Certificates will be given for the 2nd through 5th runners up in both the phone and CW Parties. Standings and scores will be published in the *QCWA NEWS* summer, 1981, issue.

ENTRIES:

Logs should include the following information: Time (GMT), call, QSO numbers, name, Chapter number or name, state or country. It is the responsibility of each contestant to provide a legible log (no carbon copies) and to list all claimed contacts. The total contacts for each page will be recorded at the bottom of each page. The total contacts for the Party should be recorded at the top-right of the first page of the log. Log sheets will not be returned. Make sure you have correct postage when you mail your logs. Send logs no later than March 31, 1981, to: Pelican Chapter QCWA, Arthur M. Monsees W4BK, 1407 48th Avenue NE, St. Petersburg FL 33703. Separate logs and scores must be submitted for both the CW and phone Parties. The decision of the Pelican Chapter of QCWA will be final with respect to scores and rules. In the event of errors or a disagreement, keep all details off the air and write either the Pelican Chapter or QCWA Headquarters.

Continued on page 108

RESULTS

RESULTS OF 1980 WASHINGTON STATE QSO PARTY

Location	Call	Score
Alaska	NL7D	330
Arizona	W7ZMD	7,280
California	N6PE	7,317
Colorado	KAØCLS	1,411
Connecticut	W1TEE	2,112
Florida	N4IJ	1,118
Georgia	N4NX	5,796
Idaho	KB7N	33
Illinois	W9QWM	3,486
Indiana	WD8QBB/9	2,688
Iowa	WBØUIT	374
Kansas	KØTJB	506
Kentucky	N4AOC	1,862
Louisiana	W5WG	4,500
Mains	WB1GLH	32
Maryland	W3PYZ	966
Massachusetts	W1AQE	1,395
Michigan	W8WVU	1,092
Missouri	K9RWL	2,520
New Jersey	K9CW/2	1,040
New York	W2RPZ	1,485
North Carolina	K4YFH	1,190
Ohio	W8EX	2,502
Oklahoma	N5CII	351
Pennsylvania	WA3JXW	351
South Carolina	K4BZD	870
South Dakota	WAØBZD	8
Tennessee	WA4CMS	1,162
Texas	W5VGX	3,759
Utah	W7LN	1,078
Virginia	W4KMS	1,001
West Virginia	WA8CNN	561
Wisconsin	K9GDF	1,386
Canada	VE3KK	1,200
England	G3MZV	432
Japan	JA7KE	814
Peru	OA8AX	24

Washington

County	Call	Score
Clark	W7FQE	1,488
Grant	W7WMO	59,858
Jefferson	W7IEU/7	3,888
King	N7AYF	37,476
Kitsap	W7DAZ	40,150
Kittitas	KA7FWW	10,815
Mason	WB7DZN	63,424
Pacific	VE7ZZ/W7	174,141

AWARDS

Bill Gosney WB7BFK
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

ALGOA BRANCH MERIT AWARD

This past month some very encouraging letters of support have been received from all parts of the world. Of particular note was the letter I received from Fred Strutt ZS2JS, representing the Algoa Branch of the South African Radio League. In his letter, Fred tells of their new award recognizing operator efficiency in CW communications.

The Algoa Branch Merit Award will be issued to any radio amateur who has had a minimum of 250 CW QSOs with any other amateurs of the world.

To qualify, all contacts must have been made after January 1, 1979. While QSLs are not required, the applicant must have his list of contacts verified by at least two fellow amateurs or by a radio club secretary. Endorsements will be issued in increments of 250 CW QSOs.

To apply, forward your verified list of CW contacts and an award fee of five (5) IRCs to: Algoa Branch Merit Award, PO Box 10050, Linton Grange, Port Elizabeth 6015, South Africa.

It has been some time since we have listed an Asian continent award. Without further ado, allow me to share with you a letter I received from our dear friend, Mr. Green VS6EZ. In his letter, Anthony tells us of two awards being made available by amateur associates in his country, the Hong Kong Amateur Radio Transmitting Society (HARTS).

THE HONG KONG FIRECRACKER AWARD

Sponsored by HARTS, the Firecracker Award is issued to licensed amateurs and shortwave listeners worldwide. Contacts on or after January 1, 1964, are valid.

To qualify for their very spectacular diploma, applicants within zones 18, 19, 24, 25, 26, 27, and 28 require confirmation with at least 10 individual VS6 stations. All other zones of the world require only six (6) VS6 contacts to qualify for the award. Awards are issued for all CW, all phone, and mixed mode. Single-band accomplishments will be recognized if requested at the time of application.

Do not send QSL cards! Prepare a list of claimed contacts and have them verified by at least two amateurs or a radio club secretary. Forward this list and an award fee of 10 IRCs to: HARTS, Post Box 541, Hong Kong.

NINE DRAGONS AWARD

Probably one of the most elaborate of my Far Eastern awards is the achievement diploma known as the Nine Dragons Award. Sponsored by HARTS, this brilliant award with its red, black, and shiny gold accents an amateur's wall with the dignity that makes all award seekers proud.

To qualify, the applicant must make contact with a country in each of the following zones: 18, 19, 24, 25, 26, 27, 28, 29, and 30. The contact made in zone 24 must be with a VS6 station. Stations located within any of these nine zones will require two (2) contacts in each zone as above.

To be valid, all contacts must be made after January 1, 1979. There are no band or mode restrictions for this award; however, special recognition will be granted if requested at the time application is made.

To apply, prepare your list of claimed contacts and have it verified by at least two amateurs or a radio club secretary. Send this list and an award fee of $2.00 or 10 IRCs to: HARTS, Post Box 541, Hong Kong.

While in Asia, it would be proper to review one of the largest awards programs in that part of the world, the one sponsored by JARL, more commonly referred to as the Japan Amateur Radio League.

ADXA AWARD

Sponsored by JARL, the ADXA (Asian DX Award) is available to licensed amateurs and shortwave listening stations worldwide. To qualify, all claimed contacts must have been made on and after July 30, 1952.

The requirements for ADXA are fairly straightforward. Applicants must establish two-way contact with at least thirty (30) countries in the Asian continent. A list of eligible countries appears below.

Do not send QSL cards! Prepare a list of claimed contacts and have it verifed by at least two fellow amateurs or a local radio club official.

Forward your application and an award fee of 8 IRCs directly to: Awards Manager, JARL, Post Box 377, Tokyo Central, Tokyo, Japan.

ADXA Countries: A4, A51, A6, A7, A9, AP, BV, BF-BU, CR9, EP, EP, HM-HL, JA-JE-JJ, JR, JD1 (KG6I), JD1, JT, JY, OD5, S21, TA, UA9-UA0, UD6, UF6, UG6, UH8, UI8, UJ8, UL7, UM8, VS6, VU, VU2-VU7-VU9, VU5-VU7, XU, XV5 (3W8), XW8, XZ2, YA, YI, YK, 1S, 4S7, 4W, 4X4-4Z4, 5B4, 7O, 8Q6, 8Z4, 9K2, 9M2, 9N1, 9V1.

WORKED/HEARD ALL JAPAN PREFECTURES

Also sponsored by the Japan Amateur Radio League, the WAJA Award is available to licensed amateurs and SWL stations on a heard-only basis. All contacts, to be valid, must have been made on or after July 30, 1952. The only exception to that rule is for contacts with Okinawa (JR6), for which contacts on or after May 15, 1972, are considered valid for this award. In addition, all contacts must be made only with fixed base stations.

To qualify, the applicant must make contact with a Japanese amateur operator in each of the 47 Japanese prefectures as they appear below.

Do not send QSL cards! Have your list of claimed prefectures verified by at least two amateurs or a local radio club secretary. Send this list and an award fee of 8 IRCs to: JARL Awards Manager, Post Box 377, Tokyo Central, Tokyo, Japan.

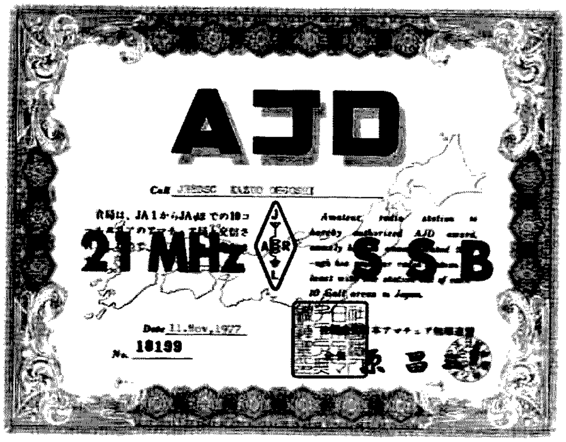
Japanese prefectures: JA1—Tokyo, Kanagawa, Chiba, Saitama, Ibaraki, Tochigl, Gumma, Yamanashi; JA2—Shizuoka, Gifu, Aichi, Mie; JA3—Kyoto, Shiga, Nara, Osaka, Wakayama, Hyogo; JA4—Okayama, Shimane, Yamaguchi, Tottori, Hiroshima; JA5—Kagawa, Tokushima, Ehime, Kochi; JA6—Fukuoka, Saga, Nagasaki, Kumamoto, Oita, Miyazaki, Kagoshima, Okinawa (JR6); JA7—Aomori, Iwate, Akita, Yamagata, Miyagi, Fukushima; JA8—Hokkaido; JA9—Toyama, Fukui, Ishikawa, and JA0—Niigata, Nagano.

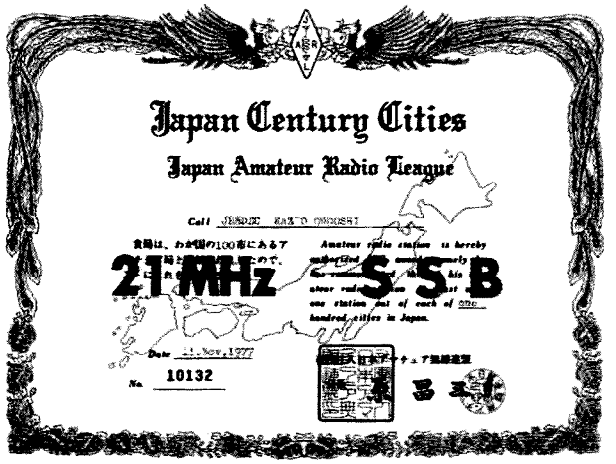
ALL JAPAN DISTRICTS AWARD

The Worked All Japan Districts Award is sponsored by the JARL and is available to licensed amateurs and SWL stations on a heard-only basis. This very basic award requires the applicant to make contact with one Japan station in each of the ten Japanese call districts.

This award is issued for single- and mixed-band accomplishments and also recognizes single- and mixed-mode achievements as well. To be valid, all contacts must have been made on or after July 30, 1952.

To apply, have your list of contacts verified by at least two amateurs or a local radio club official. Keep in mind that KA





stations (US military) will not be accepted for award credit.

Send your application with an award fee of eight (8) IRCs to the Awards Manager, JARL, Post Box 377, Tokyo Central, Tokyo, Japan.

JAPAN CENTURY CITIES AWARD

Similar to our own *73 Magazine* Century Cities Award, the Japanese version is sponsored by the JARL, requiring the applicant to make contact with a minimum of 100 individual cities within Japan. There are no further requirements and no stipulation as to band or mode. Endorsements are issued for each increment of 100 additional cities worked.

Applicants are asked not to send QSL cards! Prepare your list of cities in order of the city number. Though this may be confusing to some, it is best to write the JARL for a copy of this cities listing. This will enable you to make quick reference to the actual number assigned each city and will speed preparation of your application.

Once arranged in order, have your list of contacts verified by at least two fellow amateurs or a local radio club official. Send the application and an award fee of eight (8) IRCs to: JARL Awards Manager, Post Box 377, Tokyo Central, Tokyo, Japan.

As a final note, for those applicants who are fortunate enough to work all cities listed in Japan, a special Worked All Cities Award has been designed especially to recognize your feat!

Representing the Naniwa Club in Japan, Akio Sonoda JR3DDQ recently wrote me and asked that I share his club's new award with our many readers. With pleasure I present—

THE JAPAN OSAKA CENTURY CERTIFICATE

The JOCC Award is issued by the Naniwa Amateur Radio Club of Japan. It is made available to licensed amateurs throughout the world. To qualify for the award, applicants must submit proof of contact with stations within the Osaka prefecture. Three award categories are offered:

- Junior Class—applicant must work 10 JA stations which enable you to spell "NANIWA CLUB" with the last letter of each callsign contacted.
- Standard Class—applicant must work 10 different stations in the Osaka prefecture. Gold seal endorsements will be issued for each increment of 50.
- Special Class—applicants must work 100 different stations in the Osaka Prefecture, including 62 stations located in all 31 cities, 5 guns, and 26 wards of the prefecture. Note: A list of cities, guns, and wards is available from the Awards Manager for three (3) IRCs.

There are no band or mode requirements, but special recognition will be made if a request is made at the time of application.

Do not send QSL cards! Have your list of contacts verified by at least two amateurs or a radio club official. Send your application and eight (8) IRCs to the Awards Manger, Akio Sonoda JR3DDQ, 3-6-8 Daikoku-cho, Naniwa-chu, Osaka, Japan 556. For Gold Seal endorsements,

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OPERATION BALLARAT

There are at least two Ballarats. One is a thriving city in southern Australia, about 240 kilometers north of Melbourne. It boasts a population of approximately 75,000 and is the principal city in Australia's gold country. It is a modern city with an air of progress and prosperity.

In extreme contrast is the other Ballarat. It is an almost forgotten ghost town in the rugged desolate mountain range which rings California's Death Valley. The California Ballarat is tied to Australia's through a young prospector named George Riggins, who, in 1897, came from the famous Australian mining center of Ballarat.

The prospectors who gathered in the Panamint mountain range wanted a town named where they struck it rich. Riggins suggested the new town be given the name identified with gold the world over and it was named Ballarat. However, in the early decade of the new century, the mines were exhausted and the town of Ballarat, California, became deserted.

Now, almost 100 years later, amateur radio will briefly revive the town. For a short period during the winter weekend of January 30-31 and February 1, 1981, the old ghost town will become alive again. This time it will not be humming mining machinery or tall head frames towering above the hills hauling gold ore from the mine shafts. It will be humming from the sound of gasoline-driven emergency generators.

Towering beam antennas and dipoles will replace the head frames and ore crushers. The miners' trademark, the pick and the shovel, will be replaced with radio operators' microphones and headsets. The prize will not be the gold nuggets but a certificate, showing today's scene from both Ballarats, linked together, although 10,000 kilometers apart.

To participate in this first-of-a-kind event, you must contact both Ballarats on either 10, 15, 20, or 40 meters on SSB. Some of you may also be interested to know that the California Ballarat is located in sparsely populated Inyo County and is probably high on many county hunters' most wanted lists.

By this time, you may be curious enough to wonder how all this is going to happen. Early, Friday, January 30, an advance group will leave the Los Angeles area, drive about 400 kilometers through the Mojave Desert into the Panamints and what is left of Ballarat. A suitable site will be selected and a VHF station will be established to guide those that follow later that day.

When the four HF transceivers, three 500-Watt linear amplifiers, beam antennas, the 1-kW gasoline-electric generators, and the balance of the support equipment have arrived, we will start to set up. By then, the group of twenty will be in work teams with each receiving its task. The criterion to demonstrate the establishment of an emergency communications center in a desolate area within a two-hour period is just a side objective of this weekend activity.

At 0200Z on Saturday, January 31, we will be ready to go to work. We will operate 28.100-28.600, 21.135-21.370, and 14.275-14.350 MHz until 1400Z, February 2, when the last contact from the ghost town will be acknowledged.

We will first look for our namesake in Australia, as it would be nice to have the first contact with them. But here is what is important for you if want to participate and obtain a certificate. You must communicate with *two* out of twenty stations in Ballarat, Australia, and the one at the ghost town. Give your callsign and signal report. You will get an identifier, a sequential number, and the last two characters of the Ballarat station's callsign. It will always be 6C from the ghost-town station and two letters from Australia. Contact the other Ballarat and give your callsign and the identifier you received. It does not matter which Ballarat you contact first. That way we can verify that you qualify for the certificate.

Send your name, callsign, identifier, address, and one IRC (International Reply Coupon) to WA6NKL, 4817 Paseo de Las Tortugas, Torrance CA 90505, or VK3VEZ, 2 Cambridge Street, Wendouree, Victoria 3355, Australia. Your certificate will be on its way shortly. Good luck.

Paul M. Turkheimer WA6NKL

OSCAR ORBITS

Courtesy of AMSAT

The OSCAR satellites are subject to atmospheric drag, of course, and the present period of intense solar activity has accentuated the problem. During this period, our sun has been expelling huge numbers of charged particles, some of which find their way into the Earth's upper atmosphere, increasing the density (and thus the drag) there. It is through this region that the OSCARs must pass. OSCAR 8, in a lower orbit than OSCAR 7, is the more seriously affected of the two.

If the drag factor is not considered when OSCAR calculations are performed, long-range orbital projections will be in error. For example, by the end of 1979, OSCAR 8 was more than 20 minutes ahead of some published schedules. The nature of orbital mechanics is such that extra drag on a satellite causes it to move into a lower orbit, resulting in a shorter orbital period. Thus, the satellite arrives above a given Earthbound location earlier than predicted.

Using data supplied to us by Dr. Thomas A. Clark W3IWI of AMSAT, the equatorial crossing tables shown here were generated with the aid of a TRS-80™ microcomputer. The tables take into account the effects of atmospheric drag and should be in error by a few seconds at most.

The listed data tells you the time and place that OSCAR 7 and OSCAR 8 cross the equator in an ascending orbit for the first time each day. To calculate successive OSCAR 7 orbits, make a list of the first orbit number and the next twelve orbits for that day. List the time of the first orbit. Each successive orbit is 115 minutes later (two hours less five minutes). The chart gives the longitude of the day's first ascending (northbound) equatorial crossing. Add 29° for each succeeding orbit. When OSCAR is ascending on the other side of the world from you, it will descend over you. To find the equatorial descending longitude, subtract 166° from the ascending longitude. To find the time OSCAR 7 passes the North Pole, add 29 minutes to the time it passes the equator. You should be able to hear OSCAR 7 when it is within 45 degrees of you. The easiest way to determine if OSCAR is above the horizon (and thus within range) at your location is to take a globe and draw a circle with a radius of 2450 miles (4000 kilometers) from your QTH. If OSCAR passes above that circle, you should be able to hear it. If it passes right overhead, you should hear it for about 24 minutes total. OSCAR 7 will pass an imaginary line drawn from San Francisco to Norfolk about 12 minutes after passing the equator. Add about a minute for each 200 miles that you live north of this line. If OSCAR passes 15° east or west of you, add another minute; at 30°, three minutes; at 45°, ten minutes. Mode A: 145.85-.95 MHz uplink, 29.4-29.5 MHz downlink, beacon at 29.502 MHz. Mode B: 432.125-.175 MHz uplink, 145.975-.925 MHz downlink, beacon at 145.972 MHz.

At press time, OSCAR 7 was scheduled to be in Mode A on odd numbered days of the year and in Mode B on even numbered days. Monday is QRP day on OSCAR 7, while Wednesdays are set aside for experiments and are not available for use.

OSCAR 8 calculations are similar to those for OSCAR 7, with some important exceptions. Instead of making 13 orbits each day, OSCAR 8 makes 14 orbits during each 24-hour period. The orbital period of OSCAR 8 is therefore somewhat shorter: 103 minutes.

To calculate successive OSCAR 8 orbits, make a list of the first orbit number (from the OSCAR 8 chart) and the next thirteen orbits for that day. List the time of the first orbit. Each successive orbit is then 103 minutes later. The chart gives the longitude of the day's first ascending equatorial crossing. Add 26° for each succeeding orbit. To find the time OSCAR 8 passes the North Pole, add 26 minutes to the time it crosses the equator. OSCAR 8 will cross the imaginary San Francisco-to-Norfolk line about 11 minutes after crossing the equator. Mode A: 145.85-.95 MHz uplink, 29.4-29.50 MHz downlink, beacon at 29.40 MHz. Mode J: 145.90-146.00 MHz uplink, 435.20-435.10 MHz downlink, beacon on 435.090 MHz.

OSCAR 8 is in Mode A on Mondays and Thursdays, Mode J on Saturdays and Sundays, and both modes simultaneously on Tuesdays and Fridays. As with OSCAR 7, Wednesdays are reserved for experiments.

OSCAR 7 ORBITAL INFORMATION FOR FEBRUARY

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
28430	1	0050:07	88.5
28443	2	0144:22	102.1
28455	3	0043:40	87.0
28468	4	0137:55	100.5
28480	5	0037:14	85.4
28493	6	0131:28	99.0
28505	7	0030:47	83.8
28518	8	0125:02	97.4
28530	9	0024:20	82.3
28543	10	0118:35	95.8
28555	11	0017:53	80.7
28568	12	0112:08	94.3
28580	13	0011:27	79.1
28593	14	0105:41	92.7
28605	15	0005:00	77.6
28618	16	0059:15	91.1
28631	17	0153:30	104.7
28643	18	0052:48	89.6
28656	19	0147:03	103.2
28668	20	0046:21	88.0
28681	21	0140:36	101.6
28693	22	0039:54	86.4
28706	23	0134:09	100.0
28718	24	0033:28	84.9
28731	25	0127:42	98.5
28743	26	0027:01	83.3
28756	27	0121:16	96.9
28768	28	0020:34	81.7

OSCAR 7 ORBITAL INFORMATION FOR MARCH

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
28781	1	0114:49	95.3
28793	2	0014:07	80.2
28806	3	0108:22	93.8
28818	4	0007:40	78.6
28831	5	0101:55	92.2
28843	6	0001:13	77.0
28856	7	0055:28	90.6
28869	8	0149:43	104.2
28881	9	0049:02	89.1
28894	10	0143:16	102.6
28906	11	0042:35	87.5
28919	12	0136:50	101.1
28931	13	0036:08	85.9
28944	14	0130:23	99.5
28956	15	0029:41	84.4
28969	16	0123:56	97.9
28981	17	0023:14	82.8
28994	18	0117:29	96.4
29006	19	0016:47	81.2
29019	20	0111:02	94.8
29031	21	0010:20	79.7
29044	22	0104:35	93.2
29056	23	0003:54	78.1
29069	24	0058:08	91.7
29082	25	0152:23	105.3
29094	26	0051:41	90.1
29107	27	0145:56	103.7
29119	28	0045:15	88.5
29132	29	0139:29	102.1
29144	30	0038:48	87.0
29157	31	0133:02	100.6

OSCAR 8 ORBITAL INFORMATION FOR FEBRUARY

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
14834	1	0006:31	58.8
14848	2	0011:19	60.0
14862	3	0016:06	61.2
14876	4	0020:54	62.5
14890	5	0025:41	63.7
14904	6	0030:28	64.9
14918	7	0035:16	66.1
14932	8	0040:03	67.3
14946	9	0044:51	68.5
14960	10	0049:38	69.8
14974	11	0054:25	71.0
14988	12	0059:13	72.2
15002	13	0104:00	73.4
15016	14	0108:47	74.6
15030	15	0113:35	75.8
15044	16	0118:22	77.0
15058	17	0123:09	78.3
15072	18	0127:56	79.5
15086	19	0132:44	80.7
15100	20	0137:31	81.9
15114	21	0142:18	83.1
15127	22	0003:53	58.5
15141	23	0008:40	59.8
15155	24	0013:27	61.0
15169	25	0018:14	62.2
15183	26	0023:01	63.4
15197	27	0027:48	64.6
15211	28	0032:35	65.8

OSCAR 8 ORBITAL INFORMATION FOR MARCH

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
15225	1	0037:22	67.0
15239	2	0042:09	68.3
15253	3	0046:56	69.5
15267	4	0051:43	70.7
15281	5	0056:30	71.9
15295	6	0101:17	73.1
15309	7	0106:04	74.3
15323	8	0110:51	75.5
15337	9	0115:38	76.7
15351	10	0120:24	78.0
15365	11	0125:11	79.2
15379	12	0129:58	80.4
15393	13	0134:45	81.6
15407	14	0139:31	82.8
15420	15	0001:06	58.2
15434	16	0005:53	59.4
15448	17	0010:40	60.6
15462	18	0015:26	61.9
15476	19	0020:13	63.1
15490	20	0024:59	64.3
15504	21	0029:46	65.5
15518	22	0034:33	66.7
15532	23	0039:19	67.9
15546	24	0044:06	69.1
15560	25	0048:52	70.3
15574	26	0053:39	71.6
15588	27	0058:25	72.8
15602	28	0103:12	74.0
15616	29	0107:58	75.2
15630	30	0112:44	76.4
15644	31	0117:31	77.6

FUN!

John Edwards WB2IBE
78-56 86th Street
Glendale NY 11385

DXing! Some call it a passion, others call it an addiction; many call it nothing at all and blithely work W8s and KA6s. Whatever your personal opinion, it's evident that DXing is a primary motivating force behind all of amateur radio. After all, even if you don't work DX, chances are it still directly affects your day-to-day hamming. (Ever try to work a friend in another state on 14.210?)

When did DXing start? Probably the first time a ham attempted to work a station over a distance greater than to his neighbor. Legend has it that the first pile-up occurred the following day. Want to learn more? Read on.

ELEMENT 1—CROSSWORD PUZZLE (Illustration 1)

Across

1 Famous DXpedition island
8 Lebanese prefix
9 Prefix of 1 across
10 Japanese rig: rice______
12 Father Moran's country
14 Over
15 Greenland—MARS prefix
16 Region 1 continent (abbr.)
19 International radio regulators (abbr.)
20 Ten, at night, on cycle's bottom
21 Greek prefix
23 DXer's reaction to hearing a new country
26 Home QTH for many
28 OSCAR group (abbr.)
30 Morse question mark
31 Egyptian prefix
33 Italian prefix
34 Time when you want QSLs
37 Foreign QSL clearinghouse (2 words)
41 WARC site
43 Four-land state (abbr.)
44 Good night (abbr.)
47 DX operating technique (2 words)

Down

1 Competitive pastime
2 Mystery signal (abbr.)
3 DX operating trap
4 Rig's output (abbr.)
5 5V-land
6 Noise blanker (abbr.)
7 New country journey
11 Greenland prefix
13 Canadian Island (abbr.)
17 ______ the list
18 Rare DX makes this
22 Test item (abbr.)
24 Operating establishment (abbr.)
25 Turkish prefix
27 Top scorer in DX contest
29 Get on the ______
35 Austrian prefix
36 Eight-land state (abbr.)
38 Revilla Gigedo's prefix
39 Radar image
40 Soviet prefix
42 CW "once more"
45 No good (abbr.)
46 Irish prefix

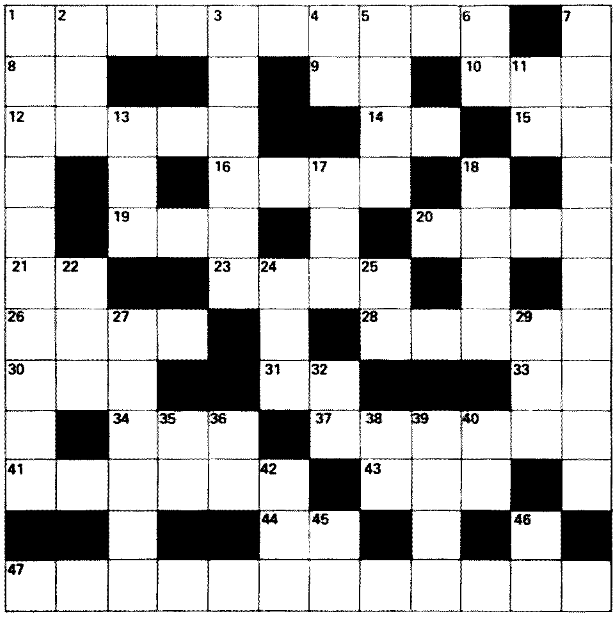


Illustration 1.

ELEMENT 2—MULTIPLE CHOICE

1) On what frequency will you find the Afrikaner Net?
1) 14.230 MHz
2) 14.250 MHz
3) 21.355 MHz
4) 28.510 MHz

2) WWV transmits solar activity bulletins:
1) 12 minutes before the hour
2) 18 minutes before the hour
3) 18 minutes after the hour
4) WWV does not transmit solar activity bulletins

3) We are currently experiencing solar cycle:
1) 21
2) 41
3) 610
4) 20

4) 160-meter DXers have to compete against LORAN generated QRM to find weak signals. Although this nuisance is now on the way out, it still pays to know your enemy. Therefore, what is LORAN an acronym for?
1) Liquid Oxygen Radio—And Nitrogen
2) Long Range Navigation
3) Low Ocean Radiation Aided Navigation
4) Long Radio Antenna

5) Which country listed below does not have a third-party agreement with the US government?
1) Cuba
2) Bolivia
3) Israel
4) Belize

6) Who was the first amateur to snag DXCC on 6-meters?
1) WB2LWJ
2) W2IDZ
3) W6AM
4) No amateur has ever worked 100 countries on 6

7) What phone frequencies are allocated to European (except Soviet) amateurs?
1) 3.6-3.8 MHz
2) 3.5-4.0 MHz
3) 3.5-3.8 MHz
4) 3.7-3.8 MHz

8) The term "master of ceremonies" (MC), when applied to DXing, refers to:
1) A DX operator
2) A QSL manager
3) A person in charge of organizing a DX list
4) A lid who disrupts a net

Continued on page 115

LETTERS

BASH VS. FAA

The letters in reply to the September article on Dick Bash indicate there are many different views on the propriety of his publishing the questions and answers to the various amateur radio tests.

It is interesting to note that at least two readers had comparisons with the FAA written tests, and I agree in principle with Mr. Remont and his opinion, "You must literally learn the test" in order to pass them.

Mr. Hauser, however, has not done his homework regarding manuals on the FAA written tests. I've identified at least 16 written test guides published by the FAA itself. These test guides cover the pilot written tests from private pilot to airplane transport ratings, the instrument and instructor ratings, plus flight engineer and navigator ratings.

Most of the later FAA written test guides are formatted very similar to the actual written tests, with the subject areas corresponding to those on the test, including questions that may even be word for word with the actual test questions, even to the four multiple-choice answers.

On the last FAA written test that I took, the commercial pilot exam, I believe that 32 of the 60 questions on the test were identical to the ones in the study guide. But bear in mind that the FAA has a slightly different approach to their written tests. The actual test booklet has, in the case of commercial pilot, 600 questions, but the test itself has only 60 questions, and the test sheet given to the applicant indicates which of the questions the applicant must answer.

The FAA written test guides do not have the answers indicated, but at least two aviation ground school operations have published answers and explanations in booklets available to the public. In addition, any pilot wishing to take weekend "cram" courses for an exam can find them within easy driving distance almost any weekend.

Yes, I suppose a person could pass an FAA written exam by memorization. But if a person memorized the 600 questions, surely he would have some understanding of what the FAA requires an airman to know.

But there is one more thing to consider. An applicant for an FAA written test has to produce evidence, a certificate or statement from a flight or ground school instructor that the applicant has undergone a course of instruction preparing him for the exam to be taken. This precludes an airman from simply memorizing the test guide, and then taking the FAA written test.

I hold a commercial pilot's license with multi-engine, land, and instrument ratings.

Sheldon Daitch WA4MZZ
Greenville NC

HORDES OF LIDS

I would like to comment on certain readers' reactions to Dick Bash's interview in *73*: How soon we forget! Anyone who remembers the old (small-format, black-cover) *ARRL License Manual* will recognize Bash's book as approximately the same thing only with more accurate questions/answers. I don't remember anyone taking the League to task for publishing the old-format *Manual* (not to be confused with the new one which might teach theory but does nothing to help you pass the test). And, what of those "schools" that drill you on questions and answers so you can pick up a First Phone? I've met graduates of these "schools" that barely know the difference between ac and dc!

I, like most who took the Extra, noticed that technical competence alone would not get you a passing grade—you needed to know how to interpret the confusing semantics of the test questions.

As for the fears that the Bash approach of licensing will produce hordes of lids, I would like to have those of you who feel this way tune in to the average DX pile-up on the low end of 20m phone. And a lot of these guys are old-timers! You'll notice that the FCC exam says nothing about tact, diplomacy, etc., in operating!

Amateur radio is something that is learned by doing, not memorizing. If you have to memorize to pass the test, so what! Your real learning begins the moment you first press a transmit switch.

Fred Heisler K5FH
New Orleans LA

PASS THE WORD

We departed California on 1 October, 1980, and flew directly to Athens, Greece. The next 10 days were spent clearing customs and obtaining our licenses.

It was only through the efforts of SV1JG and SV0AA that we got our licenses that fast. Anyone going to Greece should apply at least 2 months before arrival.

We got on the air from Crete Island as W6KG/SV9 on 12 October and by 26 October we had 9500 QSOs, half phone and half CW. We worked stations in 142 countries and were on all bands permitted in Greece.

160 meters is not permitted yet for use by Greek amateurs. Operation on 40 meters is limited to 7000 kHz through 7100 kHz, and on 80 meters to 3,500 kHz through 3,600 kHz. We were on 48 hours in the *CQ* World-Wide phone contest and made the highest score for Crete.

The tourist business is a major industry in Greece, and, as a result, all of the islands have great numbers of hotels and everyone in the hotels and shops speaks English.

We try to use Lloyd's call in one country and Iris's call in the next. From here, we go to Rhodes Island in the Dodecanese and will use Iris's call there as W6QL/SV5.

We expect to be on the air almost continuously for 6 months—please pass the word to everyone.

Lloyd Colvin W6KG
Iris Colvin W6QL
Castro Valley CA

FINALLY PASSED

I'm sure that by this time everyone is tired of reading letters about FCC exams and Dick Bash, but if you will permit me, I should like to offer some of my observations and experiences.

After failing the General class exam three times, I was sorely tempted to buy a copy of *The Final Exam*. All that prevented me was the fact that the publication was unavailable. All stores and mail-order companies were sold out and had no idea when new copies would be available, since a revision was in the works due to new FCC exams.

Why was I so tempted? Here's why: The second time I failed the test, I went home and wrote down the gist of every question I could remember from the test. I came up with 47 out of 50. I still failed! My contention, and my biggest complaint, is I failed simply because I had no way of knowing which answers were wrong! Since the FCC examiner will not allow applicants to see their corrected tests, I think I kept missing the same 14 questions!

When I finally passed this week, I missed 9, but I sure couldn't tell you which 5 questions I finally answered correctly! I guess I was lucky to pass at all, but since I was given the exact same exam every time, maybe I just finally eliminated all the wrong answers on the "guess" questions. (Four possible answers, four attempts; the law of averages caught up with me.)

I'm sure that some will say that since I had managed to remember most of the questions, I should have been able to research the correct answers, but the FCC "trick," or what I considered to be vaguely worded questions, defied research. I asked my husband (a long-time electronics and radio hobbyist), Advanced class hams, and even my brother-in-law, who just spent four years working communications in the Navy, and could come up with no answers. I am not an electronic-minded whiz kid, and I guess I'm just lucky the General exam is mostly rules, regulations, and propagation. Otherwise I would be a Novice for life.

I know that there are amateurs who have no use for the "social" operators, but I am proud to be a radio amateur, and though I have great respect for anyone holding an amateur license (especially Advanced and Extras), I feel that I am, in my own "social" way, contributing to the "advancement of skills in

Continued on page 122

NEW PRODUCTS

NEW AUTOMATIC ANTENNA TUNER

A new automatic antenna tuner for use with amateur, commercial, and government communications systems has been introduced by the J. W. Miller Division of Bell Industries.

Auto-Track Model AT2500 antenna tuners can handle power in excess of 2500 Watts PEP over a frequency range continuous from 3 to 30 MHz. Average automatic tune-up time is 15 seconds.

Front panel switch positions permit the use of three coaxial antenna outputs, one long-wire antenna, and one coaxial tuner bypass. Impedance is 10-300 Ohms. A direct-reading swr meter on the front panel is calibrated from 1:1 to infinity.

The panel meter displays rms power with continuous carrier and automatically displays peak when in the SSB mode in ranges of 0-250 Watts and 0-2500 Watts.

Additional information may be obtained from Curt Henius, *J. W. Miller Division of Bell Industries, 19070 Reyes Avenue, Compton CA 90224.* Reader Service number 483.

FT-480R TWO-METER SSB/CW/FM TRANSCEIVER

Yaesu's FT-480R is a compact SSB/CW/FM transceiver for the two-meter operator. Rated at 30-Watts PEP input on SSB, 30-Watts dc input on CW and FM, the FT-480R covers 143.5-148.5 MHz, with two vfos providing coverage of repeaters not using the standard +600-kHz split which is built into the set. The microcomputer circuitry built into the FT-480R allows ease of operation. For example, when tuning on SSB/CW, the frequency synthesizer automatically tunes at 10 Hz, 100 Hz, or 1 kHz per step (three rates available), or 1 kHz, 20 kHz, and 100 kHz per step on FM. At the flick of a switch, you can zero the display to an even-channel step (when switching from SSB to FM), thus avoiding the nuisance of being a few hundred Hertz away from a "standard" channel when changing modes.

The rig has four memories with priority channel operation, scanning from the microphone, a noise blanker, high/low power selection on CW/FM, and provision for changing frequency during transmission. A matching external power supply, the FP-80, is available for ac operation.

For further information, write *Yaesu Electronics Corporation, 15954 Downey Ave., PO Box 498, Paramount CA 90723.* Reader Service number 482.

The FT-480R two-meter SSB/CW/FM transceiver.

THE 173D PRESENTATION MODEL CLOCK

Benjamin Michael Industries, Inc., has announced the addition of the 173D Presentation Model clock to its line of quartz digital timepieces. The 173D will be of particular interest to those involved in the aviation or communications industries where both local and Greenwich Mean Time (Zulu) is needed.

The 173D is a wall or desk piece which contains two independent digital electronic clock movements. Greenwich Mean Time is displayed in the proper 24-hour military time format while local time is simultaneously presented in a 12-hour format with am/pm indicators. Both large displays are of the LCD type for easy viewing and low power consumption. The 173D features quartz-crystal accuracy along with one year of operation on a single, standard penlight battery. The clock comes in a solid walnut case; the face plate is gold anodized, brushed aluminum.

For more information, contact *Benjamin Michael Industries, Inc., 65 East Palatine Road, Prospect Heights IL 60070.* Reader Service number 480.

NEW TEN-TEC DUMMY LOAD IS AIR COOLED

A new rf dummy load from Ten-Tec is air cooled for clean, easy use around the shack in testing and alignment. It is rated at 300 Watts for 30 seconds. A derating curve is included for using the dummy load over periods of time up to a 5-minute maximum.

Vswr is 1.1:1 maximum from 0-30 MHz and 1.5:1 maximum from 30-150 MHz.

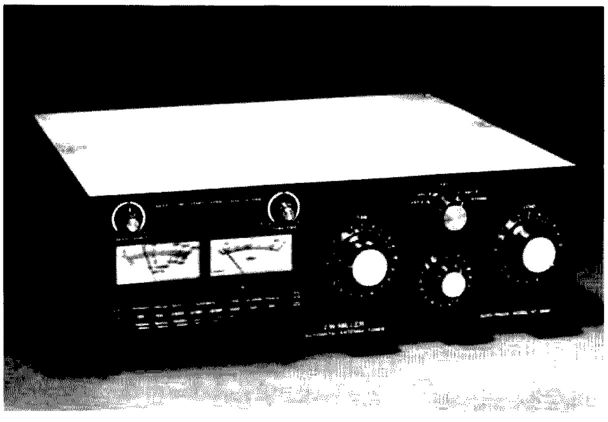
The Model 209 weighs ½ pound and is housed in a 1¾"H × 2¼"W × 6¾"D aluminum enclosure that is perforated with wide slots for free air flow and dark-painted for more effective heat dissipation. An SO-239 coax connector is built in for convenient installation.

For more information, contact *Ten-Tec, Inc., Highway 411 East, Sevierville TN 37862.*

NEW HAMTRONICS KITS

Hamtronics® has announced a new single-channel UHF FM exciter called the model T451. Patterned after the T450 exciter, the new unit is rated at 2-Watts continuous output and is contained on a 3 × 5½ inch PC

Continued on page 120



A Bell Industries antenna tuner.

The Benjamin Michael 1730 Presentation Model clock.

REVIEW

CROWN MICROPRODUCTS ROM-116 RTTY INTERFACE AND OPERATING SYSTEM

There are many changes and technical improvements taking place in amateur radio these days, and some of the most profound changes are in the field of radioteletype (RTTY). One could say that the electronic revolution is taking place a little late in RTTY, but there can be no question about it; it is taking place. The noise and aggravation of mechanical RTTY gear has kept many hams from trying out this fascinating mode, but it is time to reexamine the situation. Electronic technology is arriving in force, and there are several manufacturers producing totally silent RTTY equipment that either incorporates a microcomputer on board or interfaces with one of the popular microcomputers such as the Apple, TRS-80, Pet, etc. There are many advantages other than silent operation, however, and the Crown Microproducts ROM-116 RTTY interface and operating system is a perfect example of what can be done with a microcomputer. With no further delay, let's examine this system and find out how easy and, indeed, how much fun RTTY operation can be.

The ROM-116 is an interface board and computer program that allows a TRS-80 microcomputer to operate as a computerized solid-state teletype machine. You connect a transceiver and demodulator to the ROM-116 and the ROM-116 to your TRS-80, and you will be very close to RTTY heaven. The capabilities of the system are almost unbelievable; it appears to incorporate every feature the avid RTTY operator could desire, yet it is not a complicated system to operate.

Like many RTTY systems with video displays, the ROM-116 operates with a split-screen system. Received text is displayed on the top half of the monitor, and a message can be pre-typed in the advanced typing mode on the bottom portion. On the right side of the screen is a continuous display of program status, letting you know whether you are in the receive or transmit mode, in the ASCII or Baudot mode, baud rate, line printer on/off, and a host of other informational items. A quick glance at the status display will reassure you that everything is doing what it's supposed to be doing (or it will warn you that it's not!). Also displayed on-screen is the date and time. This information is simply entered via the keyboard whenever you power-up the system. The date and the correct time will then appear on the screen, and each time the system automatically Indentifies, the date and the correct time will be transmitted. A nice touch!

If you look at the picture for more than a second, you'll realize that the ROM-116 has only one switch: the power on/off switch. That's right, friends, the ROM-116 accomplishes everything under software control. Each of the many functions that this unit performs is selected by typing a code into the keyboard. All commands use a shift and a character, so it is unlikely you'll tell it to do something by accident. If you enter a shift T, for example, the computer will turn on the transmitter, send a CW ID, and then send anything you have typed into the text buffer. Shift K will accomplish the same thing, only a CW ID will not be sent unless it has been ten minutes since the last ID. This thing even keeps you legal!

All the other functions of the ROM-116 are accessed in the same manner. Like many other products in our digital age, you'll have to commit the command codes to memory or else use a cheat sheet that tells you what to enter for a particular function. At first, you might wish that separate switches had been used for each function, but as you grow accustomed to the system, you'll be thankful the ROM-116 uses the direct keyboard entry system for all commands.

With this system, you'll have plenty of commands! The program allows for three memory buffers. If you have a 16K TRS-80, the main text buffer will hold about 7,000 characters. A general-purpose buffer for brag tapes, CQs, and anything else you send frequently holds approximately 2500 characters. Finally, there is a callsign buffer that will hold up to 140 characters. All these memories are held in the computer, not on tape, so you don't have to go through a complicated loading procedure every time you want to send the contents of a particular buffer. If you program all the pertinent details about your station into the brag-tape buffer, you can send that information at any point in the text by typing "shift C". Naturally, while that buffer is being sent, you can continue typing into the main text buffer. As soon as all the information in the brag-tape buffer is sent, the system will send whatever else you've typed in. The callsign buffer works the same way. Anyone who has used a cassette-tape lash-up to store messages will quickly appreciate this ease of operation!

You can, however, use the TRS-80 cassette tape recorder for simple and dependable storage of incoming data, and this brings us to one of the most fascinating features of the ROM-116.

When you initialize the system for the first time during an operating session, you are asked to enter a selcal code. This can be a word, a number, or any combination thereof. Now suppose you leave the shack someday, with your equipment turned on and tuned to 14.100 MHz. If anyone transmits QST, your call, or your selcal code on this frequency, the received text will be written to cassette, following the receipt of four Ns. The system will ignore any other activity that takes place on that frequency. But wait, it gets better! If someone sends your selcal code and the letters ZM, *your* system will switch over to transmit, CW ID if necessary, and send whatever you have typed into the general-purpose buffer. "ZQ" will send 10 lines of "quick brown fox," "ZW" will send "WRU", and "ZY" will send 10 lines of "RYRY". Pretty impressive! When you come home, play back the tape and see what your friends (or enemies) have sent you. It doesn't take too active an imagination to think of all the fun you can have with this.

At this point you probably are worried about hooking up all this glorious luxury. Surprisingly, it doesn't take long at all. I do encourage anyone hooking up this system for the first time to read the manual *very* carefully. The manual is very complete and well written; nothing is left to chance. Although my experience with microcomputers and RTTY gear was somewhat limited at the time, I had no difficulties hooking up the various control cables. Everything went smoothly and worked the first time. Once you have had the system for a while, you might want to examine the back section of the manual and try out some of the goodies that can be done with the ROM-116. Modem operation, TRS-80 as a host computer, and operation on time-sharing systems are just some of the things that are possible.

While the forte of the ROM-116 is RTTY, it comes with a pretty sophisticated CW program as well. Received copy was acceptable, but to quote

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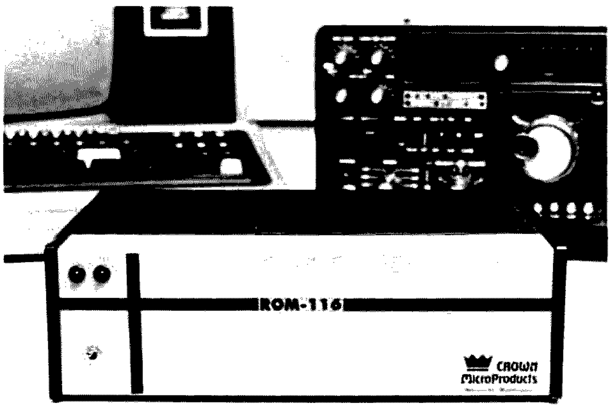

The Crown Microproducts ROM-116 RTTY Interface and Operating System.

Dwight Ernest KA2CNN/AAR2DE
Sandra Kynes-Ernest KA2DBW
223 West 21st Street, #4H
New York NY 10011

Winter Olympics Torch Run

—a one-year perspective

Editor's Note: In the May, 1980, *QST*, one participant's view was presented ot amateur radio's part in the Winter Olympics Torch Relay Run. Due, in part, to more detailed explanations of the project's complexity and the many amateurs' responsibilities, we believe the story presented here lends a different perspective to and perhaps better captures the spirit of involvement of all those who had a hand in this historic event.

Amateur radio made important contributions last year to the Olympic effort at Lake Placid. A great deal of traffic handling and commemorative operating took place with the Winter Olympic Radio Amateur Network (WORAN) and its station, WØRAN. Amateurs also performed admirably during the Winter Olympic Torch Relay Run.

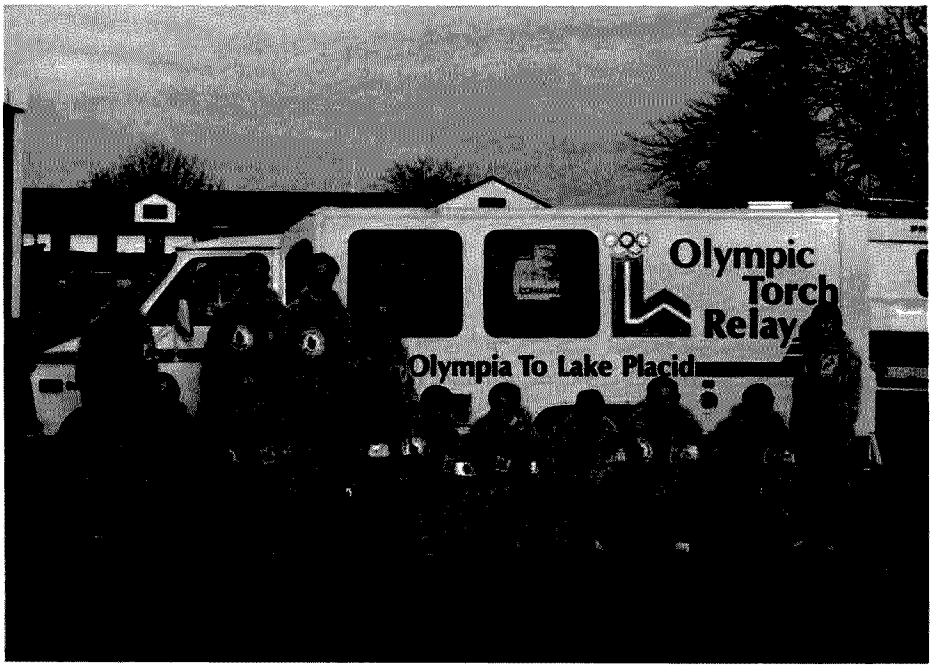

Photo A. The beginning amateur operating contingent in Yorktown poses for the obligatory group shot. Standing from left: W1RM, WA3PZO, KB3HF, KA2DBW, WB1ADL (on right); kneeling from left: WB3HWZ, K2AMU, KA2CNN, WB3EOU, WB3LGC, WA2DHF, WB2VUK, K2AV.

We were among the amateur operators who were chosen to accompany the Olympic Torch from Langley AFB to Lake Placid between January 31 and February 8. There were over 1,000 miles and nine days of extraordinary operating, mostly on VHF. It demanded all the skill and combined experience we had in contesting, traffic handling, and high-speed tactical communications. It was something none of us will ever forget, and something the entire amateur community can be proud of.

Early in 1979, the Lake Placid Olympic Organizing Committee (LPOOC) approached the ARRL. They needed experienced communicators to provide reliable communication for the vehicles involved in the Torch Relay Run. The Run had been organized, in an attempt to publicize the coming of the Olympics to the US and to Lake Placid,

s a combined public relaons and educational efort. It would be the first me the genuine Olympic ame, kindled in the temle of Hera from the rays of ne sun in Olympia, Greece, ad been on American soil he earlier Olympic flames lisplayed in this country vere ceremonial dupliates). Ham radio was re,arded as the most approriate source for trained perators for a number of easons, not the least of vhich was the fact that iams, like the athletes, are killed amateurs who sacriiced a great deal of time ind money for the thrill of ublic service contribuions and competition.

It was a tall order to fill. Over 75 people in 11 veicles, some of which would be as far as 100 miles apart, were needed to keep in touch constantly to coordinate their many and varied activities. Each little town on the Relay's route had planned its own ceremony to honor the passing of the torch, and these ceremonies needed to be coordinated with the scheduling, the program, and the safety requirements of the moving caravan within which the torchbearers were to run. This coordination would have been impossible through any medium other than ham radio. Lunches had to be found and picked up, and then the vehicle with the lunches had to find the moving caravan again. Ham radio had to deal with scouting for fuel, with command and policy communications, vehicular repairs, rest-room stop arrangements, and liaison with state and local law enforcement agencies. Literally hundreds of events each day had to be controlled in a coordinated fashion.

Safety communication was our highest priority. With eleven vehicles on two-lane roads in curving, hilly terrain, allowing vehicles to pass around the caravan became a problem. If the torchbearers stumbled, the entire caravan would have to come to an immediate halt to avoid running over them. Crisp, sharp—and secure—communications clearly were required. Bad weather had to be anticipated—but we were lucky in this potential problem area.

The operators who were chosen to accompany the torchbearers and staff were selected on the basis of their experience in contest operating (which bore many similarities to the type of operating we would be undertaking), traffic handling, and walkathon- and marathon-type operating. It included many with experience handling communications for the New York City Marathon, including the communications coordinator for that event, Steve Mendelsohn WA2DHF. The hundreds of amateurs who provided invaluable support communications along the route while the caravan was in their area are regrettably too numerous to be mentioned. The traveling operators were drawn mostly from the upstate New York, northern New Jersey, New York City, Baltimore, Philadelphia, Wilmington, and southern Connecticut areas.

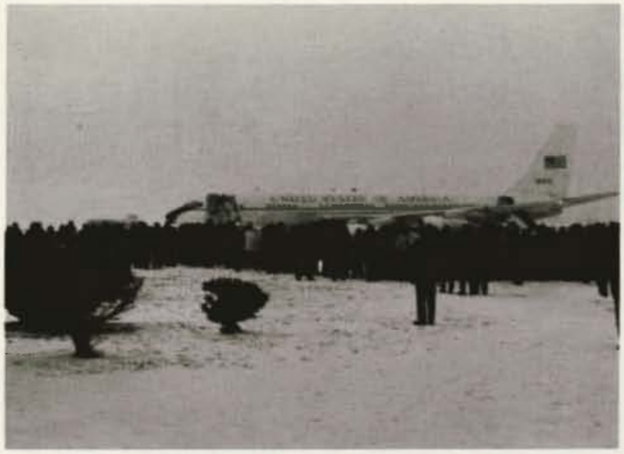

Photo B. The early-morning arrival of the Olympic flame, during a snowstorm, in a State Department aircraft similar to Air Force One, on January 31, 1980, at Langley Air Force Base.

The runners numbered 52—one from each state plus one each from the District of Columbia and Lake Placid. Evenly divided between men and women, they were chosen from

Literally scores of amateurs and their families along our route helped in various support capacities, performing tasks ranging from repair of broken rigs to transportation of emissary runners from place to place, to donations of equipment for our temporary use, to relay from VHF to HF to maintain our contact with WORAN and Link Nixon in Lake Placid. Although it would be impossible to acknowledge all of those who played important roles in this effort, here are the calls of many without whom the traveling team would have been isolated and crippled.

Maryland, Delaware, District of Columbia						
K3AHB	W3BCN	KA3BKW	WA3BPC	W3ENL	W3FA	K3HBP
WB3FOE	WB3GXD	WA3HQX	W3JAC	W3KDD	W3NFS	WB3ENF
K3RA	K3RKU	AE7T/3	W3TCI	W3XE	K3UAV	WR3ABA
WR3AFM/W3RUN				WR3ADH		
Virginia						
WA4CCK	N4NK	K8LGA	WR4AAD	W3BBN/4	N4CCF	WD4FTK
KA4FVB	KA4GAV	WB4MAE	K4MU	W4NTG	WA4RBC	WB4SHK
WB4UHC	K4BKX	WR4AFT	WR4BBZ	WB4DNT/R	W4NTG/R	K4VYN/R
W4ZA/R						
Pennsylvania						
WA3AOP	N3AYK	WB3ELA	W3NWA	WA3PZO	AG3R	
and literally hundreds of other hams...						
New Jersey						
K2ASF	K2ASG	N2BBL	AA2C	KA2CHM	KA2DOH	WB2ZRU
KB2ET	N2GJ	N2GX	AA2H	KB2HM	WB2HON	K2ASF/R
WB2HZR	WB2JHN	K2JJM	AF2L	WB2LCC	WA2MVQ	AF2L/R
WB2SZI	WB2TZS	K2UL				
New York						
N2DU	N2FU	K2GDX	W2GH	W2GN	W2CS	WA2AAU
W2HQW	WB2JDD	WA2JHJ	WA2KDE	WB2NEA	W2ODC	W1BQO
WB2PID	KA2Q	WB2QCJ	K2RJN	WA2RXQ	W2SZ	WB3BPU
KB2T	K2TR	W2TJ	WA1UGE/2	WB2VJC	W1VSA	WB2CFP
WA2WNI	N2YL	WA1ZYV/2	WR2ABB	WR2ACD	WR2ADZ	WB2CJS
K2AE/R	WR2AFS	WR2ALY	W2CXX/R	WA2CZT/R	WB2ERS/R	W2LWX/R
WB2FNV/R	W1KOO/R					

Photo C. One of the Chevy Trans-Sport custom vans used for Ceremonial, Command, and other positions. Having a fiberglass body, it required our own ground-plane metallic base with 19-inch radials attached to the body with duct tape.

among 6000 applicants on the basis of personal interviews, essays, and their running ability. They ranged in age from 15 to 54 years old. They were organized into four teams of 13 runners each, with two teams assigned running duty each day and the two off-duty teams given emissary functions. The emissaries traveled ahead of the caravan making public appearances at churches, schools, and service and social clubs, speaking about the Olympic spirit and the Relay Run itself. Officially, each runner ran between three and five miles each day, but many frequently ran alongside the torchbearer or ran after we stopped for the night.

Like the hams, the runners made the effort required for the run at their own expense, receiving only a uniform, meals, and lodging for the duration of the run and of the Olympics. Additionally, and perhaps most prized, were the Olympic participation medals we all received, along with certificates of appreciation. Runners and hams alike either took extended vacation or leaves of absence from their work to take part in this rare opportunity. Any distinction between the two groups soon faded in view of the shared excitement and sacrifice and was further eroded as the runners watched the amateurs in operation and the hams watched the runners in all weather, on all terrain, bearing the torch to Lake Placid. A great, solid bond of mutual respect developed after only a few hours.

Following personnel selection, there was a period of discussion and practice. The runners got together in Lake Placid in the summer of 1979 to practice the technique they would be using and to get to know one another better. The hams weren't so lucky where lead time was concerned. After an initial organizational meeting on the hard, cold floor at Rockefeller Center in Manhattan—to which many drove long distances—we practiced with a small group of the runners. This practice was a test of the last day of the Relay Run from Fort Ticonderoga to Lake Placid on the Albany East route, with a day-long recap and critique over the weekend of December 8-9. This full-scale test was invaluable for the technical and organizational lessons we learned there. Without it, we would have been ill-prepared for the coming trial.

We learned that because of the volume of traffic on the circuits, we would have to plan for two nets in simultaneous operation. We chose 2 meters due to the availability of equipment, although later we were to use 220-MHz simplex for part of the operation. One net would provide a low-power circuit for internal caravan safety and coordination on simplex. The other would provide a circuit for the external group of vehicles (described below), using higher-powered rigs and, where possible, using repeaters. Because of the proximity of the two nets in the same band, there were, inevitably, problems with desense and FM sideband noise.

Luckily, Dick Frey WA2AAU joined the practice group at the last minute. A competent home-brewer and technician, Dick constructed solutions to the desense and sideband problems in the short period between the practice and the real thing. He planned and built a narrow passband filter—a very sharp one—with a bandpass from 144.250 to 144.450 for use with the low-power internal frequency transceiver. Additionally, he procured and critically tuned a resonant cavity setup for use with the external net high-power transceiver, to notch out the 144.2-144.5 band. In use for almost three weeks under very harsh and demanding operating conditions, they performed flawlessly and were the ideal answer to our problems. Without Dick's effort, his advice, oodles of his own equipment (220- and 2-meter rigs and antennas), and his investment in time, gasoline, and money in this effort, it would not have worked out.

Dick's equipment was used with two UV3s loaned from Drake for the event, both of which performed perfectly in the demanding environment. Side by side, both on 2 meters, just 18 inches and 1½ MHz away from one another, with only 3 to 4 feet separating antennas on the roof of the vehicle, intermod and desense between the two rigs was so insignificant as to be almost unmeasurable. We were very pleased with both Dick's filter setup and with the performance of the Drakes. That company was also generous in the loaning of a TR7 with matching vfo and transmatch for use in our HF setup, described below.

Other companies also loaned various items of equipment for our use. Kenwood generously loaned four of their new TR-2400 synthesized handies with chargers, Tempo came through with four of their dependable S-1 handies with chargers, and Larsen loaned at least a dozen quarter-wave mag-mount antennas for 2 meters. Needless to say, synthesized equipment was the order of the day, and we all brought along what we owned if it could be put to work in the effort. Longer-range vehicles needed 5/8-wave antennas, and they were supplied by members of the team who owned them. Mobile rigs ranged from Heathkit 2036s to Icom, Yaesu, KDK, and Tempo equipment. One Yaesu FT-207R also made the trip in the hands of KA2DBW, and in the police liaison position it performed flawlessly on 75% charge, 200 mW, 15% duty cycle for 8-10 hours.

The eleven caravan vehicles—and their corresponding communications

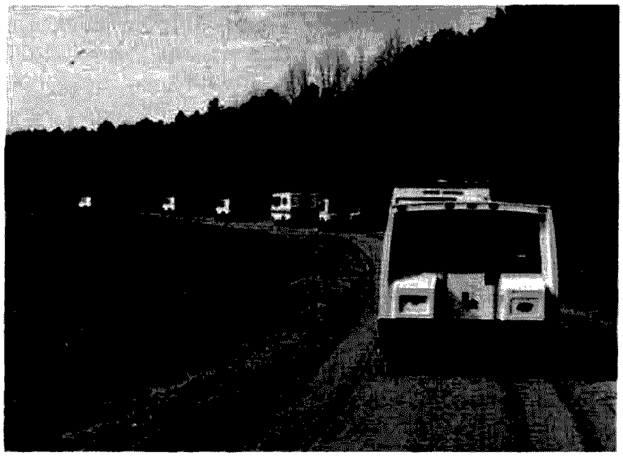

Photo D. *The arrangement of the caravan during a practice, showing the order of the vehicles, with the torchbearers visible in front of the second (Command) vehicle.*

Photo E. From left, WA2DHF and KB3HF after about 30 hours as net controls.

positions—all had specific duties to perform. They were organized into an internal and external group. In order of their travel, the police vehicle came first. (We called it "PD" on the air; although we identified every ten minutes, the circuit was so busy that we referred to vehicle designations rather than callsigns.) Usually PD was a state police car in which one of our team members was placed to provide liaison between the caravan and the state police and, through their communications system, usually with local jurisdictions, also. This vehicle changed periodically, of course, not only at state or barracks boundaries, but also as different patrolmen were relieved, since our hours far outlasted their shifts. This fact, and their prohibition against the installation of any electronic gear not under their control, required the use of an op with an HT. In some states, getting the state police to agree to our placement of an op in their vehicles was like pulling teeth. But for both the liaison function—indispensable in itself—and for safety reasons, it was a requirement of the Director of the Run and, ultimately, every jurisdiction agreed.

Usually, the vehicle behind PD was the Pace vehicle. Its personnel were responsible for keeping the pace for the very tight schedule under which we were operating and for navigating the course from a detailed computer printout. Although the runner set the pace, the personnel in this vehicle could suggest, through their PA system, that the runner pick up the pace or slow it down. They communicated the position by checkpoint number to the Director at every checkpoint and gave speed instructions to the other vehicles. They also were responsible for the calculations of ETAs at upcoming events. All of this, of course, made for a rather high volume of traffic on the circuit both to and from this vehicle.

The torchbearer with his/her accompanying entourage, often including local guest runners and, sometimes, flagbearers (and even the occasional ham!), followed the Pace vehicle. Here a very delicate compromise had to be struck. Barred from Interstates because of our 8-minute-mile pace, we were traveling on two-lane roads. Oncoming traffic, only a few feet to the runners' left, sometimes passed slowly, rubbernecking, but more often apparently was oblivious to our slow-moving caravan despite the rotating police beacons. We were moving closely together, and off as far to the right as the shoulder would allow, but a great deal of traffic was backed up behind us most of the time. We frequently were pulled off the road by the police (when there was room to accommodate the entire caravan) to allow this traffic to pass, but we had the frequent problem of the maverick crazy driver who decided his need to get around us was greater than his own life's value.

Usually, it seemed, these maniacs pulled out on curves. Soon discovering that our long, tight caravan and oncoming traffic prohibited their passing, they would abort the pass halfway into it and try to squeeze into our group. We could usually accommodate these turkeys with minimum angst; more dangerous were the times when the driver would use what to him appeared to be the only available clear spot in the caravan—which, of course, was occupied by our torchbearer.

For this reason, we kept the Pace and Command vehicles, with the runner(s) in between, as close as possible. This brought up another safety problem: If one of the runners stumbled, the Command vehicle could (and on at least one occasion almost did) run over the people involved. A delicate balance existed. Our best drivers followed the runner, and transmissions on the internal net were kept as short as possible to allow immediate notice of either unauthorized passings or of stumbling runners.

The Command vehicle served many functions. With a customized fiberglass Trans-Sport body on a Chevy van chassis, primarily it was transportation for the Technical Director of the Relay (or, on the Albany West route, the Assistant TD) for whom we provided eyes, ears, and mouthpiece. The two nets were controlled from this vehicle, which contained the two UV3s, cavities, filters, amplifiers (to 100 W for the external transceiver), and HF gear, on a table in the center of the rear

Photo F. The first torch hand-off with full ceremony in a hangar at Langley AFB.

area of the van. The NCS operators sat in what we called the "Hot Seat" for the obvious reason that this was the most demanding of positions. They coordinated the movement of all caravan vehicles, relaying pertinent information to and from the TD, exchanging information and providing relays between the internal and external nets, and frequently (but inadvertently) by necessity acting as the TD in his absence, making snap decisions.

They were assisted by a rather complex home-brewed audio setup through which either op could switch in either or both of the nets using stereo cans. They also used a magnetic chalkboard with "shrimpboats" to keep track of vehicle placement. The hot seat was claimed by five operators for the entire run, who rotated into and out of the different nets. They were WA2DHF, W1RM, K2AV, KB3HF, and WA2SPK. By necessity, they frequently had to stay glued to their positions for twelve to sixteen hours without a break—sometimes longer—and had to be dragged out in burlap sacks and resuscitated with smelling salts.

Big Macs, Whoppers, and other assorted junk foods also served as first aid on the relay. Hams are, for the most part, notorious for their eating habits, and many diehards on the team refused to partake of the available fare. This consisted of oh-so-healthy vegetables, fruits, soups, lots of prunes, and, above all, "fiber." All of this was, of course, concocted with the needs of the runners in mind and included nary a shred of red meat for days on end. The chant which most frequently broke down net discipline on our circuits was "Junk food! Junk food!", along with the sound of growling abdomens in the background. Luckily, the frequency of the internal simplex net was a closely guarded secret, ostensibly for reasons of avoiding QRM, and this was not heard by the general public. We hope!

Command was, to say the least, crowded. With all the equipment, wiring, papers, and human beings (up to seven at a time), it became the hell-on-wheels of the caravan. There were heater problems in the vehicle, to add salt to the wounds, and the net controllers and staff in the vehicle remained bundled up throughout their shifts. Upon entry to this vehicle, one was immediately reminded of an igloo, smell and all.

Two Pace Arrow RVs served as transportation for the 26 athletes running each day. Although their designations changed during the Relay, they were known basically as the on-duty "Runner" and off-duty "Walker." Each carried 13 runners and took four shifts of on-duty and off-duty time each day. Walker was for the resting runner crew and occasionally would travel in the caravan (behind Command), but usually would go ahead to a designated checkpoint and wait for the caravan to catch up, at which time its designation might change and its crew would go on duty. The communicator in this position had an easier time than most, and it was frequently used as a resting slot for the radio ops. He or she was responsible for the relay of the next team exchange checkpoint, among other minor duties.

Runner was kept busy exchanging running teams with Pace and jumping ahead several miles to the next exchange point. The op in Runner was kept rather busy coordinating personnel exchanges, getting a fresh team ready and out, taking head counts of those coming aboard, keeping the athletes informed about ceremonies and schedules, and communicating with Command during the leapfrogging, for safety coordination.

Walker usually was followed by a tail PD, sans operator, and was sometimes followed by components of the external vehicle contingent temporarily traveling as part of the internal caravan. If there were local hams traveling with the caravan to help provide local liaison and relay on HF, their vehicles would follow the last of the official vehicles and precede the tail PD escort. This happened frequently, and the help from local hams was invaluable to the effort.

In the external contingent, the Convoy vehicle, another Chevy Trans-Sport van, provided transportation for the Convoy Director and the Food and Accommodations Coordinator. They were responsible for the procurement and conveyance of our meals and the advance work concerned with our accommodations. We were fed well (the above comments notwithstanding) with four square meals or more each day—about one meal every three to four hours—and usually there were lots of leftovers. The fare was difficult for some of us—especially those from NYC used to munching on famous Nathan's hot dogs—but it was thoughtfully prepared and it even, ah, well, it was *good*! Liking carrots can be learned. And rosy cheeks are cheery. Many of us now have healthier eating habits (and a few of us have even taken up running seriously). Often, the food was prepared by generous residents of the towns through which we passed, organized by church groups, Rotary, Elks, or Lions clubs, or, on some occasions, the military. Sometimes it was purchased by the Convoy Director out of her budget; on only one or two occasions did we have to pay for it ourselves.

Most of the meals were arranged for weeks or months in advance of our arrival. Sometimes we were on such a tight schedule that the lunches were passed in through windows by volunteers running alongside the caravan. The Convoy vehicle became, after a few days, a sea of sloshing soup and vegetables on the inside. Smelly and fun, but it threatened to short out the ham gear in-

stalled there! Hip boots and rubber gloves were in order, especially during the first two days which were nonstop for over 40 hours with no opportunity to clean up until after more than a dozen different meals. The convoy crew, during that first leg from Yorktown VA to Baltimore, affectionately called themselves the "Go-Fer Squad" and almost seriously considered never eating again.

A large European-style touring bus transported half of the running team—the 26 not running on any particular day—to the next day's overnight stop, ahead usually by 85-100 miles. Although for the first day an operator was placed in this position as a communicator, it was found not to be necessary. This vehicle also was responsible for transporting some of the emissary runners to their speaking engagements or ceremonies further up the route of the Run.

The event engendered a great deal of interest by the media, and we anticipated a certain amount of need to accommodate its representatives. What we were unprepared for was the amount of coverage we were to receive. It seemed to be due to the connection the public felt with the symbol of the international Olympic flame and patriotic sentiment, even nationalistic fervor, generated by the USSR's invasion and occupation of Afghanistan and the holding of American hostages in Iran. The media, apparently as taken by surprise as we were, quickly realized the sensational side of this story and it became the content of—and set the tone for—most of the articles written and programs aired. Of course, this was commonplace during the Olympics themselves, especially where it concerned the incredible victory of our hockey team over the top-rated USSR team, but our passage marked the first expression of this popular ground swell of opinion.

We tried to prepare for this onslaught with another Pace Arrow set aside especially for the purpose of public relations. From this vehicle, which was usually ahead of the caravan by as much as three or four hours, press kits were dispensed, questions were answered, and interviews were arranged between the runners and the media representatives. The communicator here acted as a relay for specific questions directed back to the caravan and the TD on the external net and for relay of ETAs and names of the runners involved at any particular time from the TD to the PR staff. Because of demands from the press passed along to the operator, this position frequently became rather high-pressure and busy, especially in the larger metropolitan areas.

Although many attempts were made to include word of the involvement of amateurs and amateur radio in the event, the PR staff was not sympathetic to our requests for publicity regarding our support. This attitude did not reflect the general sentiment of the runners or the rest of the Relay staff, fortunately, but it did mean that many opportunities for positive PR regarding our role were lost to personalities. There was little notice of our effort by the national or local media. WA2DHF appeared on the front page of the *New York Times* on February 5, but neither the caption nor the story included his function, his role, or his name, or identified that hand-held, funny-looking box with the rubber gizmo. Our uniforms, however, did include the ARRL logo and a large patch produced for the event with "Olympic Torch Relay Run" on the top and "Amateur Radio" on the bottom in large block letters. All of the vehicles bore "Amateur Radio" placards in every possible window.

Photo G. KA2DBW on the job in her hometown, New York City, on February 4.

Many of the questions the media asked involved the technical aspect of the torch itself. It was a specially-designed instrument constructed specifically for relay runners by an American of Greek ancestry, Jim Kalamaridis. Some 132 of the devices were custom-manufactured for the event. Charged with propane, they had a life expectancy of about 40 minutes per charge, and, theoretically, could withstand a wind of 80 mph. In practice, however, we had frequent flameouts, and the original flame was maintained in a series of miner's lamps, some with a hole drilled in one of the glass panels to accommodate a sparkler to transfer this original flame from lamp to torch. Each lamp had a life of about four to six hours per propane charge, and Jim and an assistant were kept busy almost full-time simply charging and maintaining the torches we used. The flame we saw in Lake Placid, which was trotted up to the huge gas flame bowl at the ceremonial stadium by Chuck Kerr, one of the torchbearers, was the very same flame lit in Olympia weeks before and carried by our combined team up the coast of the US. If the flame went out, it was relit from one of the backup miner's lamps; we didn't just flick our Bics.

Wondering how to get an Olympic torch across the Atlantic? The Air Force lent one of the aircraft used for Air Force One—a KC-135 (military designation for a Boeing 707)—for use in conveying this most honored of guests to our nation. Inside the plane, sitting in Jim Kalamaridis' lap and on the floor around him, were the six miner's lamps, all burning with the flame lit at the temple of Hera. The plane landed at Langley AFB on the morning of January 31 and taxied to a full multi-service Honor Guard in a huge hangar, in the midst of a snowstorm.

The Torch Arming Vehicle (aka "Torch" on our circuits) was used to transport the torch technicians and their gear for the long and grueling trip. After dark, this vehicle could be recognized by the light of the frequent spontaneous propane flares issuing from the open doors of this Santana van—reminiscent of the aurora borealis. The commu-

Photo H. In gratitude, the amateurs were permitted to carry the torch on the frosty last day, a few hours outside of Lake Placid. Here KA2CNN is carrying the flame.

Photo I. WB2VUK with Brooke Newell, one of the ceremonial coordinators, at a ceremony site in upstate NY, using one of the Kenwood TR-2400s to mike her as she describes the layout of the ceremony to the TD in the caravan a few miles away. Note the collapsible whip antenna which was used instead of the rubber ducky for added range.

nicator in this vehicle, besides being preoccupied with seeking air free of the stench of propane, was responsible for notifying the torch technician in case of a flameout or torch failure.

It seemed as though every town, no matter how big or small, had some sort of welcoming ceremony prepared for us. This usually involved a high school band attempting to play the rather difficult Olympic anthem and always botching it. We heard that piece in every possible key, in every possible arrangement—even with a disco flourish. This was followed by speeches—sometimes interminable—from local dignitaries or politicians, and then words from our ceremonial coordinators describing the caravan, the function of each of the passing vehicles (especially helpful for the often-confusing passage of the advance vehicles), and an attempt to educate the crowd about our safety requirements, because the crowds were frequently large and under-controlled and we were coming in in large vehicles.

This usually was followed by a short speech from the incoming or outgoing runner, and then the torchbearer would arrive, make a handoff, the caravan would continue, and, perhaps, the incoming runner would stay to speak a little more as the caravan moved out to the next stop. We had been informed of, and could plan for, about half of these events. The rest had either been organized by groups or communities at the last minute or were spontaneous gatherings of people. Frequently involving many hundreds of people, they were completely without any authoritative control and overran the roadway. The caravan drivers, the TD, the staff, and most of all, the runners, needed to know what they were getting into on these occasions. Somehow, these unplanned crowds had to be quieted, informed, organized, moved back, and opened up for the arrival of our caravan.

The runners had a special need to know what they were getting into because of a phenomenon we did not anticipate. They suffered from a certain amount of "tunnel vision" due to the exertion, the weather, the excitement, and the adrenaline. They frequently needed to be led in by another runner at the ceremonial site, or they would trip on a curb or bump into a member of the public in the crowds. Their torch also was a fire hazard, and holding it up high gave a runner an effective height in excess of 9 feet. The job of the ceremonial coordinator was to pre-brief the caravan from an advanced position relative to obstacles, pathway, crowd quantity and mood, clearance, fire hazard, etc. This information was passed along to each driver in the caravan and also given to the runner by PA from the Pace vehicle. Because of the involvement of the ceremonial coordinators with the local groups sponsoring the ceremonies, the job of sizing up the ceremony situation frequently fell to the communicators themselves. The communicator also was responsible for the relay of ETAs to the local groups so they could plan the timing on their stages.

After the caravan and torchbearer had passed through the location of the ceremony, after it was all over, the ceremonial vehicle driver waited to collect all of the personnel. Then it was off down the road to catch up to the caravan, and—often with a very high-speed police escort—to leapfrog the caravan and make the way ready for it at the next ceremony site. On our busiest day, there were 21 such ceremonies to coordinate. Although not the most difficult position, it was a high-pressure communicating position and perhaps the most exciting, since the op was able to view the ceremonies themselves and some of them were quite well put together.

One problem the personnel in the ceremonial vehicle did not have was that of the visual and psychic effects of day after day of travel at 7 or 8 mph. We all functioned under conditions of great pressure and constant demands. Breaks were few and far between, and we were almost constantly in a state of swollen derrieres and bladders. Hallucinations were one result of the slow movement

of the passing panorama (which also made for prolonged nulls on VHF); some of us imagined having seen trees grow. Radio traffic was constant and exhausting, of a nature only contest operators may be familiar with, or those with military backgrounds. Calls for the particular vehicle for which one was communicating always seemed to come during that once-in-an-hour period of dropped guard. The circuits were so busy that even a few seconds of dead air were cherished as the most precious of gifts.

Because of the unplanned ceremonies, constant changes in plan, variations from the published Technical Manual (TM), and inaccuracies in the TM itself, on the first day out W1RM nicknamed the entire operation "Rollerball." Those who've seen the motion picture will know what we're talking about: It describes a game in which the rules change every quarter, getting tougher and more violent. The entire script of the operation literally was changed from minute to minute. So pervasive was the use of this nickname that WR3AFM, the home repeater of one of our NCSs, KB3HF, changed its ID for us. When we arrived in their area, its CW ID was spelling "Welcome Olympic Torch de WR3AFM." When we were awakened the next morning and tuned in the repeater again, it was signing "de WR3AFM Rollerball." The NCSs referred to themselves after that first 40-hour stretch from Yorktown to Baltimore as "Rollerball Control."

In the December practice, the HF setup received a limited workout with K2GDX, the coordinator for WØRAN, in the Lake Placid area, and it was thought that we would be using HF links directly from the Command vehicle to WØRAN in Lake Placid during the relay. As it turned out, this equipment was hardly ever used because of the huge volume of tactical and safety-related traffic in the Comm van, the long operating hours, because of Rollerball, and because of the relatively low priority of traffic for HF. Instead, operators from the local area traveling with the caravan or in contact with the caravan on the external VHF net served as VHF-to-HF relays. Dozens of highly competent ops were involved in this particular effort. Without them, the caravan would have been virtually cut off from the LPOOC except for the overworked and extraordinarily unreliable mobile telephones installed in the Command and PR vehicles.

Working the HF link with WØRAN required the patience of old Job. We were bothered constantly by all the many and varied incarnations of the persistent QRMer, from hams who offered to help and ended up hindering (some have to learn to listen more and transmit less unless they're certain they can help), to ops seeking commemorative contacts during traffic operations, to real "sickies" with swishing vfos and persistent strong carriers. The patience, persistence, and experience of HF ops involved did prevail, however, and the traffic was passed.

Warren Gibson WA4CCK provided just one example —perhaps the most dedicated example—of the dedication and sacrifice so many of the local hams offered. Experienced as a traffic handler on many nets, he joined us in Yorktown as the amateur coordinator for Virginia, driving a station wagon full of a rather extensive HF and VHF setup. He accompanied the main caravan for its most

Photo J. Two of the torchbearers on the road, somewhere in upstate NY.

trying days, the first ones, from Langley AFB to Baltimore, nonstop for over forty hours of driving and operating relay, and also the third day, from Baltimore into a grand ceremony on the steps of the Capitol. He left us in DC amid cheers of gratitude from all members of the traveling communications team, having served as an invaluable shoehorn on countless occasions.

We even got some "maritime mobile" operating into this thing. Steve WA2DHF is a radio operator for the Naval Reserve and was chosen to accompany the torchbearer on a seagoing journey aboard a Navy landing craft from Langley AFB to the Yorktown pier—about 2½ hours in the water—using a Tempo S-1 all the way. For the startup of the Relay overland, he joined Pete Chamalian W1RM in the Command vehicle. Also present for the startup were ourselves; Bob Fern K2AMU; Jeff Young KB3HF; Jim Arnold WB3EOU; our coordinator, Bobbie Chamalian WB1ADL; Steve Shearer WB3LGC; Guy Olinger K2AV; Paul Vydareny WB2VUK; Bob Josuweit WA3PZO; Bob Strickland WB3HWZ; and, previously mentioned, Warren Gibson WA4CCK, in his own vehicle.

Joining in Princeton was Gary Kantor WA2BAU. In Albany, the route was split: Communities to the west of the officially planned route had raised funds on their own sufficient to allow the personnel and vehicles to split after the Albany ceremony, permitting 26 runners to go northwest through the Adirondacks while the "Albany East" team took the other half of runners on the original route. A tremendous ceremony involving thousands

of spectators, with disabled veterans holding the torch with the torchbearer for the last couple of hundred feet, greeted us all in Albany. Governor Carey, following a moving speech of welcome, oversaw the lighting of two torches from the original incoming torch, and two runners left the plaza, one bound northeast, the other northwest, both destined to meet a few days later in Lake Placid.

In Albany, additional vehicles and staff personnel were added to take up the slack and to provide coverage for the scores of ceremonies awaiting us on both east and west routes. The closer the runners got to Lake Placid, the more identification local communities felt with the Olympics and the larger and more frequent the individual ceremonies became. Five traveling operators drawn from the Albany/Troy/Schenectady areas were added to the communications team: Joe Krone WA2SPL; Dennis Connors WB2SPK; Armand Canestraro WA2EQW; Dan Marcella KA2DVK; and Guy Kitchen WA2SPE. Stationary support and east-with-west relay was provided by Dick Frey WA2AAU.

On the last day, during our approach to Lake Placid and facing the prospect of breaking up the group which by this time had built up an incredible bond of solidarity, the amateurs and support staff were afforded a rare privilege: We all were given the opportunity to carry the torch for a few minutes. On a clear stretch of Route 32 south of Saranac Lake, we left our vehicles, one position at a time, and in moments none of us would ever forget, we bore the flame north to the Olympics. The feeling each of us had, holding this sacred flame and running it north, was indescribable. Wonderful. As we ran, the runners cheered us on and our fellow ops took pictures by the dozens.

On the night of Friday, February 9, after rollerballing for nine days and nearly a thousand miles, we reached our goal. The east and west route torches had to meet in downtown Lake Placid at exactly the same instant. Timing was crucial and the circuits began to fill with almost nonstop checkpoint and ETA advisories between the two caravans. One caravan with torchbearer could not be kept waiting at the end for the arrival of the other. The crowd was huge, and the media were out in full force as we played our last hot and heavy round of rollerball. This was the biggest and last task for the communications team, and we knew we had to get it right; this was the event the participants would remember more than any other; it was our crucial test.

We did it. The timing was flawless, and not a dry eye remained in the entire team, runner, ham, or staff member. We had reached our destination. Looking back, despite some mistakes, some personality conflicts, and numerous technical difficulties, we had performed our job through the most incredible experience of teamwork any of us had ever had. When the two torchbearers met in Lake Placid that night, the elation and feeling of accomplishment that swept through the team made the stress, deprivation, and hardship of nine days on the road well worth the effort. We're looking forward to working together again in 1984 in Los Angeles. Perhaps we'll see you there! ■

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New Life for Old Klystrons

—tips for microwave experimenters

What? Use a vacuum tube in this modern era of solid-state electronics? Reading about Gunn diodes, Impatts, and other such exotic devices is fine, but with the exception of the Microwave Associates Gunnplexer, there are no complete solid-state oscillators available to the amateur.[1] This became very apparent while I was trying to put together a receiver for direct reception of television signals from geosynchronous satellites at 3.7 to 4.2 GHz.

A multi-stage oscillator-multiplier chain was ruled out because of insufficient time. If everything works, the final receiver might have a solid-state local oscillator, but then again, maybe not—why discard a working circuit? Reflex klystron oscillators of the 723 and 2K25 class (see Fig. 1) have been available on the surplus market for over thirty years. Output frequencies from below 3 GHz up through 9.6 GHz are currently available with output powers in the neighborhood of 10 to 150 milliwatts.[2] These klystrons have found applications in the past in polar-plexers and as pump oscillators for amateur and commercial parametric amplifiers.[3,4,5,6] The tubes listed in Table 1 are similar in construction and can be mounted in octal sockets that have had pin 4 removed and bored out with a number 24 drill. The output is via the small diameter, rigid coax line which terminates in a short probe. The probe was used to directly excite a waveguide or was capacitively coupled to a coax cable.

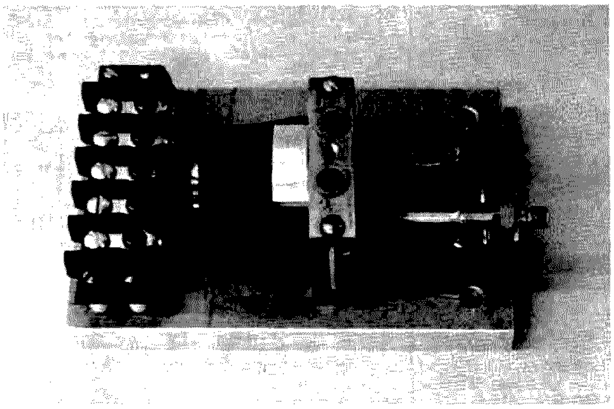

Photo A. 726A klystron with coax output and terminal strip.

Tube	Output frequency(GHz)	Output power(mW)
726C	2.7-2.96	100
726B	2.88-3.18	150
726A	3.18-3.41	100
2K22	4.3-4.9	115
6115	5.1-5.9	100
2K26	6.25-7.06	100
2K25*	8.5-9.66	30
723A/B	8.5-9.66	25

*Improved version of 723A/B, both of which can reach 10 GHz by stretching the cavity.[5]

Table 1. Reflex klystrons from 2.7 to 9.66 GHz.

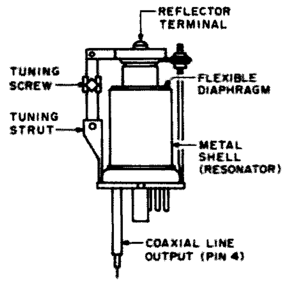

Fig. 1. 723-class reflex klystron.

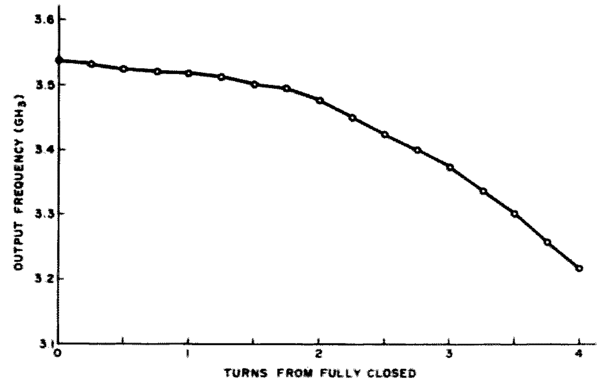

Fig. 2. Output frequency of 726A as a function of tuning-screw rotation.

In normal operation, the tube shell is operated at 250 to 300 volts above ground. This puts the output cable, which is connected directly to the shell, at a hazardous potential. However, by operating the cathode at a negative voltage, the shell and output cable can be maintained safely at ground potential.

The photograph shows a 726A klystron mounted on an aluminum plate for use as a local oscillator for the satellite receiver. The tube is clamped by a simple split block to allow conduction cooling and provide a mechanically stable support. This degree of mechanical rigidity is not required but was convenient in this case. Also, free-standing operation with convective cooling is alright. The oscillator covers a measured frequency range of from below 3.2 GHz to above 3.5 GHz.

The output frequency of this particular tube as a function of the rotation of the tuning screw is shown in Fig. 2. By changing the reflector voltage, the output frequency could be shifted electrically plus or minus fifteen megahertz from the mechanically set frequency. This FM characteristic can be used for fine tuning or for a form of afc with simple circuitry.[7]

The output probe is terminated with an SMA connector. A cross section of the connector assembly is shown in Fig. 3. A BNC connector could be used with equal success. The output probe center conductor is clipped close to the insulated sleeve, the ferrule is slid back onto the probe. Then the center conductor is soldered to the coax connector. Following this, the ferrule is slid forward, screwed to the connector with two 2-56 screws, and then sweat-soldered to the probe.

Power leads run from a barrier strip to the tube. Connections to the tube are made with a modified octal tube socket—see Fig. 4. While normal operation requires −300 to −700 volts at zero current for the reflector, operation at reduced potentials and output powers is not only possible but desirable in that power dissipation and heat are reduced substantially. This adds to the tube life-expectancy.

Operation has been at cathode voltages as low as −150 volts at 10 mA and reflector voltages of −150 to −300 volts. With a −300-volt cathode supply, output powers in excess of 60 milliwatts were readily obtained. With a −150-volt cathode supply, the output dropped to about 4 mW, which is still sufficient for use as a local oscillator. Even at the high powers with only free convection cooling, life expectancy is high. Tubes pulled out of service after hundreds of hours of service and stored thirty years or more are still operating.

A word of caution: The reflector must *never* become positive with respect to the cathode. If it does, it will draw current, heat up, and outgas, ruining the tube. To prevent this from occurring, merely connect a rectifier diode between the cathode and reflector as shown in Fig. 4.

The theory and operation of reflex klystrons is available elsewhere and therefore is not covered here.[8,9] What I hope I have accomplished here is to remind other amateurs of the availability of reflex klystrons as packaged sources of microwave power that are rugged, cover a wide spectrum, and are economical.■

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6. "A Complete X-Band Transmitter," S. M. Olberg W1SNN, *73 Magazine*, August, 1978.

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9. *Technique of Microwave Measurement*, Radiation Laboratory Series, Volume 11, McGraw-Hill, 1948.

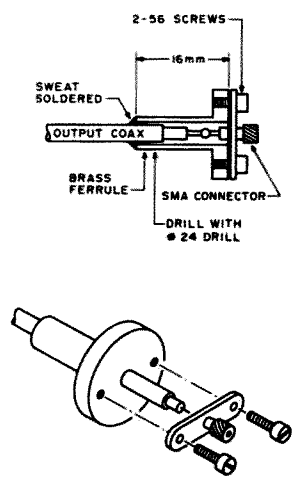

Fig. 3. Coax connector detail and assembly.

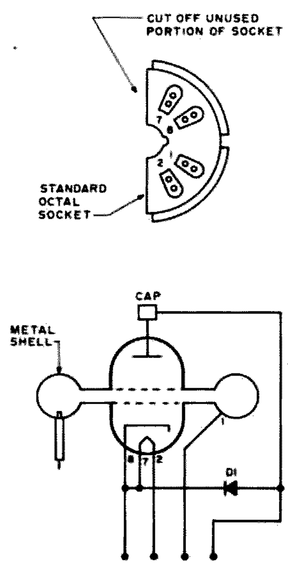

Fig. 4. Socket modifications and wiring diagram.

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Add RTTY to Your Repeater

—voice operation is preserved

The consensus was that we needed a RTTY repeater in Corpus Christi. It also was decided, on that Saturday morning, that I would build it. I had no vote and no objections were allowed. I would build it.

The first idea was to transmit AFSK tones through the local 147.06/.66 repeater. It used subaudible tone control, and few people used it. This method was tried, and it worked with some success, but different tone frequencies and levels caused problems in copying. What was needed were standard tones from the repeater.

Looking through the Flesher catalog, the answer stood out like a BY prefix on twenty. I could demodulate the incoming RTTY audio using the Flesher DM-170 and use the loop-keyer output transistor to key the FS-1 Audio Frequency Shift Keyer to feed audio to the mike input of the repeater transmitter. As an added bonus, I could use the autostart circuitry (on the DM-170) to operate the transmitter PTT control, clean and simple. Flesher even has a nice little power supply to operate both boards—Model TTP-12. All these goodies cost less than $100.00. The boards arrived in 4 days!

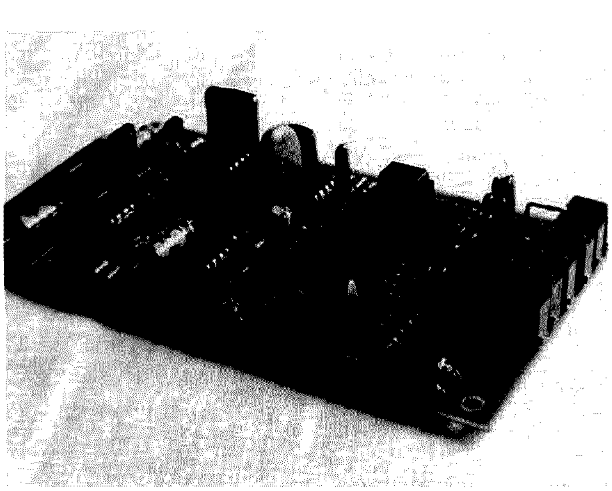

Photo A. Modified DM-170 showing use of 6 trimpots in place of 12 fixed resistors.

The FS-1 and power supply were constructed by K5OG, and I assembled the DM-170. Total construction time was about four hours and the boards worked the first time. The only problem was that hand-picking resistors to tune the DM-170 was slow and somewhat inaccurate. The DM-170 copied 20-meter RTTY perfectly, but I was bothered by the resistors. I assumed Flesher had used the resistors as a cost-cutting technique. However, my RTTY converter had to be perfect. I cut the 12 fixed resistors from the board (R14, 15, 18, 19, 22, 23, 26, 27, 30, 31, 34, 35) and superglued six Weston 850W 2k trimpots in place of them (see Photo A and Fig. 2).

Flesher's design used two resistors in parallel connected to the "−" terminals, pin 6 or 2 of the op amps serving as filters. The tune-up is similar to their method. When the pots are glued to the board, only one lead is connected to the ground for each pot and the wiper arm of the pot is soldered to the correct terminal as you tune that stage. (Read their instructions and use their method of tuning, and tuning the pots will be very straightforward.) I tuned the board with the pots in 15 minutes. It takes an hour with the hand-selected resistors.

I used an H-P audio oscillator driving a frequency counter as my frequency standard. It is important to keep the audio level to the DM-170 as low as possible to get accurate tuning. I faced the problem of having too much audio to the DM-170 when I had correct audio to the counter. I solved this by using a BNC T-connector on the oscillator, feeding directly to the counter and using a 10-to-1 scope probe as an attenuator to feed the DM-170. I now could lower the audio

oscillator to the correct level without losing the counter.

The DM-170 has an "improved mark hold" option which is the installation of an additional diode. I suggest this be installed to force the board to mark any time the audio is lost. This feature is very nice when the DM-170 is keying the FS-1. As soon as the repeater comes on the air, it transmits a steady mark. This mark is our local reference and is a convenient 2125 mark for tuning filters.

While building the board, install a wire from Q5 base to pin 2 of the edge connector to key RY1.

The Motorola repeater I was using has a 5-volt dc to ground to key the PTT. The autostart transistor (Q5) collector was used to take this voltage to ground. Without making any timing changes or adding the threshold control as suggested by Flesher, the repeater would key up after receiving six seconds of steady mark. The repeater would drop out 15 seconds after the input audio to the DM-170 was removed. These times proved popular with the local RTTY users so they were left unchanged. The threshold control was never added. The six-second delay prevents kerchunking the repeater, and the sharpness of the filter and time required prevents someone from whistling the machine up. The 15-second off delay gives a reasonable time to look at filter tuning or to zero your AFSK unit to the repeater mark. I found it possible to rough-tune a filter and AFSK unit enough to get on the air by zero beating the mark and space audio from another QSO.

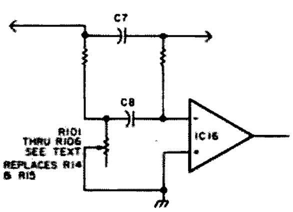

Fig. 2. Pot connection to DM-170.

The nice thing about using a demod and AFSK at the repeater is that everyone hears the same mark and space. Gone are the problems of who has the correct frequency. The only operating problem using this arrangement is the need to use a 170-cycle shift for the CW ID requirement. The mark/hold circuit will not repeat the narrower shifts used for some CW IDs. When the 170-Hz shift is used, the repeater will transmit the ID in CW as it is received. I don't consider the small bit of garbage from the CW on my screen a problem.

After operating the machine a few weeks, several operators wanted the audio for voice communication back on the machine so they could talk about RTTY problems without changing frequencies. A small 12-volt relay was installed to switch the input audio between the receiver audio and the FS-1 unit. A 2N2222 transistor controlled by the base voltage of Q5 through a 330-Ohm resistor was used to ground the coil of the relay. The relay closes in the RTTY mode.

When the repeater was in the standby mode, the subaudible tone would key it in the voice mode. Or, when 6 seconds of mark were received, the relay would close and the repeater would come up in the RTTY mode and transmit a steady mark until it received a RTTY signal, or it would stay up for 15 seconds and drop.

The repeater IDer is connected to ID when the transmitter is activated, regardless of mode. In the voice mode, operation is normal as required by FCC rules and can be heard in the background of voice communication. In the RTTY mode, the operation

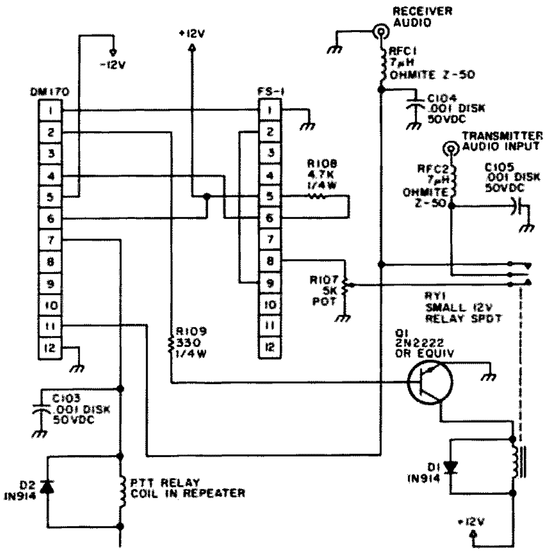

Fig. 1. Interface connections for RTTY repeater modifications.

of the IDer is the same as voice, except the RTTY filters at the receiving RTTY station do not acknowledge the 700-Hz repeater ID frequency. So far, no one has complained of garbled copy due to the repeater ID unit. The repeater can properly ID itself and it will repeat the CW FSK IDs from the user RTTY station. Using this relay arrangement gives RTTY priority over voice and keeps voice communication in the input frequency from garbling RTTY copy.

All three boards were mounted in a 3-inch chassis which was mounted inside the repeater cabinet. With a cover in place and proper line filtering and audio filtering, there were no rf problems. It is important to use proper filtering as rf will keep the autostart in the on mode and keep the transmitter up. Connection of the FS-1 board is straightforward. Connect the proper output to match your repeater input level, adjusting R107 as needed to match the level of the RTTY tones to the level of the receiver voice audio, using a deviation meter monitoring the transmitter output.

Using the direct keyboard connection drawing shown in the FS-1 instructions, connect the junction of pin 6 and the 4.7k resistor to the collector of Q6 on the DM-170 (pin 4, loop keyer). The FS-1 will now track the DM-170 mark for mark and space for space, including CW IDs.

The TTP-12 power supply provides ±12 volts at 0.2 Amps and maintains regulation through a wide range of input voltages. The specifications for the DM-170 call for ±15 volts, but the board will operate fine with the 12 volts supplied from the TTP-12—just use the supply when you tune the filters. Install a power switch in the ac line, because the DM-170 will key the transmitter for 15 seconds at power on. When you bring your repeater up from a cold start, wait the required warm-up time if you are using a tube final and then turn on the RTTY boards.

It's not bad for a hundred bucks and a few hours of work. ■

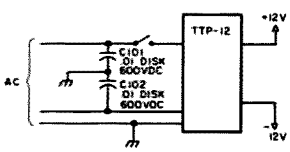

Fig. 3. Ac filter.

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A Patch for the TS-120S

—add phone patch compatibility

When I bought a Kenwood TS-120S and sold my Drake TR-4C, it cost my station phone-patch capability. There's just no graceful way of mating the existing patch with the Kenwood's input and output accesses. That brought on the challenge of second-guessing the Japanese engineers. Sometimes that's easy; often it's not. There seems to be an unwritten law (or is it written?) that all equipment must be designed to make customer modifications difficult.

A bit of study of the schematic wiring diagram for the TS-120S revealed an unused terminal (#7) on the remote connector. More study revealed that audio signal and send-receive functions were available at the remote connector. Ah, now if one had microphone input also available... Could it be just a matter of piping a wee bit of audio to the mic input jack from that unused (#7) terminal? It looked feasible on paper, but it pays never to leap too precipitately to conclusions. So the next step involved a bit of exploration of the innards.

If you've never uncovered your TS-120S, a word or two of advice might be of worth. Take the top cover off first, taking care not to disturb the four screws that hold the internal speaker in place. It's not necessary to remove the top totally; just loosen it and slightly move it from place. Now you can flip the set over on its top side without endangering the three top controls and without having to worry about the lead to the speaker.

With the top loose, the bottom comes off readily. Once it's off, take a look at the back side of the mic connector. One of the four terminals has a single white wire going to it. That's the one you're interested in! And it's the one most easily reached! No doubt the Japanese engineer responsible for this grievous faux pas has been compelled to commit hara-kiri.

But how about the other end? Not to worry! There's a plate mounting a number of jacks, the remote connector among them. This plate comes out with the removal of five screws. Once out, terminal #7 is most easily reached. Ah, breathe a prayer for the soul of the poor engineer!

Now, all that remains is to find a single-wire shielded conductor small enough to snake along the edge of the chassis. There are holes through the compartment shielding to accommodate a small and flexible cable. I suggest you ground the shield of this wire only at one end (I used the terminal #7 end) to avoid ground loops.

The remote connector now provides the following services: ground and #1—audio output, 8 Ohms; ground and #3—send-receive control; ground and #7—audio input, high impedance.

You might take a hint from the wiring diagram and put a 100-Ohm resistor in series with that audio output. This will both reduce the signal level (most likely too high for phone lines) and also protect the output transistors from any non-kosher load a phone patch may offer.

The introduction of the capacitance of the short cable across the mic circuit has made no detectable difference in the quality of the voice signal from my TS-120S.■

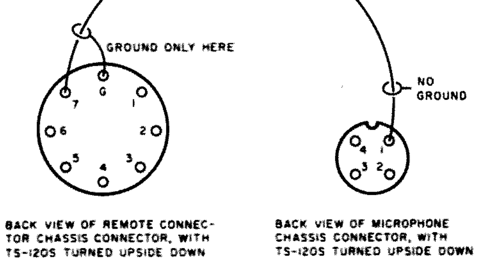

Fig. 1.

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Successful Ham Classes

—a guide for club organizers

In 3 years, I organized 11 ham code and theory classes, with the following results:

- 70 Novices
- 40 Generals
- 5 Advanced
- 2 Extras

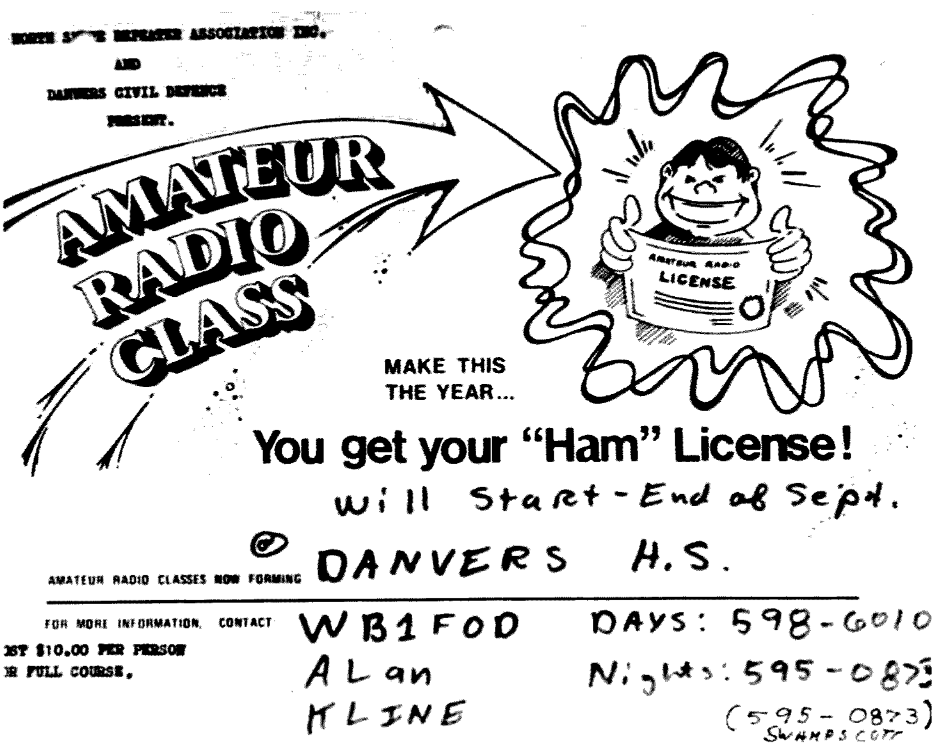
—with two more classes starting the first of the year in two different locations. If I can do it, so can you; here's how I did it, with help from my club members.

It all started when I joined the local repeater club and became friends with the club's secretary. Every morning for months we would meet at the local post office and he would fill me in on the club's history and current events. The ARRL had been pushing all clubs to sponsor classes to beef up the number of U.S. hams before the WARC conference. As the club had not fulfilled this request, he felt they should start some kind of educational program. I volunteered for the job.

Before I was going to organize *any* program, I had to know if there was a need. As there were classes in a town only 10 miles away, I wanted to be sure we would be successful in our attempts. It was discussed at length at my work QTH and decided that a marketing survey could be conducted to establish the community's ham radio educational needs. A test market of a 20-mile radius within our repeater's coverage would be a good parameter. I set out to do a direct-mail market survey.

As the survey needed to go to unlicensed but potential hams, I remembered having once been an associate member of the ARRL. Associate members are the unlicensed league members who get *QST* every month. For various reasons, this group joins the League, and the results from this mailing would show that this group had need for a class to help many of them get their tickets.

In requesting a list of the



This is the standard poster I use. It is from the League, but I like to add information to it.

League's associate members, the League told me any ARRL affiliated club could request a computer printout of the League's mailing list by zip code. The list is conveniently printed on pressure-sensitive labels.

Upon receiving the list, I immediately had it duplicated. Certain brands of commercial copying machines have this capability. I was glad I made three copies, because later I would find out that the League will only supply the list once a year. A quick scan of the labels produced the mailing list of associates I was to use. The rest of the list was used to solicit membership and to announce the General and Advanced classes.

Response

I printed an announcement of the possibility of having Novice and General classes and mailed one out to each of the fifty potential hams on the League's associate member list. There was instant response. All of the 25 calls I got were logged in a notebook with addresses and the callers' stories. By their stories, I mean that they all had various reasons for joining the League and for not being licensed.

The first caller claimed to be able to copy code at 20 wpm. He was in his early sixties and nearing retirement age, having learned his CW in the army in WWII, and he had never forgotten it. A Drake TR-4 was used to copy code for many years, but he never had the help he seemed to need to get a ticket. The second caller was a Vietnam veteran who also had learned the code in the service. Both of these calls were typical of the many I would receive.

Three of the responses came from adults with various handicaps. They had long-time interests in communications, but needed help to get on the air. To help them with their individual problems, I joined the Handi-Ham System at the Courage Center in Minnesota. Their program is a United Fund-sponsored agency that helps the handicapped not only get their tickets, but loans them equipment. Involvement in the Handi-Ham System has led me and my instructors into some very rewarding personal experiences.

A Committee Is Formed

Based on the calls I got, I knew there was need for a class of some kind. I announced that I was going to organize a class and asked the repeater club membership for help. We formed the club's first educational committee.

Those involved included a high-school guidance counselor with much teaching experience, a professional musician and teacher, a state safety inspector, and an electronics technician. (I am a ladder and scaffolding salesman.) After talking with them, I decided they all had the ability to explain ham radio and communications in layman's terms. In selecting teachers, you must let only the active hams do most of the teaching. It didn't take long to realize that my lack of CW experience and primary interest in VHF/UHF was of little help to aspiring Novices. I decided to stick to the organizational end of the program.

At this point, I contacted the Club and Training Department at the League and, for $1.50, they sent me their instructor's package. It included many items of interest. The first is a 10-12-week lesson plan for teaching a Novice class. It is written to go along with the ARRL's *Tune in the World* textbook and code tape. In later classes, we only used this as a guide for the teachers and let the students choose their own books.

Don Robson, 12 Boulder Way, Swampscott MA 09107. Don is blind and confined to a wheelchair. One of our first students, he worked hard for 18 months before getting his ticket. The repeater club gave him a standing ovation the night he came to announce his call.

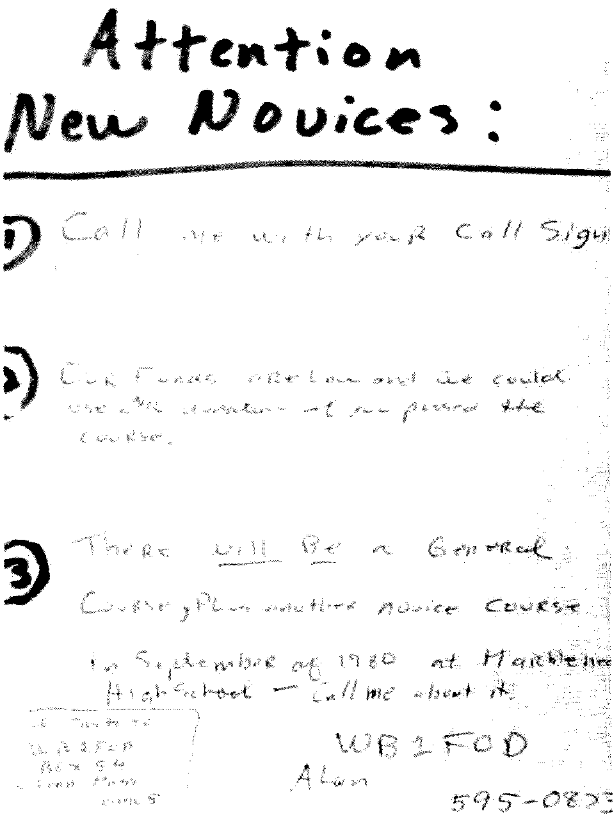
The second booklet was a workbook with problems and duplications of the League's 35mm Novice slide program. We invested in two sets of these slides so our instructors could reinforce hard-to-explain concepts. The third and most useful booklet is entitled *How to Start a Course in Amateur Radio*. After carefully reading all this material, I knew we were heading in the right direction.

For our first class, we decided to use the *Tune in the World* series plus the *73 Magazine* code tapes.

Rooms

In scouting out potential classroom sites, I had to remember the need for wheelchair access ramps. The room also would need to have a movie screen, blackboards, and ac outlets, and, most importantly, be in a good location for the students to drive to. In most communities there is usually a building that meets these requirements. Our first site was the local high school in my hometown. The school was open four nights a week for the town's adult education program and still had many large vacant rooms.

Since the students do not all pass the code at the same time, it is necessary to separate some students from the others. As the code exam is given, the students who pass it earlier than the rest will get their written exams back from Gettysburg before the slower students. If you have a second room, you can split the class into two groups each night. One group will



This is a follow-up mailer for a class we didn't have any money for. At least half the class responded by sending money.

always be in the second room taking one of the two exams. Because the FCC doesn't let instructors have bulk exams anymore, the Novice instructor is always burdened with the extra work of sending exams back to the FCC at staggered times.

I contacted the director of continuing education at the school I selected and arranged for three rooms. One was a large sewing room with big desks that served as Novice classroom number one. It was big enough to seat 25 students, three wheelchairs, and also large enough for our demonstrations. The second classroom was across the hall and was used as the extra exam room.

The third room was the high school's electronics lab. We chose to teach a small General class in there. Besides having VTVMs and scopes, there was a general coverage receiver. Lots of other electronic equipment there made it easier to teach prospective Generals. Most regional vocational technical high schools and junior colleges have similar labs and might be willing to let you use them.

Media	Calls	Percent of Total Calls
Newspaper ads	90	45
Heathkit posters	60	30
ARRL lists	20	10
Ham stores	20	10
Word of mouth	10	5
Totals	200	100

Table 1.

Taxpayers like to see and hear about the school being used as much as possible.

At this point, I made my first mistake: I offered to pay for the rooms. We had to charge $25 per student to cover our initial costs. For that, they received the *Tune in the World* package and a guarantee of a Novice license! When the time came to make the next year's arrangements for rooms, I had learned that most school departments are more than willing to let any civic group use their facilities.

For our second year's program, the town of Danvers, Massachusetts, civil defense radio unit was the repeater's cosponsor. The superintendent of schools and the school committee were glad to give us the needed four rooms at no charge. We met as part of the adult education program on Thursday nights. Both the school and the CD unit helped the club advertise the classes.

During the second half of the school year, we had planned only to teach the follow-up General class and a small Advanced class at the Danvers site. But there were so many calls for a Novice class, we quickly organized two new Novice classes in both Danvers and Swampscott.

Other Sites

Other room ideas I checked out and will probably use at later dates were the local hospital where our repeater is housed, the Boys Clubs and Girls Clubs, the Red Cross headquarters, a private nursing home, and both state colleges. Whereever you find a suitable room, try to contract for it for no fee. There will be plenty of ways to show the landlord your club's appreciation. Also, don't be surprised if the landlord, i.e., the school department, asks your club to sign a contract for the rooms. They must establish responsibility for not only the cleanup of the premises but also the liability in case of an accident.

Our current class is part of the very successful adult education program of the town of Marblehead, Massachusetts. It is a coordinated effort between the repeater club, the town, and the high school's industrial arts department. One class meets after school and the others on Thursday nights. Funds collected from the evening program will be used to donate station equipment to the school's new station.

Our other class is at the Lenox Hill Nursing Home in Lynn, Massachusetts. It is a private institution with many handicapped young people. The director was a radio operator during the Korean War who immediately saw the value of adding ham radio as a weekly activity. We will set up a station there (donated by Handi-Hams) and have a regular schedule of operators drop in during the week to use it. As interest in ham radio grows, we will show the recently produced Dave Bell film on ham radio to the patients. I'm sure we will have a small group of people interested enough to start teaching code and theory.

Our final teaching effort for this year will be a similar wintertime project at the Greater Lynn Boys Club. As an urban club, its membership swells in the winter months, and not all young people enjoy sports. These 5th, 6th, and 7th graders could turn out to be the future electronic technicians this country needs.

Finding Students

Armed with the results of the original test mailing, it was time to find more potential students. In advertising for our first class, an-

nouncements were sent out by mail to all the high schools, junior high schools, vocational schools, colleges, community centers, scout groups, and other ham clubs. A news release was also sent to all the newspapers, radio stations, and local magazines. And finally, posters were put up in the electronics stores, Heathkit® store, both ham stores, and local surplus emporiums. When having a class for the first time, you can never advertise too much. After logging the answers to the question of how the students heard about your class, you can decide which advertising media worked best.

Table 1 shows the results over a six-month period of sending out the announcements of the course and logging all the return calls. Using these statistics, much less advertising effort was required for our second and third classes. A small poster at the Heathkit store and Tufts Radio in Medford, Massachusetts, generated about 50% of the calls. The rest came from a small news item that reappeared weekly for four weeks in the local newspaper.

Careful selection of which newspaper to use was also a factor. In the towns we teach in, the residents all seem to read the smaller weekly papers that have a weekly events column. The one I chose was a weekly tabloid with more real estate ads and community news items than daily news.

Most students, when queried, said they saw or heard about the classes from more than one source. Many not only read about it in the newspapers, but heard about it from a repeater member or on the CB band. On a few occasions, I would answer questions about the class or ham radio in general on the CB band.

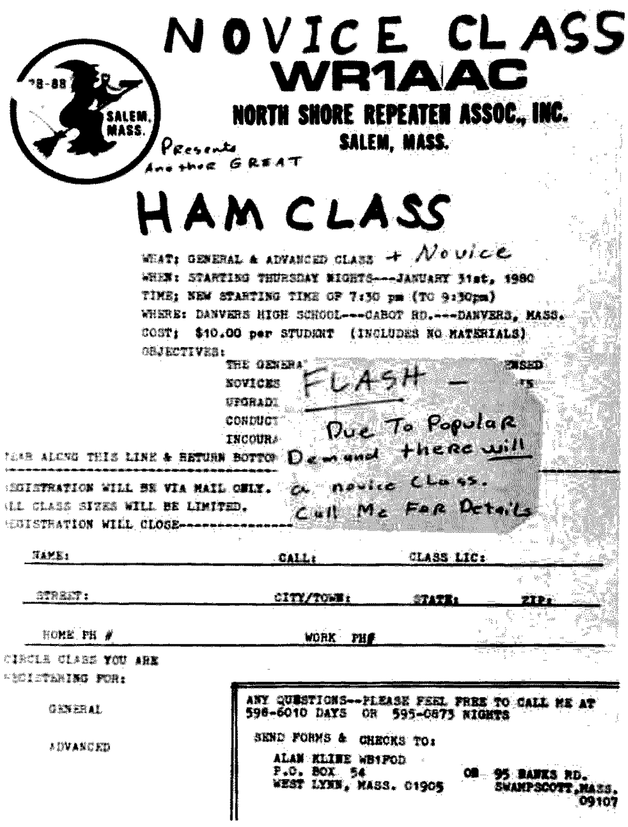
Once you've gone this far and generated all this interest, be prepared for the phone to start ringing. Find a retired or handicapped ham who is home a lot to take and log all the calls. He must be prepared to explain all facets of ham radio and mail out the ARRL's supplied material. Many people will call and not attend the next class, so it is important that they stay on your mailing list.

When writing announcements for the media, keep them as formal as possible. They should be typed on the club's letterheads and be neat. You want to convey that the organization running the classes is a professional one. When writing anything for the students, I wanted to project that ham radio is a relaxing, informal hobby. To help create this informal atmosphere, I always hand-wrote the announcements for the students. We always stress that anyone who puts in the effort and learns the required code will get the help they need to get their ticket—no matter how long it takes.

Many students who don't pass the course the first time will be hesitant to come again unless you have this relaxed atmosphere. Informality helps break down many barriers between the teachers and the students.

Teamwork

When it is possible, have three instructors for each Novice class. Two will alternate teaching the theory and the other will teach code and give exams. If any one of the three is absent, and that will happen, there will always be a back-up instructor who knows the students and the lesson plan. You can delegate one of them to handle all the paperwork. In our program, I do all the paperwork and advertising and leave the instructors to do what they do best.


NOVICE CLASS
WR1AAC
'78-'88 SALEM, MASS.
NORTH SHORE REPEATER ASSOC., INC.
SALEM, MASS.
Presents Another GREAT
HAM CLASS

WHAT: GENERAL & ADVANCED CLASS + Novice
WHEN: STARTING THURSDAY NIGHTS---JANUARY 31st, 1980
TIME: NEW STARTING TIME OF 7:30 pm (TO 9:30pm)
WHERE: DANVERS HIGH SCHOOL---CABOT RD.---DANVERS, MASS.
COST: $10.00 per STUDENT (INCLUDES NO MATERIALS)
OBJECTIVES:
THE GENERA ... NSED
NOVICES ... S
UPGRADI
CONDUCT
INCOURA

FLASH —
Due To Popular Demand there will a novice Class.
Call Me For Details

TEAR ALONG THIS LINE & RETURN BOTTOM

REGISTRATION WILL BE VIA MAIL ONLY.
ALL CLASS SIZES WILL BE LIMITED.
REGISTRATION WILL CLOSE---------------

NAME: CALL: CLASS LIC:
STREET: CITY/TOWN: STATE: ZIP:
HOME PH # WORK PH#

CIRCLE CLASS YOU ARE REGISTERING FOR:
GENERAL
ADVANCED

ANY QUESTIONS--PLEASE FEEL FREE TO CALL ME AT 596-6010 DAYS OR 595-0875 NIGHTS

SEND FORMS & CHECKS TO:
ALAN KLINE WB1POD
P.O. BOX 54
WEST LYNN, MASS. 01905
OR 95 BANKS RD.
SWAMPSCOTT, MASS. 09107

This is a typical announcement that was mailed to potential students. It was changed to offer a Novice class on short notice.

General and Advanced classes only require one teacher who is an active ham. By active, I mean one who has worked all modes and all bands. It is less important that you have a backup instructor for these classes, as the General students can always sit in on the Novice classes. The unlicensed Novices will have fun that night because they can spend the night asking the Generals questions about the hobby.

If you have only one Novice instructor, keep the class size as small as possible. One teacher can only handle about ten struggling Novices. We had no intentions of offering a Novice class during one session, but when 22 students showed up, a volunteer was called on the repeater and he gave it a good try. His passing rate was much lower than our other classes.

Opening Night

The most important meeting is always the first. For the first course we ran, on the first night, the four instructors all talked about some aspect of ham radio that they were into, public service, DX, RTTY, ATV, and CW, but this didn't work. Murphy's Law of boasting took over and each ham tried to out-talk the other. Too much material was covered. We didn't remember that the students were there because they already knew something about ham radio.

The correct first-night procedure should be to show one of the League's films. They cover all aspects of the hobby in 30 to 45 minutes. After showing the film, you can go right into the first night's lesson.

Where to find Good
USED RIGS

Burghardt Amateur Center
Box 73 Ph#
Watertown, S.D. 57201 1-605-886-7314

Associated Radio Ph#
Box 4327 1-913-381-5900
Overland Park, Kansas 66204

Thomas Communications
95 Hills Lane 1-800-243-7765
Newington, CT. 06111

Look in the back of 73 Magazine + QST. Many MFG's have new models out + older models are being discounted.

Especially Look FOR:

Kenwood Closeouts.
Yaesu "
Atlas "
Ten Tec "
DRAKE "

Amateur Radio Wholesale has Lots of Special
See QST Ads

One of the weekly handouts.

Other first-night chores include introducing the teachers and having all the students introduce themselves. It is also helpful to have them tell why they came to the class and explain their communications experience.

Keeping the Interest

In most classes, the dropout rate was as high as 50%, and they all dropped out within the first few weeks of code lessons. To keep student attention during this period, we tried to provide some sort of a handout at each class. They were either a small electronic part, catalog from an electronics company, or a printed sheet on antennas or circuits. We also brought in a different piece of ham gear each week to discuss. We were trying to string along the slow learners so they wouldn't get discouraged. Many of these methods worked.

Ham radio, like all hobbies, has its magazines, stores, and clubs. To help out aspiring Novices, each class has its own booklet. The booklet contains a short message from the sponsors, dates of meetings, teachers' names and calls, local repeaters to listen to on their scanners, W1AW code schedules, recommended magazines, parts stores, study guides, code tape sources, club meeting sites and times, and a ten-point check list on buying their first rig.

Since our repeater is located on the North Shore of Massachusetts, the booklet is entitled *An Introduction to Ham Radio on the North Shore*. With each new class, we add additional information we feel is needed, as most of us forget a lot of these facts ourselves. This booklet is also good as a ham radio public relations tool.

At each class after that you can pass out the other sheets and catalogs previously mentioned. Other good handouts we used were reprints of Novice articles, flea-market flyers, and old issues of ham radio magazines that came from the club members. The local Heathkit manager was not only a great help in supplying books, but also supplied catalogs, space for our posters, and a small kit for no charge. The printed circuit board, after having been assembled, was brought into a Heathkit store for checking. If it were properly built, it acted like an oscillator. It was a good gimmick for all involved.

Final Handout

The final handout should be an SASE or postcard for the students to mail back with their callsign. I usually put it this way: We need to know if our teaching efforts were successful—please let us know your callsign, and, if you didn't pass the exam, let us know if you want to try again. All students are so proud and so grateful for your help, that very few don't return the cards. Sometimes they are like QSL cards; a few will show up months later from other states because the students have moved.

Follow-Up

At this point, you might think that you've done your part. Not so! Most new hams will need some encouragement to get through that first CW contact. The club should start a slow-speed CW net that meets at least once a week. This is a good way to get other club members active in helping out the educational committee. Also, anyone who doesn't get a license should stay on your mailing list for future classes. We heard many personal reasons for dropping out of classes, but in a lot of cases they would sign up for another class at a more convenient time.

Registration Forms

In making up registration forms for both the repeater club and our classes, we ask for all the pertinent information such as name, nickname, address, town, summer address, zip codes, phone number, mailing address, if different, home and work phone numbers, bands active on, mobile or portable capabilities, and, finally, these important questions. First, how did you hear about the class? This will give you ideas on which advertising works best.

Second, what is your job or profession? This question is usually overlooked by clubs and here is why it's important. In the classroom, if the teacher knows everyone's backgound and jobs, he can draw on those talents in making analogies. This shows your interest in the students and if the club's board of directors has access to a list of what each member does for a living, they can draw from this group for meeting programs.

Clubs and classes are always in need of new speakers on both technical subjects and human interest stories. One good example of this was a husband who called to sign his wife up for a Novice class. In the conversation I found out that he was an Advanced class ham who was the new Belden cable salesman for the area. He was glad to talk to both the club and classes!

Deadlines

When printing up your class registration forms, always make the deadline for enrollment at least one week before your first night. This allows you to know exactly how much material you will need. It was a big surprise, at one first meeting, to have 20 more people show up for a Novice class than the 30 who had sent in checks. If you have a small class and decide to supply textbooks for them, it takes at least two weeks to procure them.

Our first attempt included the ARRL's *Tune in the World* which required careful guess work on the projected number of attendees. In later classes, we purchased ample supplies of the League's or Ameco's question-and-answer-style books.

Money

Having a total of 11 classes over three years with fees ranging to $25 per family member, we generated plenty of money to purchase all the supplies, code tapes, slide programs, books, and teachers' guides. Since I was the chairman of our educational committee, I usually decided what else the money was spent on.

As a club, we recently gave the town and high school libraries in three communities the ARRL's complete set of current publications. The League will sell any affiliated club this package for only $55. All six librarians were gracious enough to accept the donations at our annual meeting for the installation of new officers. A picture was taken and a small article appeared in the local paper about the books and our new officers. It was a good ham radio PR move.

Even if your club decides to underwrite the costs of the class, it's still important to charge for the class. I've argued this point many times over the air, but I am convinced the $10 or so you charge makes the student feel he has made a commitment. No student has ever questioned our fees, and many have made other donations. When asked what happened to the money, I always explained the Handi-Ham System, because all the extra funds were used to put the handicapped on the air.

Thank You

By donating books and new ham gear to the towns and school systems that provided rooms for our use, we had thanked them in our own way. In some other nearby communities, the ham radio instructors are paid as paid regular teachers in the evening school. None of my instructors gets any money out of our projects, but in my own way I showed them my appreciation.

After two years of teaching one night a week, my ten instructors had spent a lot of time teaching ham radio. I know that they would have been happy enough with the students' individual thank-yous, but that was not enough. My wife and I had the instructors over to our home, with their wives, for a dinner party. I wanted them and especially their wives to know how special this group was to me. I got a lot of thank-yous from the students and club members, but it was this group who actually got the teaching done.

After you organize your first class, no matter how large or small, and the first happy Novice calls up to say, "I just got my callsign—KA1FCC," you'll know why we don't want to stop organizing them. If you think there aren't any people interested in ham radio classes for you to teach, then start by generating interest. I don't know how many classes we will help run over the next few years, but with the help of my fellow club members, the Courage Center, an understanding boss, and especially my wife, I look forward to many more happy Novices and Generals calling up to say "thank you."■

How FCC Rules Are Made

—a labyrinthine tale

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541 Broadway
Birmingham AL 35209

I think it appropriate to begin this discussion with a brief history of radio transmission and subsequent regulation. Federal regulation of interstate electrical communication can be traced to the *Post Roads Act of 1866*, which authorized the Postmaster General to fix rates annually for government tele-

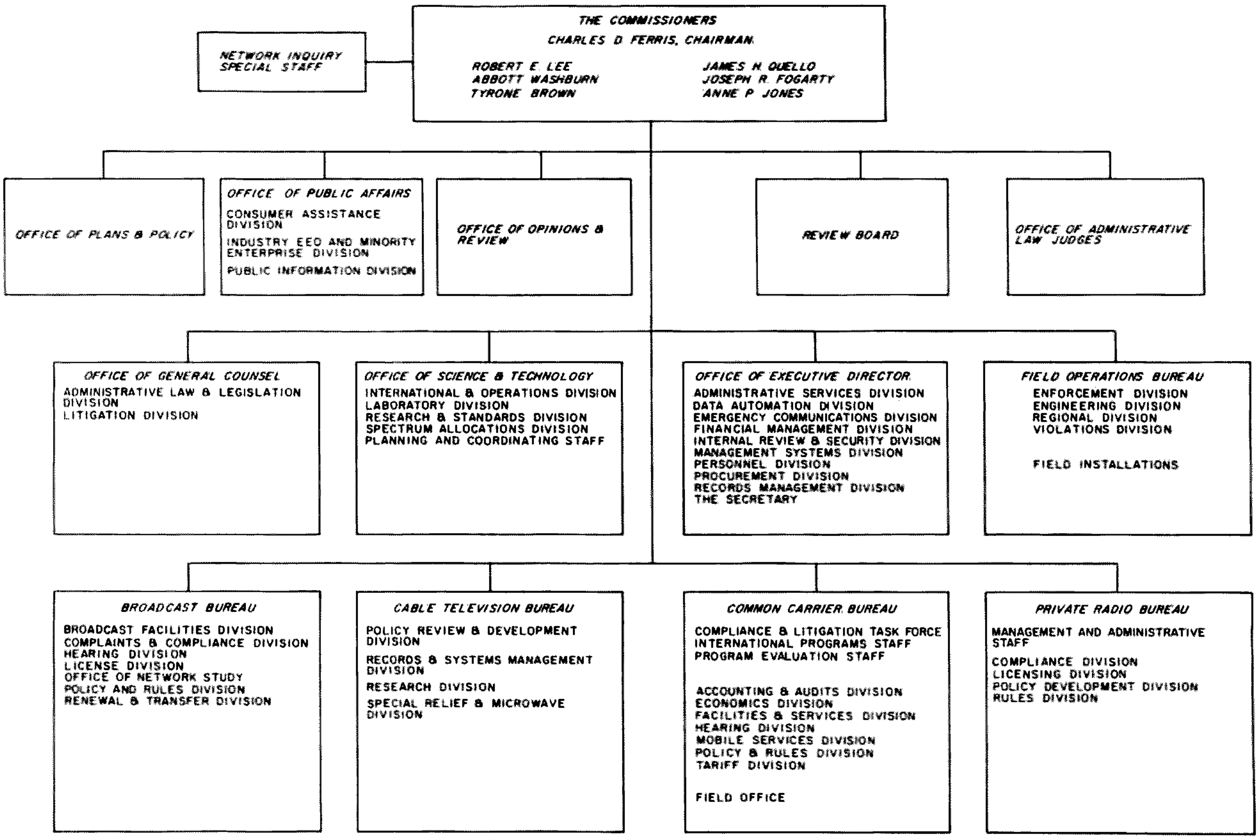

Fig. 1. FCC organization.

grams. This was followed by the *Interstate Commerce Act of 1887*, which granted the Interstate Commerce Commission (ICC) authority to require interconnection of telegraph systems to expand coverage across the country. Then, the *Vann-Elkins Act of 1910* directed the ICC to develop uniform accounting practices for these telegraph systems. This statute, in effect, extended provisions of existing law to cover certain wireless telegraphy. By 1910, wireless radio transmissions had proven worthwhile aboard ships, and the *Wireless Ship Act of 1910* required radio installation on large seagoing passenger vessels.

Two years later, the United States participated in the International Radio Telegraph Conference. Conference findings were the basis for the *Radio Act of 1912*. This Act regulated emissions, distress calls, set aside frequencies for government use, and mandated licensing. Licensing began later that year.

World War I ensued, and the Federal Government exercised control of radio, telephone, and telegraph as a precautionary measure. After the war, a tremendous growth in broadcast radio occurred. Broadcast radio had been unregulated by the legislation of 1912, which prompted President Coolidge to request of Congress the authority to control this growth. Congress responded with the *Dill-White Radio Act of 1927*. This Act established a five-member Federal Radio Commission under the Secretary of Commerce, with regulatory powers over radio.

Broadcast radio continued to prosper, and in 1934 Franklin D. Roosevelt asked Congress to approve the establishment of an independent commission to regulate radio transmissions. Congress responded by passing the *Communications Act of 1934*. This Act contained six major sections, or titles, and created the seven-member Federal Communications Commission (FCC) as we know it today.

There were extensive revisions to this Act, both in 1952 and during the period of 1960 to 1962. More recently, the *Communications Satellite Act of 1962* gave the FCC new responsibilities in the areas of space communications. Thus, over a period of time, Congress delegated authority to the FCC to govern radio; therefore, the Commission may develop regulations as they feel necessary to carry out these responsibilities.

Organization of the FCC

The seven commissioners are appointed for seven years by the President with the approval of the Senate. The Commission's chairman is selected by and serves at the pleasure of the President. The commissioners function as a unit, supervising all FCC activities. This is accomplished by delegating responsibilities to boards and staff units. Fig. 1 shows a current organizational chart for the FCC (amateur radio is within the Private Radio Bureau).

Rule Making

In order for the FCC to regulate radio transmissions as directed, the FCC must develop rules and regulations. Fig. 2 shows the pathway which a new Rule Making may follow. Using Fig. 2, let's begin at step 1 and follow a request for either a new rule or a rule change through the entire process.

Step 1. *Initiation of Action*. Any individual represented by one of the five groups may initiate a Rule Making.

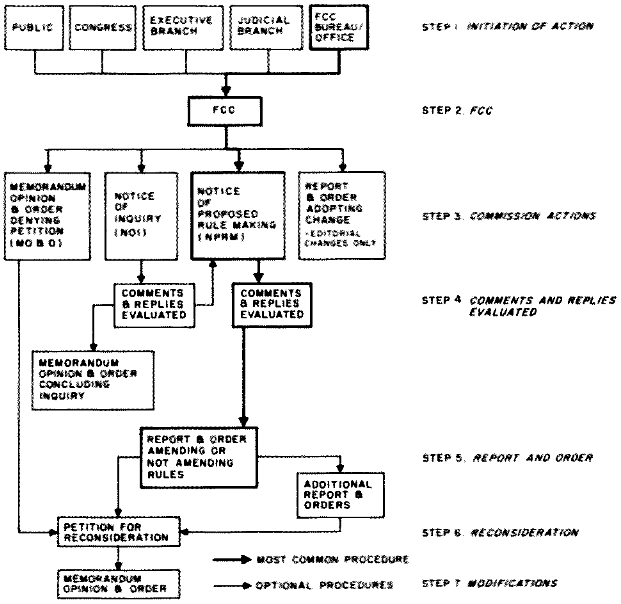

Fig. 2. FCC Rule Making diagram (from FCC Communicator, *September, 1975).*

Step 2. *FCC*. When a petition for Rule Making is received, it is sent to the appropriate Bureau for evaluation (the Private Radio Bureau for amateur regulations). If the Bureau decides a petition is meritorious, it will request that the Dockets Section assign a Rule Making (RM) number. The Bureau may then request one of four actions by the Commission as shown. A free weekly summary of Commission actions, *FCC Actions Alert*, is available from the FCC; the address for obtaining this publication will be found at the end of the "Publications" section.

Step 3. *Commission Actions*. If the Rule Making would require major changes in the rules, the Commission will issue either a Notice of Inquiry (NOI) or an Notice of Proposed Rule Making (NPRM). When either an NOI or an NPRM is requested, such a request will appear both in the *Federal Register* and the *FCC Actions Alert*. The NOI is basically to see if there is enough public interest to merit further consideration. The NPRM is an official announcement that a new rule is being considered. If the Commission feels that the proposal did not merit further consideration, they would issue a Memorandum Opinion and Order (MO), which would stop the action. The NOI usually leads to either an NPRM or an MO. An NPRM usually leads to a Report and Order (RO) or an MO. The RO either issues a new rule or amends and confirms an existing rule.

Step 4. *Comments and Replies Evaluated*. When an NOI or an NPRM is issued, the FCC solicits public comment. Replies to public comments are also solicited. Any comment or reply should reference the Docket Number.

Step 5. *Report and Order*. An RO is issued to institute a new rule, amend an existing rule, or confirm the current rule.

Step 6. *Reconsideration*. Petitions for reconsidera-

tion must be filed within 30 days.

Step 7. *Modifications*. A review of a petition for reconsideration may merit a change in the initial decision. The Commission may issue an MO to amend the initial decision.

Commenting

If you intend to file comments, the following subjects should be addressed. First, state your experience, expertise, and any insights which make your judgments accurate and worthwhile. Second, any facts, comments, or opinions should be clearly stated in easily understood fashion. Third, your comments should reach the Commission on or before the comment deadline. Moreover, if you intend to submit comments as a formal filing, you must submit an original and five copies. Comments should be submitted to: Secretary, Federal Communications Commission, 1919 M Street NW, Washington DC 20554. Be sure to note the Docket Number on the comments.

To help in filing comments, the next section will outline various materials available on the subject, and where they may be obtained. These publications will add clarity to FCC policies and procedures.

Publications

A) *Federal Register*, a daily publication from the U.S. Government which covers both proposed and official changes in regulations prepared by government agencies. The FCC is just one of hundreds of agencies and commissions which publish regulations in the *Federal Register*. A subscription may be obtained for $50 yearly from the Superintendent of Documents. The *Federal Register* is usually available at libraries in most areas.

B) *FCC Actions Alert*, a weekly bulletin published by the FCC containing Commission actions. The *FCC Actions Alert* is available without charge from the FCC.

C) *FCC Reports* contain complete texts of FCC reports and actions and is available for a fee from the Superintendent of Documents.

D) *FCC Rules and Regulations* is a looseleaf subscription service which continually updates the FCC regulations covered by that particular subscription. In order to cover all FCC Rules and Regulations, several separate subscriptions would be required. Information concerning which parts each subscription covers and how they may be ordered will be found in the U.S. Government Printing Office pamphlet *SB-281*, as described below.

E) *Federal Communications Commission Publication SB-281* is a subject bibliography available without charge from the Superintendent of Documents and lists all publications available from the U.S. Printing Office concerning the FCC.

F) *FCC Information Bulletins* are available without charge upon request from the FCC. Each bulletin covers a specific area of the FCC's responsibilities or a topic of interest to radio enthusiasts.

Federal Register, FCC Reports, FCC Rules and Regulations, and subject bibliography *SB-281* are available from: Superintendent of Documents, U.S. Government Printing Office, Washington DC 20402.

FCC Actions Alert and *FCC Information Bulletins* are available from: Federal Communications Commission, 1919 M Street NW, Washington DC 20554.

Summary

Amateur radio clubs should be apprised of proposed changes in FCC regulations which affect amateur radio. Too often over the last few years, we learned that we were the subject of substantial changes without sufficient prior notice. Because of printing and mailing lead times necessary with publishing magazines, it is very possible that the FCC comment period is long over by the time you receive the current issue containing the notice. This can be avoided by having the club or a responsible individual placed on the *FCC Actions Alert* mailing list (see "Publications"). If a Rule Making concerning amateur radio is received, then the membership can be notified. In addition, the FCC maintains two phone numbers, one for general information from the Public Information Officer, (202)-632-7260, and the second, a recorded message concerning weekly actions, at (202)-632-0002 (neither is toll-free).

As you know, the trend regarding frequencies has been "use them or lose them"; the same is true of Rule Makings. Failure by the FCC to receive a number of comments on proposals means to the regulator that there is little or no interest in the subject; therefore, they should proceed with their proposals. Many times this just isn't true. Therefore, I suggest that you as an individual or club member monitor FCC Rule Makings, perhaps even suggesting changes in amateur regulations which you feel merit consideration. Your very participation will help ensure the place of amateur radio in the future. ■

Acknowledgement

A portion of the information contained in this article was obtained from the Federal Communications Commission.

REVIEW

from page 32

the manual, "The quality of copy is directly proportional to the quality of the signal being received as well as the quality of the CW being received. If you are trying to copy a guy with a sloppy fist, then you'd better expect sloppy copy. If, on the other hand, the CW is being sent by a keyer or a keyboard, the copy will probably be perfect." Amen. If you intend to use the ROM-116 for serious CW reception, get a good CW filter and talk only to people who can send well! Whatever conclusions you draw about machine-read CW, the transmit portion of the ROM-116 is faultless. It is easy to use, sends perfectly, and even allows you to start typing a reply while receiving a message.

By necessity, this is only a brief overview of the capabilities of the ROM-116; it has many intriguing features that are not mentioned in this review. How did it perform in the real world? Superbly. It is at the top of its class. With equipment like this on the market, the old stalwarts are going to have to brace themselves for an influx of enthusiastic operators using computer-based RTTY gear. Few people who listen in on the RTTY segments of the band will be surprised if RTTY operation begins to spread out and take more spectrum. Things are already pretty crowded! A device like the ROM-116 will attract a lot of people to RTTY who would never have considered it before —people like me!

There is one big if that deserves mentioning. Microcomputers, to varying degrees, can emit a lot of hash into the rf spectrum. If your computer is unshielded (as is the TRS-80), you may or may not hear a great deal of noise in your receiver, all generated by the computer. In the *73* shack, using unshielded interconnecting cables and making absolutely no effort to reduce interference, the problem was there, but it wasn't severe. Weak signal work could suffer some interference, but the problem was not as bad as we expected. Best of all, the combined efforts of our Alpha 374 and Dentron MLA-2500 amplifiers did not cause any interference to the RTTY system, even while operating RTTY and SSB simultaneously.

This is the dilemma that hams face when they go shopping for a microcomputer-based RTTY system: Do they buy a completely RFI-proofed system that offers limited or non-existent use as a separate computer, or do they go for a microcomputer and interface system that can be extremely useful when the bands go dead, but may or may not need some work to clean up RFI? If getting dual usage out of your equipment appeals to you, the Crown Microproducts ROM-116 deserves your attention; it's a first class piece of gear that you'll never grow out of. For further information, contact *Crown Microproducts, PO Box 892, Marysville WA 98270.* Reader Service number 478.

Paul Grupp KA1LR
***73 Magazine* Staff**

REALISTIC PRO-2008

Radio Shack's latest introduction to the scanner market, the PRO-2008, provides the Public Service Band enthusiast with an interesting blend of traditional and unique features. The new, stay-at-home relative of the popular PRO-2001 is designed to be a lower-priced alternative for those whose listening needs require a smaller number of channels without a searching capability. The 2008 is a 1980 addition to the Realistic family of scanning monitors and is midway in price and performance between the most expensive crystal-controlled scanners and the more sophisticated synthesized models.

The 2008 is a programmable FM scanning receiver with direct keyboard entry system, capable of scanning any eight frequencies in the ranges 30-50, 144-174, and 410-512 MHz. The entire unit is controlled by an onboard microprocessor designed especially for use in this scanning monitor. The microprocessor is accessed via the 18-key

Continued on page 117

Paul Danzer N1II
2 Dawn Road
Norwalk CT 06851

A $10 Phone Patch

—CQ Ma Bell

You don't *have* to spend $40 to $90 for a phone patch to match your new solid-state rig. This simple circuit will give perfectly adequate performance with parts purchased at your local Radio Shack. For a cost of under $10 and one evening's work, you can have a patch that will work with a new solid-state rig or an older tube-type transceiver. This circuit (or variations of it) has been in use by several hams in this area for a number of years (see Fig. 1). With the bypass capacitors shown, no effect from rf feedback has been experienced, even when used with a kilowatt.

S1 is a four-pole, two-position switch (Radio Shack 275-1384 or equivalent) used to switch the patch on and off. The fourth section of this switch (S1d) is used to switch the patch into the circuit in place of the usual station microphone. If your rig has a phone patch input, you can leave the mike connected to its usual jack and use the alternate connection shown by the dotted line.

S2 is a DPDT toggle or lever switch. It allows you to select XMIT (transmit) or RCV (receive) from the front panel of the patch, rather than fumbling with the microphone PTT switch, telephone handset, and receiver audio gain control all at once.

S2 is wired in such a way as to permit operation with many types of solid-state rigs. These rigs often have the novel little problem that the receiver audio is not cut completely off while in the transmit mode. During normal operation this is not a problem. However, with many of the usual phone patches, an audio oscillation will result, with the phone patch acting as the oscillator coupling element. Switch S2 disconnects the receiver audio from the patch when in the transmit mode, thus eliminating the problem.

The second section of this switch (S2b) grounds the PTT line when you wish to transmit. On a few of the new rigs, this line is called MOX rather than PTT. MOX stands for Manually Operated Xmit, similar to VOX for Voice Operated Xmit.

Impedance matching is provided by T1 and T2, which are identical 8-Ohm-to-1000-Ohm (center-tapped) audio transformers. Radio Shack lists this item as 275-1384. They are not critical, and any 8-Ohm-to-1000-Ohm or 8-Ohm-to-500-Ohm audio transformer will do. Good performance has been obtained even with a pair of 12-volt filament transformers. The 12-volt secondary is connected in place of the 8-Ohm winding and the 115-volt primary in

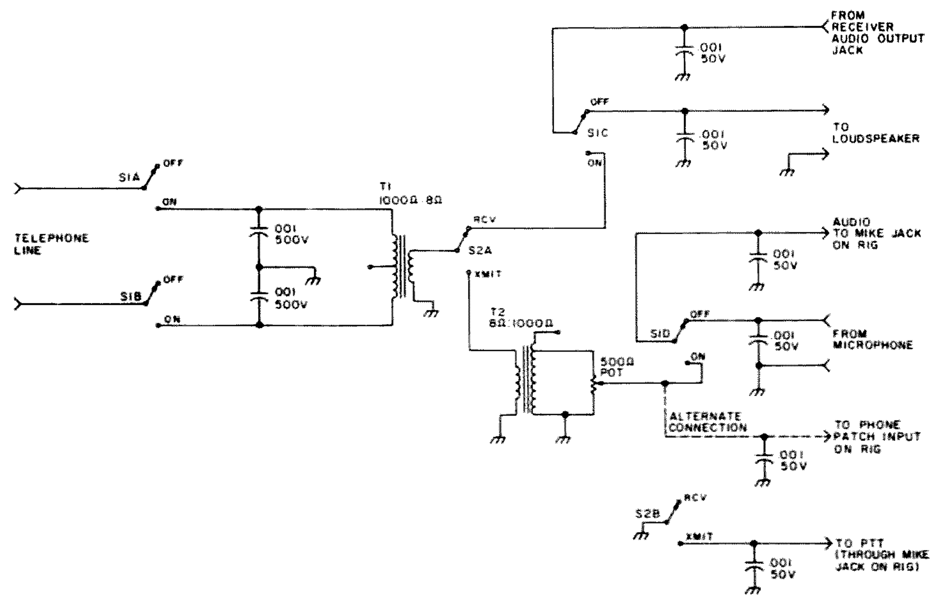

Fig. 1. Inexpensive phone patch uses readily available components.

place of the 500- or 1000-Ohm winding.

The transmit level is set by the 500-Ohm pot connected to T2. Bypass capacitors are shown on all input and output leads to prevent rf feedback. A metal enclosure for the patch is recommended.

To use the patch, set S1 to ON and S2 to RCV and listen on the telephone handset. You can get a clear line (no dial tone) by dialing the first digit of a local exchange. Tune in a station on your receiver and set the audio gain control on the receiver for a comfortable level in the telephone handset. Telephones are quite tolerant and level setting is not critical. If the audio sounds comfortable in your ear on receive while listening through the telephone handset, it probably is acceptable.

Next, put S2 in the XMIT position and talk normally into the telephone handset. Set the 500-Ohm pot so that the meter on the final in your rig swings into its normal area as though you were using the station microphone.

There is no provision for VOX operation. Most hams prefer manual RX/TX since it both prevents an operator's accidental sneeze or cough from turning on the transmitter and allows you to cut off the speaker if he or she attempts to say something inappropriate for transmission over your station.

One tip on phone patch use—for some reason, when you tell someone on the telephone to talk louder, they will do so for a few minutes and then lapse back to their orginal volume. However, if you turn the audio gain control down so that they hear the other station more softly, they will automatically speak up as though to compensate.■

✓ Reader Service—see page 146

Two Stations on One Antenna

—Impossible? Guess again!

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Can two amateurs live next door to each other and operate in harmony with *one* antenna system for *two* shacks? Sure! Here's how we did it.

At the time I (Charlie WA4RRB) moved in next door to Phil WB4INC, we had a few things going for us: (1) We had been friends for many years. (2) Our shacks were to be very close. (3) We had a lot of parts in the junk box. (4) And, most importantly, we agreed that it would be ridiculous to have two complete antenna systems side-by-side. We couldn't both operate on the same band at the same time, anyway.

We ended up with a very versatile and simple switching system that features: (1)

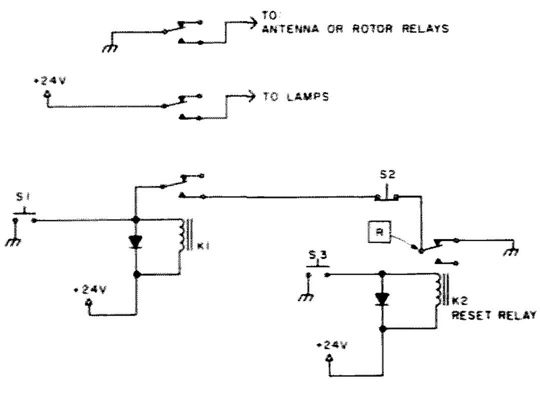

Fig. 1. Basic control relay hookup.

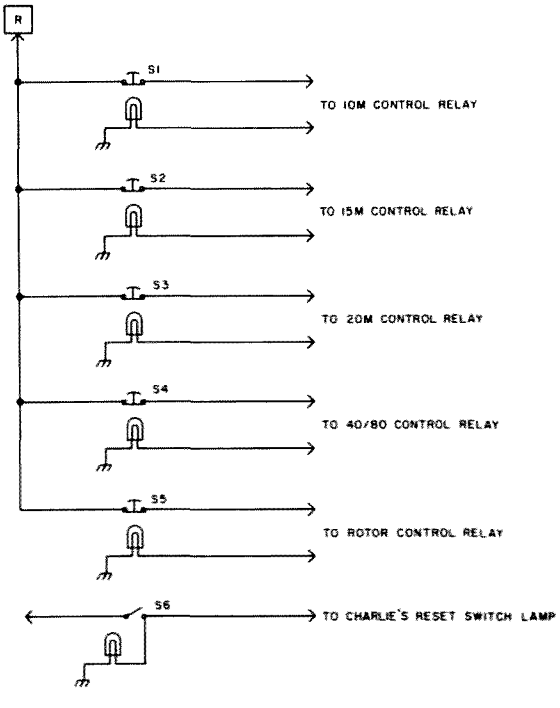

Fig. 2. Phil's control panel.

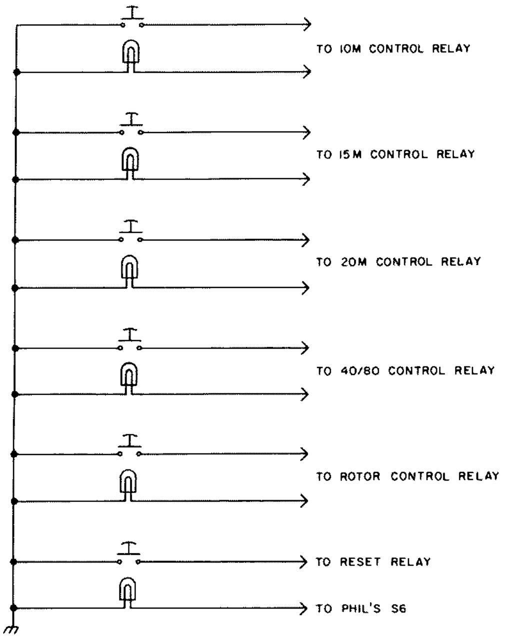

Fig. 3. My control panel.

two-way intercom between shacks; (2) remote control of all the separate feedlines for a three-band, two-element quad for 10, 15 and 20 meters; (3) remote control of a two-band trap dipole for 40 and 80 meters, and (5) lighted indicators.

Since all of the antennas already existed at Phil's, we left them there and I undertook the construction of the switching system. The design considerations were: (1) as little disruption to Phil's shack as possible; (2) a low control voltage between shacks; (3) fail-safe normals so that power supply failure would not inconvenience Phil (after all, I was saving lots of bucks by not having to buy and erect an antenna system); (4) a simple single-voltage power supply; (5) grounding of all antennas when not in use, and (6) ability to override the other shack—if one operator forgot to clear his control panel, the other still could gain access to any antenna.

There are four sections to the system: the control relays, Phil's control panel, my control panel, and the antenna relays. The basic control relay hookup is shown in Fig. 1.

If I press S1 (a momentary NO SPST push-button switch), K1 pulls in. The lower set of contacts applies a latching ground to the relay coil through two dependent normals: S2 (an NC momentary push-button switch) and an NC set of contacts on K2. S2 is on Phil's control panel and when it is pressed, it resets the condition that S1 set. K2 and S3 allow a momentary break in the ground used to latch K1. I use S3 to reset anything I've remoted. Phil uses S2 to reset the relay if I walk off and leave something remoted.

Point R is connected to all of Phil's switches, allowing reset of any remote condition to my shack.

S1 and S2 have internal lamps that are lighted when K1 pulls in. The lights indicate a remote condition. All bulbs are 28 V dc running on 24 V dc to lengthen life. All control relays are 4PDT 24 V dc.

This circuit is duplicated five times: four for the antenna relay control and the other for rotor control.

S6 is a push-on, push-off SPST switch with an internal lamp. Phil presses S6 when at the rig, illuminating my reset switch lamp (in S3) and warning me of Phil's operation. I check with Phil over the intercom to see what antennas are available.

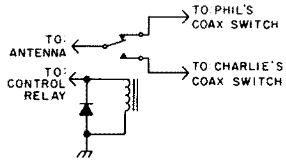

Fig. 4. Antenna relays.

All control switches are momentary SPST push-buttons with internal lamps.

We home-brewed the antenna relays, not only because of the availability of parts in the junk box, but also because of the cost of commercial units. The relays were enclosed in small aluminum miniboxes, with all coax connections made through SO-239s. We feared an impedance lump, but were pleased to find no change in the operation of any of the antennas. The relays used were 24 V dc with large contacts, capable of handling a kilowatt. We also were pleased that no rf got back into the power supply.

The outputs of the antenna relays feed ground-shorting rotary coax switches in both shacks.

All interconnecting cables run between the two shacks through four-inch PVC pipe that is buried about six inches down. The elbow connections into the shacks are hidden from the street with bushes and ferns.

We are able to operate simultaneously, even when both stations are using the quad. The only conflict that arises is in the direction the quad is pointed. Remember—we're friends. . .

The system has been in continuous operation for over two years, with not one failure. ■

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Build a 60-Hz Frequency Monitor

—keep the power company on its toes

How many times have you needed a simple, cheap, 60-Hz frequency indicator? Sure, a commercial reed-type meter is nice, but it never seems to be available when you need it. The other alternative, the station frequency counter, is bulky and expensive.

Here is another device—a circuit—which can resolve cycles per minute and costs only a few dollars to build. The circuit is basically a frequency comparator, and the idea can be extended to almost any frequency you wish.* Fig. 1 shows the schematic. The reference frequency (60 Hz) is derived by using a color-TV crystal and an MM5369 programmed divider (integrated circuit). Both crystal and IC are very reasonably priced and useful for many digital clock/timer projects as well. The input frequency is taken from the low-voltage secondary of the power transformer. The power supply is straightforward, using a bridge rectifier and a 5-volt IC regulator, U6.

*"Circuits²," *73 Magazine*, July, 1977, p. 35.

The reference and the input frequencies are processed by the Schmitt trigger, U2, and fed to the comparator circuit, U3, U4, and U5. U3 provides identical pulse shapes to U4. U4 is a 4-bit counter which counts up with one input and down with the other. The counter contents are decoded by U5 and used to light D5 to D8, in sequence. The direction of the sequence will indicate whether the input frequency is fast or slow. For the display, I used a 7-segment readout with a defective segment, but four standard LEDs work as well.

The PC artwork I used is shown in Fig. 2, and parts placement in Fig. 3. Any method of construction you find convenient to use with ICs is okay. Nothing is particularly critical, but you may need 0.01-uF bypass capacitors for the 7400-series ICs. U6 should have a small heat sink.

It's simple to use. Plug it in and watch the rotation of the LEDs. For the most part, the oscillator trimmer doesn't really have to be adjustable. If you're a purist, the oscillator can be set to 3.579545 MHz with a frequency counter on U1 pin 7, a buffered output.

Plug it into your local power company, and you will see a very slow rotation, once every five minutes or so, corresponding to a frequency difference of perhaps four cycles in five minutes. Most power companies rarely hit 60 Hz on a

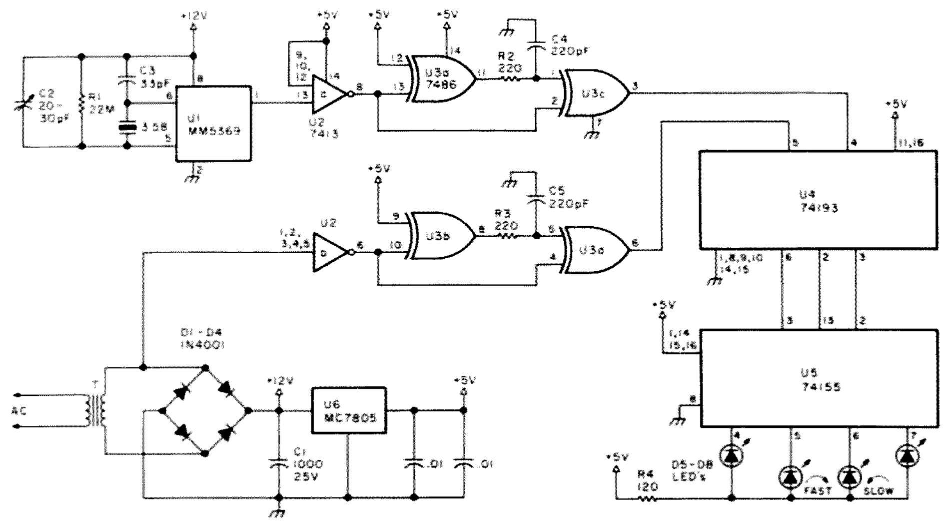


Fig. 1. 60-Hz comparator schematic.

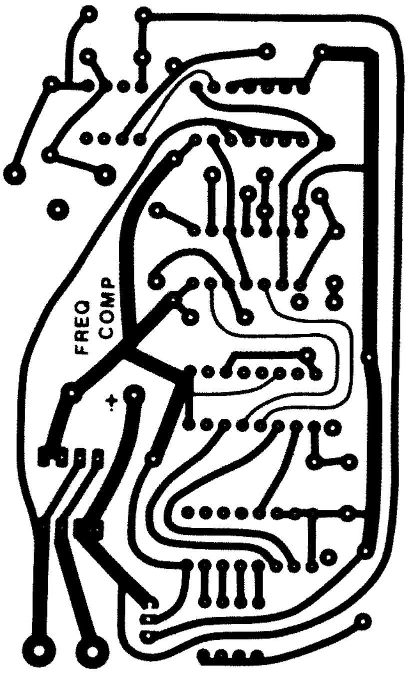


Fig. 2. PC board layout.

short-term basis because of adjustments needed for demand, etc., but over the long term, all the clocks stay on time. This is why the rotation will be fast (clockwise) at some times while slow (counterclockwise) at others. On an emergency or standby power system, you will see quite wide changes of frequency with load variations.

That's all there is to it. One of these devices is in use at a local radio station. (Opening the throttle on a 30-kW diesel generator until the fluorescent lights fire is not the best way to set engine speed!) Try one for Field Day.

I want to thank Carol Stoops and Keith Anderson for the photography, and Lindsay Mickler for her assistance in preparing this manuscript. ■

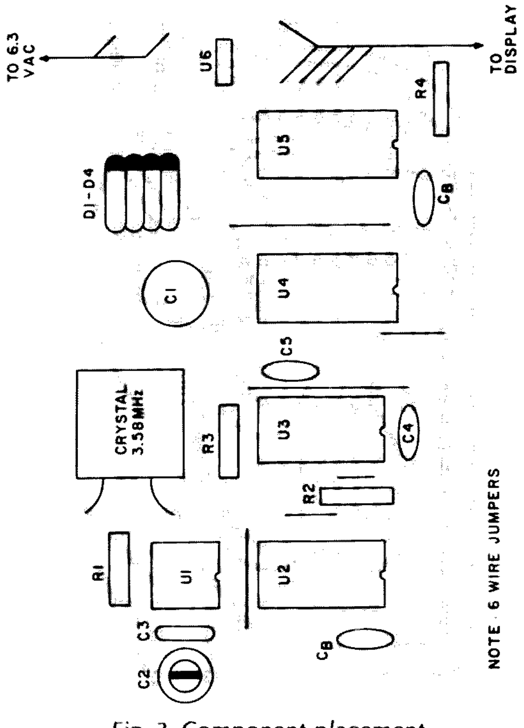
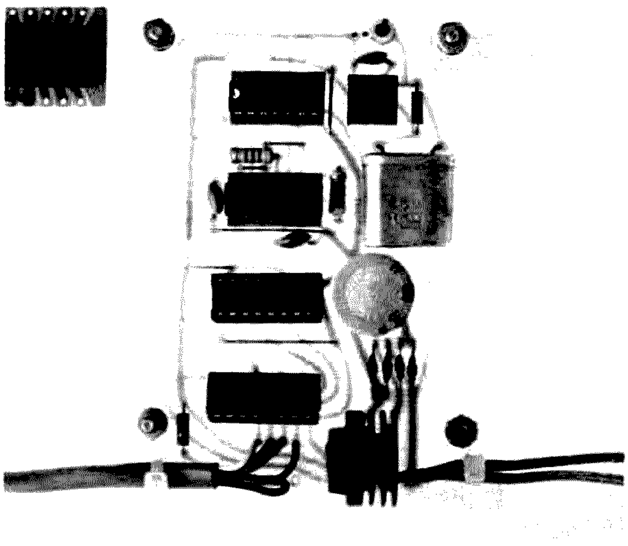


Fig. 3. Component placement.


60-Hz comparator.

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Feelin' No Pain

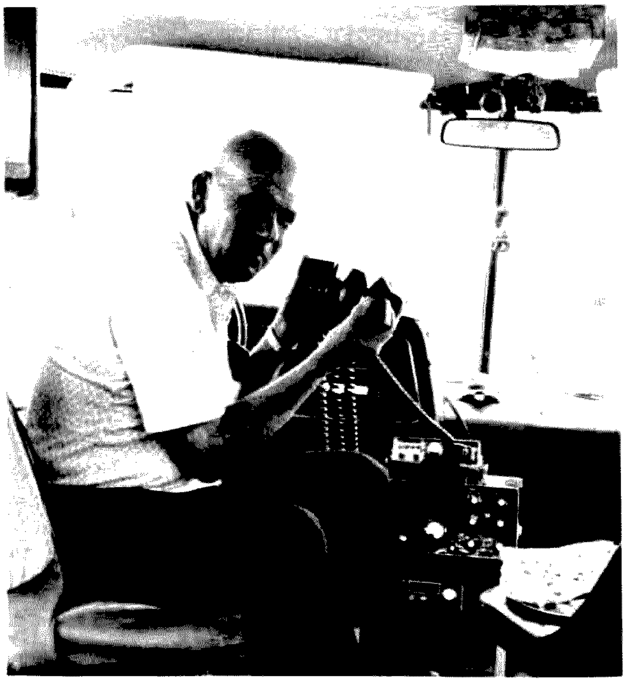
—expedition to Luckenbach

Permanent residents of Luckenbach, Texas, whose numbers fluctuate between three and five depending on the time of year and which way the wind is blowing, took the whole thing in stride on that May weekend.

And why not?

On previous weekends, for instance, thousands of country-and-western-music fans had jammed the tiny Texas hill country community to listen to their heroes, Willie Nelson and Waylon Jennings, sing the praises of Luckenbach ("where ain't nobody feelin' no pain") and drink beer.

Other weekends brought numbers of Bandidos (the Texas answer to California's Hell's Angels) roaring down Luckenbach's main street on their motorcycles for days of dancing and drinking beer.



"Tex" N5TX offers a handful of mikes from inside his mobile home's main operating and driving location. The vehicle served as one of the many operating points during the weekend.

And, on weekends between, there is a constant stream of curious tourists, carrying cans of beer and admiring such well-known landmarks as the town's lone parking meter, the recently installed pay telephone (the only one in town), or the bust of the late Hondo Crouch, who helped rescue Luckenbach from becoming a ghost town by buying it—lock, stock, barrel, and egg-delivery route.

What was so special about the arrival on the weekend of May 12-13, 1979, of several dozen radio amateurs (with their elaborate equipment and antennas) for the first DXpedition to Luckenbach? For the locals, not much—except for another increase in beer sales. Few passersby noticed the sounds of CW signals drifting over the row of faded green outhouses across from the combination general store and bar.

But if the regulars were being blasé about the DXpedition, amateurs around the world were not. They were lined up, waiting their turn for a contact with W5TEX, the Voice of Luckenbach, for the weekend. When the pileups cleared at noon Sunday, after twenty-eight hours of operation, some 2,200 amateurs had qualifed for special certificates issued for the occasion. And some of those pileups were so massive, operators and loggers occasionally had to summon help.

One of those waiting to land W5TEX was UA9DO in Moscow, who read about the DXpedition in a US ham radio magazine. That particular QSO was the longest distance worked during the weekend. (One Texas ham wondered why the Russian apparently was getting better and speedier delivery of the magazine than were the locals.)

Other DX logged included WA4JHS/MM1 in the Mediterranean, SV0AH in Greece, YU2RAW in Yugoslavia, and EA9FE in Africa, all on 10 meters.

And there was the bewildered WB2RLK/VE1 in Nova Scotia, who could not immediately grasp the details of his QSO with Luck-

Larry N5LL handles the 10-meter and 6-meter FM positions from a relaxed perch just aft of the tailgate of a vehicle.

"Cherokee" WD5JKW at the key on 15-meter CW, one of the most active operating positions in Luckenbach.

enbach. Dee WB5VWX and Floyd WB5PFR found an old set of bedsprings, took it outside, propped it up, loaded a Ten-Tec Argonaut into it through a tuner, and worked him on 10 meters, getting a respectable 5-by-5 report in return. They said later that they had to twice explain where they were and what was happening with their antenna; they quoted him as saying that "since he was working a station in Luckenbach, he could believe almost anything." That QSO netted him the only bedspring endorsement to be awarded on a certificate. The antenna was dismantled immediately afterward.

The whole event, staged by the Bexar County Repeater Organization in San Antonio, was timed to coincide with the annual return of the mud daubers—an occasion rivaled only by the return of the swallows to Capistrano or the return of the turkey vultures to Hinckley, Ohio. And the mud daubers (pronounced "muddobbers" locally) winged in promptly at noon on Saturday to be greeted with cheers (and another round of Lone Star beer) from the crowd that had gathered to mark the event.

Operations were set up in a former cow pasture, adjacent to the main street, vehicles were deployed around the area, and the place soon took on the air of Field Day. Stations were set up in mobile homes, travel-trailers, on the tailgates of pickup trucks, and in a nearby building.

Beams (lent by Wilson Electronics Corp.) and longwires were everywhere. In many instances, the beams were cranked by hand.

Using regular power sources instead of emergency generators, the operators jumped to their tasks just after breakfast on Saturday. Sixty-one operators and loggers manned the various points, with stations on all the high-frequency bands and on 6 and 2 meters in the VHF spectrum. Phyllis Dyer WB5ZFA put all the other operators to shame by handling 291 out of 582 contacts on 20-meter phone during the weekend. And there were 524 contacts on 40 phone, 498 on 15 phone, and 205 on 15 CW.

The idea for the outing came (as a joke) from a repeater organization member to Bob Schneider AI5Q, who was the net control station one night.

"Clem WB5VDL said he was turning the net back over to AI5Q, who was organizing a DXpedition to Luckenbach," Schneider recalled later. "Everyone heard it, and the next thing I knew, we were getting calls from as far away as Corpus Christi wanting to know about it."

From there the idea caught on and spread. The repeater group raised about $1,200 through a raffle to finance the costs.

Tentative plans call for the San Antonio group to mount its next DXpedition from deep in the heart of Texas—literally. The next outing has been scheduled for mid-1981 from a cavern below the surface of the earth—a cool spot on hot days.

Other sites being eyed are Terlinqua, Texas, near Big Bend National Park in far west Texas and the site of an annual chili-cooking competition, and Lost Pines, near Bryan, Texas. Legend has it that Lost Pines, located in an area of the state otherwise devoid of pine trees, came from seeds planted by the famous Johnny Pineseed, a descendant of Johnny Appleseed, who wandered that section of east Texas in the last century and whose exploits are expected to be the center of attention any day now, according to Schneider.

Any chance of a return trip to Luckenbach?

"That's possible, too," Schneider said. "They were glad to have us and happy about the publicity. We were so tame compared with the normal Luckenbach groups that we almost weren't noticed. We probably were the first group in three or four years that didn't have hair down to our shoulders."■

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Operating Overseas
—licensing facts for traveling hams

Early in 1977, after having passed the radio amateur examination in South Africa, I had to travel for my company to the German Federal Republic. In South Africa, I could find no information readily available on how to obtain permission to operate in other countries. A phone call to the DARC (the Deutscher Amateur Radio Club) amateur radio center, the Amateurfunk-Zentrum (AFZ) in Baunatal, West Germany, brought me all information on how to get a guest license.

After returning to South Africa, I discussed my experience with other hams. It became clear to me how many of us travel but leave our rigs behind and do not apply for permission to operate in the countries visited because there is just no one who knows who to contact for such permission. Subsequently, I wrote to the DARC and got photostats of all the guest license information available at that time (early 1978). The information supplied by the DARC is, of course, intended for German radio amateurs and is based mainly on arrangements the German Ministry of Posts has made with other foreign telecommunication authorities.

This was used as a basis for finding out the conditions under which foreign telecommunication authorities issue licenses to visitors. When I visited the UK and West Germany early last year, I was lucky to meet the General Manager of the Radio Society of Great Britain (RSGB), OM Dave Evans, in London, as well as the General Manager of the DARC in Baunatal. We discussed problems that visiting hams encounter, and I was now able to help the DARC update its guest license file with information from South Africa and elsewhere.

The information contained in this article has been gathered from various trips that other hams and I have made. Guest licensing is in a stage of rapid advancement as more hams travel and licensing authorities realize the needs and benefits—especially in developing countries.

Let's take now a look at how various countries grant licenses to visitors.

Reciprocal Agreement

Countries which base licensing for visitors strictly on reciprocal agreements only are, for example, Austria, Denmark, Great Britain, Switzerland, and the United States.

● *The United States:* Licensing for visitors is based on reciprocal agreements between two licensing authorities, in which both parties to the agreement state which license classes are equivalent and are recognized by each other.

● *Great Britain:* The Home Office in London is the British licensing authority dealing with application from visitors. Between the UK and South Africa, a reciprocal agreement has already existed for quite some time. However, a large number of radio hams traveling from South Africa to the UK were not born in South Africa. There are, for example, British passport holders who participated in the classes of the Johannesburg branch of the South African Radio League, as well as other non-S.A. nationals who passed the amateur radio operators examination in South Africa.

The agreement states that each license authority will recognize each other's exam certificate provided

the applicant is a national of the country where he passed the exam. I pointed out that this would exclude the non-S.A. citizens who are permanent residents in South Africa. The Home Office spokesman indicated that new consideration would be given to this matter. Nobody had realized that this wording could be discriminating.

Guest Licensing

The Ministry of Posts in the German Federal Republic, along with other European countries, started in the sixties to conclude agreements with other countries to cater to traveling German hams and for the visitors. The general liberalization in Germany and other countries led to a new type of permission to be introduced. The guest license (also called short-term permit in some countries) is not based on a bilateral agreement anymore but on the merits of the individual applicant. This eliminates a lot of paperwork and politics for the administrations.

Any radio ham holding a valid amateur license in his/her home country can apply for such a guest license. A basic requirement is that the examination passed in the home country be equal to or of a higher level than the class applied for in the country to be visited. For example, in the US the Technician class license is similar to the class "A" in the German Federal Republic, but the Novice license is not equivalent to the German class "C" because of differences of depth in the theory and the absence of a CW test in the "C" license.

Belgium, France, West Germany, and Israel are countries which issue guest licenses without a reciprocal agreement in force.

● *Australia:* A visitor permit is issued on application for a period of up to 12 months for a fee of $A12, provided the visitor is a bona fide tourist and does not intend to enter the country to take up employment. Radio hams arriving from countries where a reciprocal agreement exists with Australia will be given an Australian license even if they take up employment. Arrivals from non-agreement countries wishing to take up employment have to sit for the exam.

● *Swaziland:* A visitor permit is issued on application to hams originating from ITU-member countries for a period of up to 30 days free of charge (include an IRC for airmail reply). Applications for permanent callsigns from hams arriving to take up employment will be considered (through a security check) once they are resident.

Swaziland, a beautiful mountain kingdom with a wealth of tourist trade mainly from South Africa, is not super-rare DX, but there are many hams who do not have a QSL card.

The Swazi Telecommunications Department has been acquainted with amateur radio since its start and visitors have always been allowed to operate. Applicants, however, sometimes did not have an answer after waiting for six months and more. When in Mbabane, the capital, I went to see Mr. B. Manana, the man in charge, who explained the problem to me.

There was no application form available, and hams simply wrote letters indicating the period they wanted to operate and enclosed photostats of their current license. If all required information was provided, a permit was granted. Where the application was incomplete, it was filed. The basic problem was that applicants did not know what they were supposed to do.

I developed an application form which covered all questions to the satisfaction of the administration, and to my knowledge no completed application has since been unsuccessful.

● *Zimbabwe Rhodesia:* Short-term permits are issued free of charge on application from visiting hams originating in countries where no reciprocal agreement exists, provided the application is received at least six weeks before arrival in the country.

● *South Africa:* The South African Telecommunications Department bases its licensing decisions for visitors on reciprocal agreements only. At the AGM of the South African Radio League in Durban in 1979, a motion was passed unanimously to appoint a committee to investigate guest licensing for visitors to South Africa.

Reciprocal Licensing vs. Guest Licensing

Reciprocal Licensing. This has the advantage that US hams are granted the same privileges as visitors to the US. This is the same, of course, in all other countries which license strictly on a reciprocal system. Reciprocal agreements place a great administrative burden on the licensing authorities concerned, sometimes for the benefit of only a very small number of hams. The US is a world leader in reciprocal agreements, followed by Great Britain. This effort is very commendable, but not all administrations are prepared to conclude agreements with large numbers of other countries.

Guest Licensing and Short-term Permits. This takes a lot of the work load off the administration, and visitors from rare DX countries can be considered, which is, of course, a lot of fun for the hams in the country being visited. It gives the visitor a better opportunity to meet the locals and make friends. It also is exciting to hear an A2C station mobile in 3D6, a ZS6 call portable ZE, or (when I was in Germany) an A2CPS/DL/mobile on the air. Political differences between countries are not obstacles anymore, and applicants whom an administration might find undesirable can be rejected without any embarrassment.

Where Does the Information Come From?

In my travels, I make a point of visiting the license authorities to obtain application forms, discuss the various aspects of guest licensing, and to maintain a personal contact. You could do the same.

To provide up-to-date information for radio hams, each amateur society should have a current file based on travels by members. Awareness can be created by the editor of the national amateur magazine. In the South African *Radio ZS Magazine*, I have had various articles published which have helped hams to obtain reciprocal as well as guest licenses.

The *cq-DL* also has frequent reports of traveling hams who have visited rare countries, describing their experiences.

It is not in my scope to answer all queries of all US hams traveling the world. However, hams traveling in Southern Africa, including Botswana, Rhodesia, Bophuthatswana and Transkei can contact me for application forms and an information sheet. Please include $1(US) for postage and photostat expenses per country. (Any queries without 3 IRCs for return air postage cannot be considered.) A *must:* Include callsign, license class, proposed date of arrival, and period of intended stay. Please type, or use neat handwriting, and allow at least 60 days. ■

Stalking the Elusive Ground Fault

—a real-life adventure

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Midnight, and after four hours, I had finally found the semicolon some nearsighted copyreader had overlooked in my BASIC manual. I pulled the plugs and put my toys away.

Early in the evening, there had been flashes of lightning in the area, and the general forecast was for possible thunder-showers. In this part of the Ozarks, that can be bad news, so I made the rounds. First, the garage, where my country-type water system was installed—check water pressure and then disconnect the pump; throw the master switch. Then to the radio shack—all gear disconnected from the power line, antennas properly grounded, everything there OK. Back in the house—two-meter gear disconnected, organ plug pulled, TV antennas and line plug out, hi-fi system disconnected—nothing running there but the electric clock built into the wall. Refrigerator and deep-freeze still connected; pull them only when lightning is making the dog howl. Nothing connected in my bedroom but a cheap radio and a fluorescent lamp; in my wife's room, I knew there was another fluorescent lamp and a clock-radio; they should all be OK. About twelve-thirty now, and it had been a long day. Even the dog was asleep.

Two-thirty. *"Bob, I need your help!"*

I reckon she did—house full of stinking electric-type smoke. Wife's fluorescent lamp in flames; electric clock dead. Bulb in the ceiling with a dull glow. Pulled beds and dressers around to get at various outlet boxes; nothing wrong. (Still not awake.) Out in the kitchen, refrigerator not running—oh, boy! Those things cost money! Utility room, deep-freeze not running; they're expensive, too. Pulled refrigerator plug. Pulled deep-freeze plug—hey! Lights came on bright.

So, problem solved. Pretty good for me. Back in the days when the Kaiser was invading Belgium and Rickenbacker was learning to fly, I used to be able to solve little problems like this, and I still could, by golly! So—must be the deep-freeze. Plugged the refrigerator back in; lights went out. Good grief, refrigerator *and* deep-freeze; half a year's social security!

Plugged in the coffee pot; the lights went out. Make coffee on the gas. Plugged in the toaster; the lights went out. The Kaiser was getting near Paris by this time, and it dawned on me that I still had a problem. (Rickenbacker was looking for the Red Baron.)

Out to the shack for a voltmeter. (Hey! It's cold out here for a guy my age running around in pajamas.) Then to the utility box to check circuits. No definite conclusion. Let's start at the beginning, the power pole out in the yard, where I had a master circuit breaker.

It's dark; screwdriver to get into box; careful, you drop that damned screw, you'll never find it in the grass. Box open, screw in bathrobe pocket, voltmeter in one hand, probes hunting screws on 220-volt line, flashlight on probes, need light on voltmeter, need two more hands; it's dark. Got reading—110 on one side, 125 on other side of line. So what does that tell me that I hadn't already guessed? Try to shake 75 years out of my mind—doesn't shake.

Replaced cover on circuit-breaker box. Returned to house to drink coffee my wife thoughtfully brewed on gas range. Stopped shivering after a while. Let's analyze this thing. Garage and water system completely disconnected—couldn't be anything wrong there. In the shack, maybe? Told wife to go back to bed. Pulled master circuit-breaker in house and went out to shack with toaster in hand. Plugged in toaster, lights got a little brighter; plugged toaster in on the other line, lights went out. Ah ha! Trouble in

the shack. I knew early in the game that it was a ground-fault problem I was looking for, but how to find it in my pajamas at four o'clock on a cold morning? Better call the power company, if our rural phone is working. First, though, let's be sure.

Pulled the master switch in the shack, went back in house, threw that breaker back on, and plugged in the toaster. The lights went out. So it isn't the shack, it isn't the house, it can't be the garage; what the heck was that power company number?

Electric company office fifty miles away, but it's an "800" number. Found it; telephone is working. Ringing. Ringing. Ringing. Very sleepy voice answering. I tell him I have a problem. He asks what's wrong. I tell him. He says I have a problem.

After a while he wakes up, too, finds out where I live, and says he will send a crew. The last time the power company "sent a crew," it turned out to be a couple of smart young linemen who wanted to teach "grandpa" how to suck eggs, but maybe they've got more than one crew. Time passed. I got dressed. Warmer now; stopped shivering.

Lights coming down the gravel road. Stopped at my driveway. Glory-be, help has arrived. This is a different crew: Didn't believe in arguments at five o'clock in the morning, agreed I had a ground-fault problem, noted the ladder against the house and commented that I had already checked that connector. Told them that I had, but suggested they check it anyway. Said they would, but would "check our stuff first." Restarted their truck motor and fired up a pretty good searchlight, put on spurs, and climbed the utility pole. Wiggled the connector on our incoming ground line and the lights in the house flickered! Tightened connector and told me to try my toaster. Tried toaster; it heated and lights stayed on. Plugged in the refrigerator and the angels were singing and so was the frig. Tried deep-freeze; wife's face fell—no new deep-freeze.

Line crew replaced connector, also another like it on the transformer pole a few yards away (sort of sleep insurance).

Greeted the sun with coffee all around. Line crew told me that they had just got into bed after an emergency in a town across the county when they got the call sending them to me. Figured now it was too late to go home and to bed; might as well get ready and go to work.

Wife gets ready and leaves for work. I don't work (so she tells me). Dig into clock radio. Transformer shot. Got one, little bit too big, but it will do until I get a proper replacement. Installed transformer and clock back in business. Hooked it up in bedroom, shut off radio, wouldn't shut off! Now what? Disconnected clock, remembered gremlins, reconnected clock, switch now works.

Dig into fluorescent light. Loading coil a bundle of tar with two leads sticking out. Checked with a voltmeter and had continuity. Whadayaknow; just melted the leads and the tar and made a stink. Cleaned tar, soldered new leads, potted coil in epoxy, replaced bulb, light works. Still stinks.

Wife says I'm a genius. Don't tell her that I'm not smart, just cheap! ■

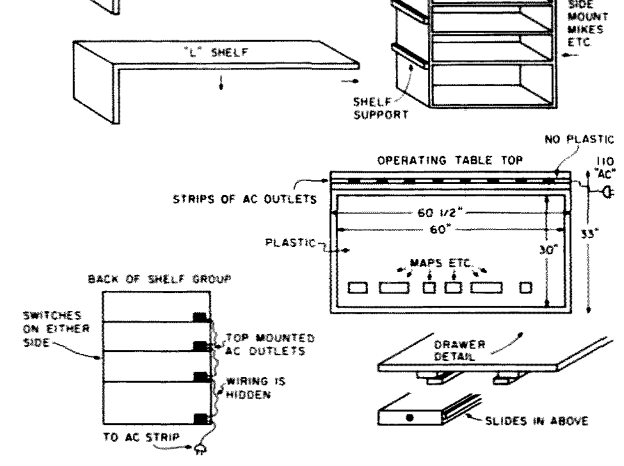
Wells Chapin W8GI
507 Franklin
Kingsley MI 49649

An Operating Console with Class

—customize to your heart's desire

Take a look at the W8GI operating console in Photo A. Total cost of this console arrangement was $85. It is easy to build, and it makes moving of the equipment and console to other places simple, as the whole arrangement breaks down into lightweight pieces. You don't have to heave around a heavy desk, you can customize it to your purposes, it is expandable, and you can remove any unit without changing a panel or removing screws. It takes out all the haywire in the shack, puts all your operating aids such as maps in clear view at all times, keeps your *Callbooks*, pencils, etc., handy, makes operating a pleasure, gives your equipment a professional look, and last but certainly not the least, it will keep the wife happy.

This article is not intended to be a detailed construction article. It is only an idea article with enough details to enable you to customize your own installation. Nearly everyone can use a few of the ideas to expand a present operating setup. The shelf-group idea can be applied to any desk—*et voilà*—you have a



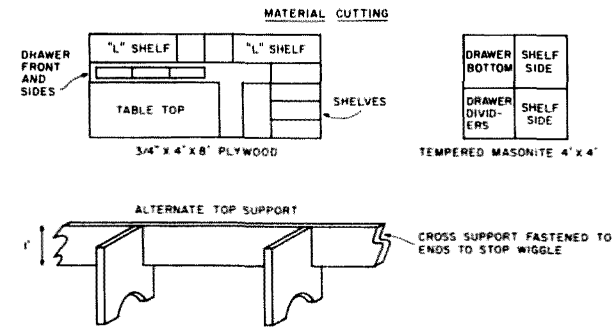


Fig. 1. Suggested layouts and construction details.

custom setup with a minimum of work and cost.

The only tools you need are an electric hand saw, plane, file, hammer, nails, small screws, stain, and sandpaper. Material required is a 3/4″ × 4′ × 8′ piece of plywood, a 4′ × 4′ piece of tempered Masonite™, a piece of storm-door plastic to fit the top of your console, two three-drawer unfinished cabinets, 18 feet of 1/4″ × 1″ stripping or screen molding, and a strip of 110 V ac plugs. All the material was purchased at our local K-Mart store. You can eliminate the three-drawer cabinets by buying a 4′ × 4′ piece of plywood and making your own ends.

The first step is to decide how large you want your operating table. I chose 33″ × 60″ because it is wide enough and long enough, and just fits a standard 30″ × 60″ storm-door plastic panel. This makes it cheaper, and you do not have to cut the plastic. You should decide what shelf-group you want, and design it with the number of shelves you want—with the depth, width, and height you desire. Be sure to consider possible later expansion.

The old Crosley Model 52 and other units are on an L shelf that simply sits on a support on the side of the shelf-group, and the L portion rests on the operating table. You can add as many of these L shelves as you want by installing another small support on the side of the shelf-group and adding another L shelf that sits on top of the first. Details of this arrangement are shown in Fig. 1. Be sure to leave room at the top of the operating units for free air circulation. Notice the shelf-group on the right that is within easy arm's reach. The L shelves are supported on one end by a 1-inch square × 10-inch support glued or bolted onto the side of the shelves.

Masonite is used for the sides of the shelf-group because it is only 1/8-inch thick, and thus you can mount short-sleeved switches without any trouble. The microphones are mounted on one side of the shelf. Top-mounted ac outlets are positioned on the rear of each shelf and are wired together, starting at the top and ending at the bottom with a pigtail plug lead that goes to the ac strip on the rear of the table. The wiring is concealed on the inside back of the cabinet. Glue a piece of felt on the bottom of the shelves, as this will stop scratching of the plastic top and keep it from sliding.

Fig. 1 shows suggested layouts and some construction details. Also shown is a layout that will enable you to get all the pieces out of a single sheet of plywood and one piece of tempered Masonite.

The following are helpful hints that resulted from my experiences when building the console. You can use 1/4″ × 1″ stripping or screen window trim to put a finish on the edge of the plywood. One side of the plywood is fine-finished, and all it needs is fine sanding and a light coat of stain. Drill the holes in the plastic top along the edges before you put it on top of the operating table, as when the drill goes through, you have small chips that are unsightly and raise the plastic.

Place your operating aids, maps, DX prefixes, charts, etc., on the table and arrange to suit. Be sure they are back far enough from the edge of the plastic top. When you get the final arrangement, take small pieces of tape and hold them in place, because if you don't, when the plastic top is dropped down the air


Photo A. The W8GI operating console.

will rush out and disturb everything. Mount the ac plug strip across the back of the table and right up against the plastic top, so that there is no hole to collect dirt. Don't forget to put an extension long enough to reach your 110 V ac line before you snap the strip plugs closed. You will have an inch or so of table showing, but this is unseen.

Happy console-building. It's easy—it's fun—it's rewarding. ■

Add-On Capacitance Meter

—works with your counter

Joe Westenhaver W4FEC
155 Woodfield Drive
Auburn Al 36830

This seven-digit capacitance meter will allow you to accurately check the capacitance of almost any capacitor quicker than you can read the printed value. It also shows leaky capacitors and the polarity of polarized capacitors. It covers 2 pF to 999 uF in only two ranges and consumes almost no power. All this for only $1.28 (2ICs—46¢, 1 diode—16¢, 5 resistors—25¢, 1 DPST switch—39¢).

There must be some catch—of course, there is. You must already own a digital frequency counter. My tester was built to be used in conjunction with a homemade seven-digit counter using an ICM 7207/7208 counter chip salvaged from a Conar model 202 frequency counter, but it should work equally well with other counters.

Theory

Ok, let's see how it works. When a discharged capacitor has a fixed voltage applied through a fixed series resistance, it will charge at a rate directly proportional to its capacitance value. What we will measure is the time it takes to charge our unknown capacitor to some predetermined value.

That's where the frequency counter comes in. We use a flip-flop to obtain a pulse whose width is a function of the charging time and then the counter to count how many clock pulses can pass during the time interval of that flip-flop pulse. A combination of clock frequency, charging voltage, series resistance, and trigger point is chosen so that one clock pulse passes for each 1 pF in the low range, or one clock pulse for each 1000 pF in the high range. With this arrangement, our counter gives a direct capacitance readout.

The capacitance measurement must be synchronized with the count interval of the frequency counter. See Fig. 1. Counting is enabled when pin 13 of the ICM 7208 is brought low (logic 0). Intersil calls this the inhibit input pin. This function is frequently called the gate, and on some counters may be a logic 1 signal. If your counter uses a logic 1 gate, then the optional IC1a gate connection in Fig. 1 can be used to invert the gating signal. Commonly used gate times are 0.1 second and 1 second. The gate time interval does not affect the capacitance measurement except to limit the maximum value of capacitance which can be measured.

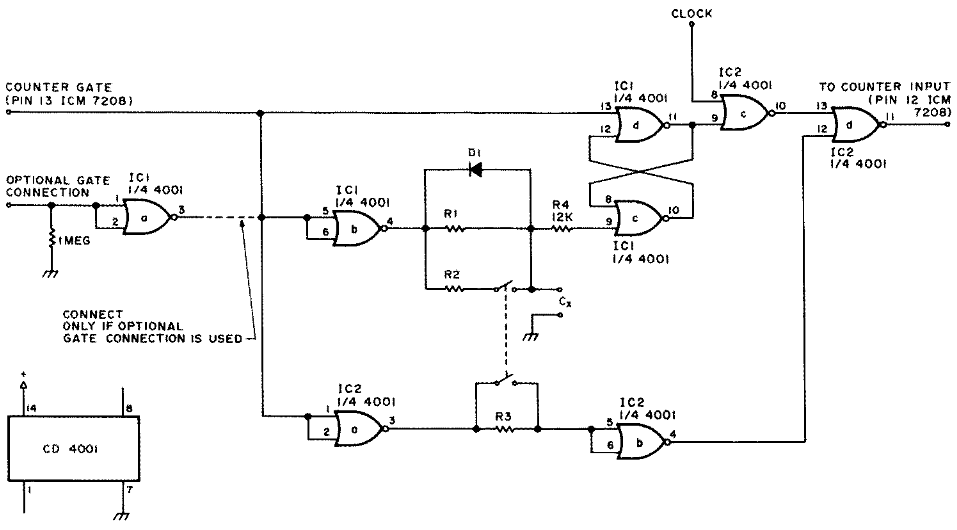


Fig. 1. Capacitance checker schematic.

When the gate signal

goes low, the counter is ready to count pulses. IC1b goes high and starts charging the unknown capacitor through R1 or R2. The flip-flop formed by IC1c and IC1d was reset to a low output when the gate was high. Now its output changes to high after the time delay of charging the capacitor up to the flip-flop changeover point. This time delay is directly proportional to the capacitance value and is the basis of our measurement.

IC2c is initially on while the flip-flop output is low and will allow clock pulses to pass until the Cx time delay expires and the flip-flop goes high. However, IC2d blocks the clock pulses from the counter until the gate goes low and a slight time delay imposed by IC2a, R3, and IC2b expires. This time delay compensates for the input capacitance of IC1c (about 5 pF) and circuit stray capacitances. This allows us to measure accurately right down to 2 pF. R3 is determined experimentally and is about the same as R1. If errors below 100 pF are of no concern, IC2a, IC2b, and R3 can be eliminated. D1 allows a quick discharge of Cx and can be any small switching diode.

Now, about the clock. (Ah, another catch not included in the $1.28!) It must be a stable source of pulses compatible with CMOS logic. The frequency doesn't matter much, but if it is much above 5 MHz, the CMOS chips have trouble. If it is too low in frequency, the ability to measure small capacitors become jeopardized. About 1 MHz seems ideal. Stability should be at least 1%, so a crystal source is best.

Your counter already has a crystal oscillator in it which can probably be used. If it is in the 5-6-MHz range, then a divide-by-5 (½ 74C90) will do the job. I happened to have a crystal marked 1001 kHz and used that in a separate oscillator (½ 4001). Almost any crystal in the 2-10-MHz range could be used with an undertone oscillator.[1] So, I'll leave the source of the clock pulses up to you.

Calibration

Now for calibration. This instrument has two ranges. The low range displays pF and the high range pF × 1000. On the low range, the idea is to have one clock pulse for each pF. Therefore, the time delay for R1 and Cx needs to be the time of one cycle of the clock for each pF. On the high range, the time delay for R2 and Cx needs to be one thousandth of the time for one cycle of the clock for each pF.

For example, with a 1-MHz clock the cycle time is 1 us. Therefore, the time delay for the low range for a 1-pF Cx should be adjusted with R1 to be 1 us. The time delay for the high range for a 1000-pF Cx should also be adjusted with R2 to be 1 us. Thus, with a 1-MHz clock, the maximum value that can be measured with a 0.1-second gate is 99,999 pF or about 0.1 uF. With a 1-second gate, we can go to 999,999 pF or 1 uF. On the high range, we can go to 99 uF with a 0.1-second gate and 999 uF with a 1-second gate. On the high range, the error caused by the input capacitance of IC1c is negligible and R3 is switched out! The values of R1 and R2 depend on the clock frequency and also the characteristics of the particular 4001 chip. The chip characteristics will vary quite a bit from one to another but are stable and predictable in each chip.

Calibration obviously requires some sort of standard. I have found capacitors marked ±10% to be far off the printed value.

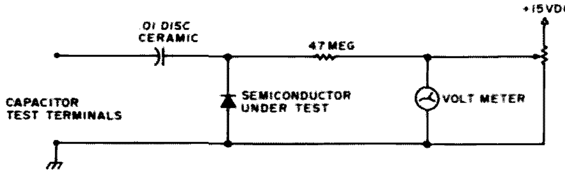


Fig. 2. Semiconductor junction voltage-variable capacitance characteristics test setup.

Also, ±5% capacitors vary considerably. The values marked on most electrolytics are only approximations. I have found silver mica and disc ceramic capacitors which are marked ±2% to be very close, so I use these for calibration.

With 1000 pF ±2% at Cx, I adjust R1 for a counter display of 1000. Then I crosscheck with a 27-pF ±2% silver mica and bingo—27! Once calibrated on the low range with these capacitors, I measure a 0.22-uF molded capacitor (.218752) and select the high range and adjust R2 for a readout of 219.

Obviously, the accuracy is limited in this calibration scheme to the tolerance of the best capacitors you can find. I think, however, that you will find the tester very useful and accurate enough for anything but laboratory work if calibrated to within 2%. With the particular 4001 I have in service and the 1.001-MHz clock, R1 is about 1.04 megohms and R2 is about 800 Ohms. Both R1 and R2 are fixed, with small potentiometers (not included in the $1.28!) in series for fine adjustment. R3 is fixed at 1 megohm.

When connected to a counter, with no capacitor under test, this tester will always indicate a 1 on the last digit. R3 is selected so that a very small capacitor (such as 5 pF) reads correctly. A 1 pF or less then indicates 1 and anything larger will indicate correctly.

With large capacitors there will be a large number of digits displayed. You should ignore all except the first three significant digits. The rest will change after each sampling period, but they have no meaning since you only calibrated the instrument to 1 or 2%. I have never found the reading to fluctuate as much as 1%, and frequently it fluctuates less than .01%.

Operation

The power source for your tester should be stable and can be drawn from your counter if it is between 3 and 15 volts dc. Current drain is negligible.

Now that it is all built and calibrated, let's look at some operating considerations. Leads from IC1c to the test jack should be short to prevent hum pickup. Also, you should keep external leads to the capacitor very short and keep hands off during sampling to keep hum out. Furthermore, you should mount IC1 in a socket to make it easier to replace after you ruin it by not observing a few simple precautions.

Note that the test point connects to an input gate of the CMOS chip. R4 should provide input gate protection up to about 120 volts. Testing a capacitor in a hot circuit can zap the 4001; placing a charged capacitor to the terminals can zap it, too. Large static discharges will also spell the end of the 4001 and you'll be out 23¢ or so. While these precautions seem worth mentioning, in over a year of frequent use I have never harmed the 4001.

If your counter has a 0.1-second gate, you will want to use it most of the time. This means the longest you will have to wait for

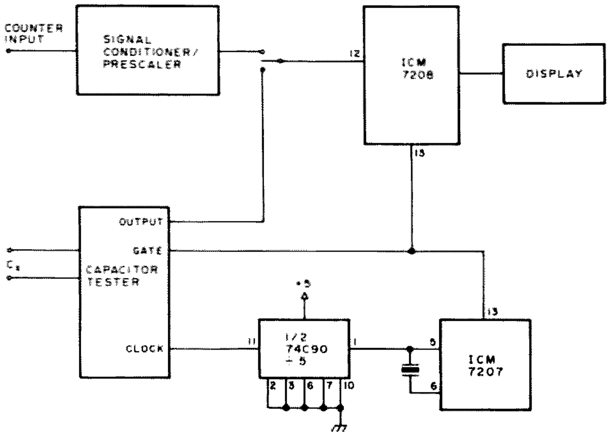


Fig. 3. Suggested interconnections for capacitance checker, counter, and timebase.

your reading is 1/5 of a second. With a 1-second gate, it might take 2 seconds. A leaky capacitor will indicate much too high of a value. Just a small amount of leakage will cause a little disc ceramic to read out 999 uF. You will not see this often, but when you do, throw that one away.

Polarized electrolytic capacitors usually have leakage when the correct polarity is not observed. If you test one by connecting it to the test terminals in both directions and get the same reading each time, it is probably non-polarized. If you get considerably different readings, the smaller reading is correct and indicates the correct polarity. Of course, the correct way to connect electrolytics is the − (minus) to ground and the + (plus) to the test point.

Lots of fun can be had testing trimmer capacitors, crystal holder capacitances, transistor input/output capacitances, twisted wires, coax, etc. All can be easily measured. The voltage-variable capacitance characteristics of semiconductor junctions can be easily observed by using the hookup shown in Fig. 3. Keep all leads as short as possible to prevent hum pickup.

I have found that selected zener diodes exhibit very nice large capacitance varactor characteristics up to their zener voltage. Selected silicon transistors with their base/collector junction reverse biased make nice, small-capacitance varactors. And, of course, you can test a standard varactor to see if it covers the desired tuning range for a voltage tuning application. The best application of all is to turn that junk box full of poorly marked capacitors into a supply of useful components of known values.

You don't have a frequency counter? Shame! Run right out and buy one, or better yet, build one such as the $50 Mini-Counter[2] and incorporate this tester inside. For $1.28 (or so) you can't afford not to! A suggested interconnect block diagram with the ICM 7207/7208 pair is shown in Fig. 3.■

References

1. "Undertones," Joe Westenhaver W4FEC, *73 Magazine*, October, 1980.

2. "Build this $50 Mini-Counter," Gary McClellan, *73 Magazine*, December, 1979.

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Better Pilot Lights

—LEDs are the "in" thing

After having a vfo pilot lamp burn out prematurely in my T-599D, I decided to replace the lamp and red lens with an LED. Referring to Fig. 1(a), the red lens is held in place with a small amount of cement, and is illuminated by a lamp positioned close to it.

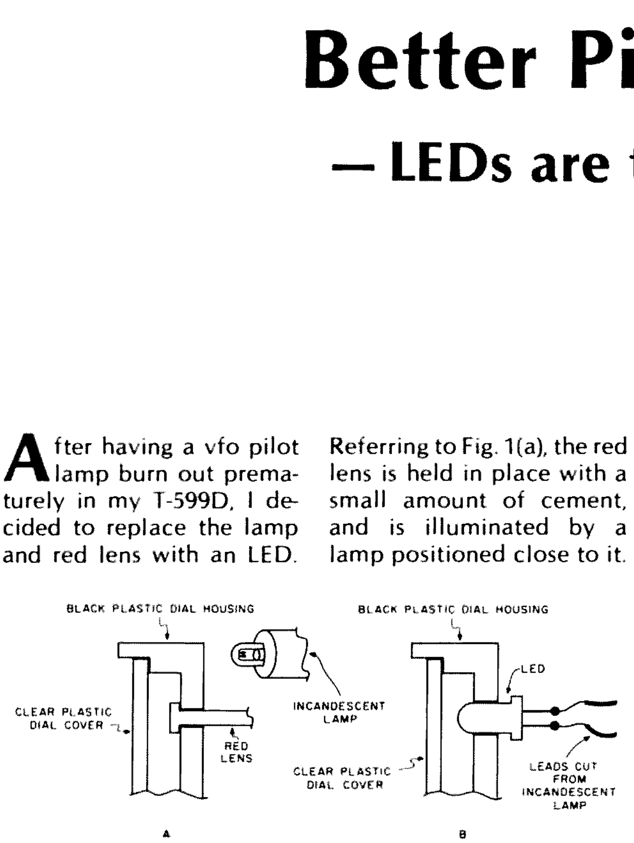

Fig. 1. (a) Cross-sectional view of Kenwood's vfo pilot light system. (b) Cross-sectional view of LED vfo pilot light system.

The red lens may be removed easily after cutting away the cement. After removal of the red lens, the hole is slowly enlarged with a reamer to the point where the LED fits snugly in the hole (caution should be exercised, as the plastic plate is very soft and one easily can exceed the desired hole diameter).

Referring to Fig. 1(b), with the LED in place, the clear plastic dial cover should fit properly in the black plastic housing. Next, apply some cement to the rear of the LED and housing to hold the LED in place.

The leads cut from the lamp are soldered to the LED. It is necessary to insert a 1200-Ohm, ½-Watt resistor in series with one of the leads to the LED. It is convenient to place the resistor on the solder terminal that the lamp leads are attached to, and in series with either lead.

I found this modification to be an improvement, as the LEDs are brighter and should last much longer. ■

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Caution: Solid-State Finals

—learning to live with no-tune radios

Here you are—your brand new Mark XVIII Loudenputer unpacked, connected to the power supply, and your old tri-band beam plugged in. Key down; measure the power output—only 15 Watts instead of the rated 100 Watts. Check the instruction manual and notice that the power rating holds for a 50-Ohm load. You have been using the beam for five years with your old Heath or Swan without a matchbox so you know the antenna is OK. Guess you will have to send the new rig back for repair.

Before you go running down to the post office or UPS, perhaps you ought to take a second look. Your new rig has solid-state finals, and your old rig a pair of 6146s. There is a considerable difference.

Design Differences

A typical tube final is shown in Fig. 1(a). The tubes, which are the source of rf power, feed an adjustable network which matches the tube output impedance to the load. This load is not a 50-Ohm dummy load but a real-life antenna whose impedance may vary drastically with the operating frequency and with weather conditions such as wind and temperature.

The solid-state rig is shown in Fig. 1(b). A set of transistors feeds a fixed bandpass filter. This filter changes only as you switch bands. The key difference (and advertised advantage) is that no tuning is required. Just change bands, dial up the operating frequency, perhaps peak a preselector, and transmit. In fact, except for a desire to see what is going on, there is no apparent need for a collector current meter since there is no dipping or peaking required.

This basic design difference leads to what has been called the "A-OK into dummy load" syndrome. In the example given above, the rig probably puts out the full rated power when connected into a dummy load. With a practical antenna, however, low power, tripping breakers, or even self-destruction of the finals may result. More insidious is the potential for the generation of spurious signals due to antenna mismatch, even though the rig is perfectly clean (and has been type-accepted) when connected to a dummy load.

Why Does It Happen?

Solid-state amplifiers are designed as broadband amplifiers followed by a bandpass filter under the assumption that a purely resistive 50-Ohm load is connected to the output. If the amplifier is not connected to an ideal load, i.e., the load is not 50 Ohms resistive or contains reactive components, the bandpass filter is no longer terminated in its design conditions, and it may no longer act as the needed filter. In addition, the filter also is designed to be driven by a fixed source (the transistors), and if the transistors are operating at a higher or lower power level (Fig. 2), the filter is again not operating under its de-

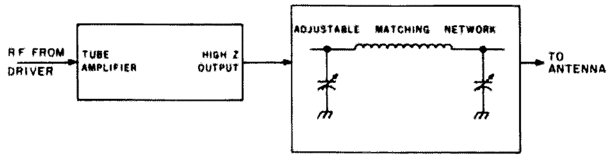

Fig. 1(a). A typical tube final.

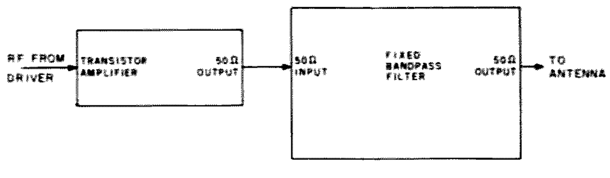

Fig. 1(b). A solid-state rig.

signed conditions. This leads to the remarkable situation in which some rigs may operate perfectly well when tuned up at full power but put out spurs if you try to operate at low power.

A number of rigs which have power-foldback protection suffer doubly from this effect. When connected to a moderate swr load (say, 3:1 or higher), the swr is sensed, and in order to protect the finals, the drive to the finals is now decreased. This means that the bandpass filter is no longer fed by transistors operating with the design output impedance and, in addition, the filter is connected to a load far different from the 50-Ohm design load.

What Choice Do You Have?

Since most if not all of the new rigs have solid-state finals, we have to live with the problem. There are, however, a number of things you can do to put out full power, protect your finals, and prevent spurs from occurring.

1) You probably will have to use an antenna tuner or matchbox. The disadvantage of having more knobs to turn is not that serious, since you no longer have to dip and peak your final. Caution: Tuning for minimum swr or maximum power output may not be enough. You may have to build or buy a noise bridge and preset the tuner on your favorite operating frequencies.

2) You may have to operate the rig near full power all the time. Run a test. If your swr varies drastically as you reduce the drive to your rig, you may be putting out spurs at the lower power levels. Similarly, don't overdrive it. The couple of extra Watts you get beyond the manufacturer's ratings may all be out of the band.

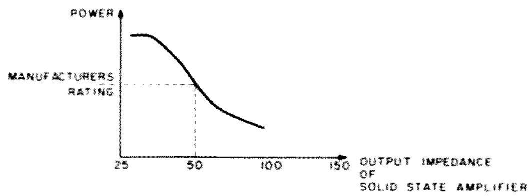

Fig. 2. Impedance change vs. power level.

3) Be careful in selecting a linear amplifier. Untuned inputs on grounded-grid linears may have been perfectly acceptable with vacuum-tube exciters. However, if your solid-state rig has power-foldback or some other protection and the linear does not have a 50-Ohm input impedance, you either might not be able to drive the linear to full power or you might have to use a matchbox between the rig and the linear.

4) Be careful (especially on VHF) of mating a rig to an amplifier. Tube equipment was tolerant. Transistors are not. If your new little handie-talkie does not have sufficient protection, the finals may vaporize in the time it takes the relay in the amplifier to switch. Be cautious and talk to someone who has seen this combination working before.

5) Read and reread the instruction manual. If you don't understand, or if information is not included, call the distributor or manufacturer. Users groups can be very helpful. There is no reason for you to guess how to use it when there are five thousand identical rigs being used. ■

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Under Software Control

—a repeater control system with minimal hardware

This computer program, which runs on a MOS Technology KIM-1 microcomputer, will replace all the control circuitry normally required for a small repeater system. This system features a smart CW ID, a courtesy beep, remote control, time-out timer, and an ID interval timer, all implemented without any external hardware.

The KIM-1 microcomputer is an ideal system for this type of application, with its built-in I/O ports and interval timers; all the necessary hardware for undertaking this project is provided as an assembled and tested unit.

When it was decided to undertake this project, the highest priority was given to implementation with a

Location	Function
002D	Length of kerchunk delay
004F	Setting of time-out timer in minutes
00B0	Setting of ID interval in minutes
0283	CW speed
0284	CW tone
02C1	Space for breakers
02C6	Length of courtesy beep
02D3	Length of transmitter tail

Note: Changing the CW speed will affect all timing parameters, except the two clocks, in the same manner as the speed is changed.

Table 1. Program timing variables.

Ltr	Code	Ltr	Code	Ltr	Code
A	60	B	88	C	A8
D	90	E	40	F	28
G	D0	H	08	I	20
J	78	K	B0	L	48
M	E0	N	A0	O	F0
P	68	Q	D8	R	50
S	10	T	C0	U	30
V	18	W	70	X	98
Y	B8	Z	C8	0	FC
1	7C	2	3C	3	1C
4	0C	5	04	6	84
7	C4	8	E4	9	F4
/	94				
Space	00				FF

End of Message

To program your repeater call, look up each letter of call in table above and put code into KIM starting at 0068; for a space between words, put a 00. Remember, at the end of the message, to put an FF in memory.

Table 2. ID code table.

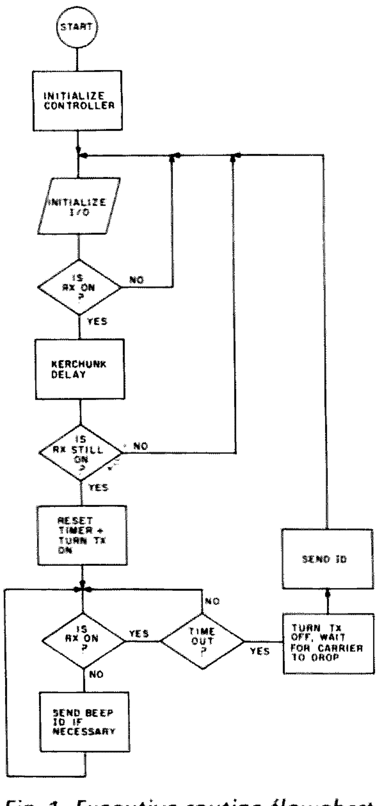

Fig. 1. Executive routine flowchart.

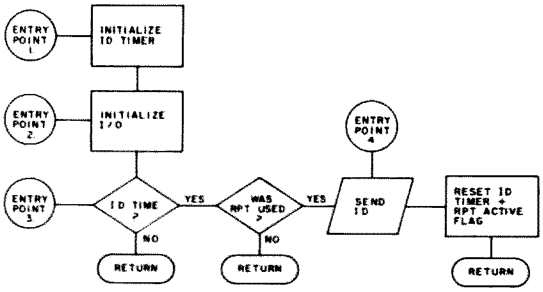

Fig. 2. Initialization routine flowchart.

minimum amount of support hardware and a maximum amount of work being done by the software. That goal has been successfully reached here without any compromises in the performance of this repeater control system.

The control system will send the required repeater ID in CW. The audio tone required is generated internally by the microprocessor. The repeater system, when not active, will ID only if the system has been keyed within the current ID interval; otherwise it will ID after the next keying. When the repeater is being used, it will ID only after the courtesy beep has been sent, minimizing the chance of the IDer's audio covering a user's transmission through the repeater. The ID interval is currently set at 7 minutes, but the control system can be set at from 1 to 60 minutes in one-minute intervals.

If the repeater is timed out by a signal staying on too long on the input frequency, when the signal is removed, the system will immediately ID, informing the user that he timed the repeater out. The time-out interval is currently set at 3 minutes; this can be set at rom 1 to 60 minutes in one-minute intervals.

Two interrupt-driven real-time clocks have been implemented in software using one of the KIM-1's rogrammable interval imers. The other programmable interval timer is used to generate the required audio tones.

A kerchunk filter has also been added which prevents the repeater from being keyed by a signal on the input frequency of the repeater for less than one second in duration. This kerchunk filter does not affect the operation of the repeater once it has been activated.

A remote-control feature has also been provided for in this control system to turn the repeater on and off when this is necessary.

The program provided here has all of the timing parameters set for a very pleasing sound on the air. Almost every timing parameter in the controller program can be changed very easily, however, should you desire to change it. Table 1 shows all of the important locations that can be changed and what effect they will have on system operation.

Figs. 1 through 6 are the flowcharts for the program modules which comprise this system. These flowcharts, combined with the freely-commented program listing, should make the understanding and modification of this control system relatively easy.

The flowchart for the executive routine is shown in Fig. 1. The starting location for this routine is at 0000, and this also is the entry point for activating the control system. The executive routine is where this system spends most of its time. It is this routine which provides the logic for how the repeater will respond to an incoming signal. Any lines of the program that need to be used frequently have been coded as subroutines. The time-out routine is located in the executive routine, as is the kerchunk filter. The executive routine and the courtesy-tone routine together determine when to ID.

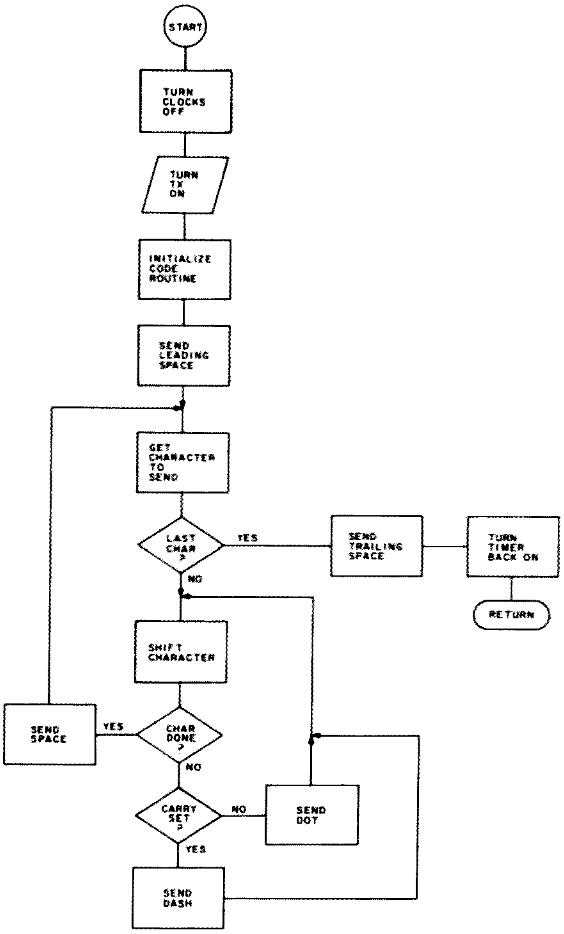

Fig. 3. CW ID routine flowchart.

After the executive routine, next in memory is the code for the CW ID. The ID must start at location 0068 and must not exceed location 007F. Table 2 gives all the information needed to program your own callsign into the system.

The next subroutine we come upon is the receiver mask routine. No flowchart is provided because of its small size and simple coding. This is where the system determines if the repeater's receiver is being activated.

The initialization routine, a flowchart of which is shown in Fig. 2, starts at location 009A. This routine handles all of the input and output port initialization and control of the CW IDer. There actually are four entry points to this subroutine; they all are labeled in the program listing along with their use.

The subroutine for sending the CW ID is located starting at 0200. The flowchart for this routine is shown in Fig. 3. This routine is a much-modified version of a program published in

Program listing.

Executive Routine

```
0000  A9 00     LDA #$00    LOAD NMI INTERRUPT VECTOR TO
0002  8D FA 17  STA 17FA    ADDRESS OF REAL TIME CLOCK
0005  A9 03     LDA #$03    ROUTINE (0300)
0007  8D FB 17  STA 17FB
000A  8D FF 17  STA 17FF    LOAD IRQ INTERRUPT VECTOR TO
000D  A9 80     LDA #$80    ADDRESS OF REMOTE CONTROL
000F  8D FE 17  STA 17FE    ROUTINE (0380)
0012  A9 F4     LDA #$F4    TURN INTERRUPT TIMER ON
0014  8D 0F 17  STA 170F
0017  20 9A 00  JSR 009A    INITIALIZE I/O & RTC
001A  20 00 02  JSR 0200    SEND ID (INITIALIZE TONE)
001D  20 A0 00  JSR 00A0    INITIALIZE I/O
0020  20 8F 00  JSR 008F    LOAD & MASK FOR RX INPUT
0023  D0 03     BNE 0028
0025  4C 2C 00  JMP 002C    JUMP TO TX TURN ON ROUTINE
0028  58        CLI         CLEAR INTERRUPT
0029  4C 1D 00  JMP 001D    INITIALIZE I/O & LOOK AT RX AGAIN
002C  A2 10     LDX #$10    KERCHUNK DELAY (INITAL TURN ON)
002E  20 79 02  JSR 0279
0031  20 8F 00  JSR 008F    LOAD & MASK FOR RX INPUT
0034  F0 03     BEQ 0039    IS SIGNAL STILL PRESENT
0036  4C 1D 00  JMP 001D    No, IGNORE KERCHUNK
0039  20 B0 03  JSR 03B0    YES, INITIALIZE 3 MINUTE TIMER
003C  A9 04     LDA #$04    TURN TX ON
003E  8D 00 17  STA 1700
0041  20 8F 00  JSR 008F    LOAD & MASK FOR RX INPUT
0044  F0 06     BEQ 004C    IS RX OFF
0046  20 C0 02  JSR 02C0    YES, SEND COURTESY TONE
0049  4C 31 00  JMP 0031    GO LOOK FOR NEXT SIGNAL
004C  A5 8D     LDA 008D    NO, CHECK 3 MINUTE TIMER
004E  C9 03     CMP #$03
0050  F0 03     BEQ 0055    IS TIME UP
0052  4C 41 00  JMP 0041    NO, CONTINUE LOOKING
0055  A9 00     LDA #$00    YES, TIME OUT ROUTINE
0057  8D 00 17  STA 1700    TURN TRANSMITTER OFF
005A  20 8F 00  JSR 008F    WAIT FOR CARRIER TO DROP
005D  D0 03     BNE 0062
005F  4C 5A 00  JMP 005A
0062  20 BC 00  JSR 00BC    SEND ID AFTER TIMEOUT
0065  4C 1D 00  JMP 001D    RETURN TO MASTER EXECUTIVE LOOP
```

ID Code

```
0068  90 40 00 70 90 E4 A8 08 08 94 50 68 C0 00 A8 48 40 FF
      D  E     W  D  8  C  H  H  /  R  P  T     C  L  E
```

Receiver Mask Routine

```
008F  EA        NOP         SPACE FOR RX DEBOUNCE IF NEEDED
0090  EA        NOP
0091  EA        NOP
0092  EA        NOP
0093  EA        NOP
0094  AD 02 17  LDA 1702    LOAD INPUT PORT
0097  29 20     AND #$20    MASK FOR RX INPUT
0099  60        RTS
```

Initialization Routine

```
009A  A9 00     LDA #$00    ENTRY POINT TO INITIALIZE ID TIMER
009C  85 81     STA 0081
009E  85 82     STA 0082
00A0  A9 FF     LDA #$FF    ENTRY POINT TO INITIALIZE I/O
00A2  8D 01 17  STA 1701
00A5  A9 00     LDA #$00
00A7  8D 00 17  STA 1700
00AA  8D 03 17  STA 1703
00AD  A5 82     LDA 0082    ENTRY POINT FOR ID TIME CHECK
00AF  C9 07     CMP #$07    NUMBER OF MINUTES BETWEEN ID'S
00B1  F0 03     BEQ 00B6
00B3  10 01     BPL 00B6
00B5  60        RTS
00B6  A5 8E     LDA 008E    NOW CHECK RPT ACTIVE FLAG
00B8  C9 00     CMP #$00
00BA  D0 0D     BNE 00C9    NO, RETURN
00BC  20 00 02  JSR 0200    YES, ID (ENTRY POINT FOR T-O ID)
00BF  A9 00     LDA #$00    RESET ID TIMER
00C1  85 82     STA 0082
00C3  85 81     STA 0081
00C5  A9 FF     LDA #$FF    RESET RPT ACTIVE FLAG
00C7  85 8E     STA 008E
00C9  60        RTS
```

Code Routine

```
0200  A9 00     LDA #$00    TURN OFF REAL TIME CLOCK
0202  8D 07 17  STA 1707
0205  A9 04     LDA #$04    TURN TRANSMITTER ON
0207  8D 00 17  STA 1700
020A  A2 0C     LDX #$0C    INITIALIZE CODE ROUTINE
020C  BD 8F 02  LDA 028F,X
020F  95 E2     STA 00E2,X
0211  CA        DEX
0212  10 F8     BPL 020C
0214  A2 08     LDX #$08    SEND LEADING SPACE
0216  20 79 02  JSR 0279
0219  A2 03     LDX #$03    SPACE BETWEEN LETTERS
021B  20 79 02  JSR 0279
021E  20 8A 02  JSR 028A    GET CHARACTER TO SEND
0221  AA        TAX
0222  E6 E2     INC 00E2    INCREMENT POINTER TO NEXT CHARACTER
0224  C9 60     CMP #$00    CHECK TO SEE IF CURRENT CHAR. IS SPACE
0226  D0 03     BNE 022B
0228  4C 19 02  JMP 0219
022B  C9 FF     CMP #$FF    CHECK TO SEE IF END OF MESSAGE
022D  D0 03     BNE 0232
022F  4C 50 02  JMP 0250
0232  8A        TXA
0233  85 DF     STA 00DF    TEMP STORAGE OF CHARACTER TO SEND
0235  06 DF     ASL 00DF
0237  F0 E0     BEQ 0219    DONE WITH CHARACTER
0239  B0 0D     BCS 0248    GO SEND DASH
023B  A2 01     LDX #$01
023D  20 5B 02  JSR 025B    SEND DOT
0240  A2 01     LDX #$01
0242  20 79 02  JSR 0279    SEND SPACE
0245  18        CLC
0246  90 ED     BCC 0235
0248  A2 03     LDX #$03    REALLY DO A DASH
024A  20 5B 02  JSR 025B
024D  18        CLC
024E  90 F0     BCC 0246
0250  A2 08     LDX #$08    TRAILING SPACE
0252  20 79 02  JSR 0279
```

the *First Book of KIM*.* This program now has the ability to take strings of code directly from memory and send them out as CW and the ability to insert spaces between words and indicate the end of the message. In addition, the portions of this module which actually generate the audio tones have been changed to use the programmable interval timer normally used by the KIM-1's cassette I/O routine. This change freed up the other interval timer which can be used to interrupt-drive another program. This timer is then used in the real-time clock subroutine. Subroutine calls are made frequently to routines in this module to handle various timing delays and to generate the courtesy beep.

The courtesy-tone routine which starts at location 02C0 is shown in the flowchart in Fig. 4. The length of the time allotted for breakers before the courtesy beep, the duration of the courtesy beep, and the length of the repeater's transmitter tail are all controlled in this routine. All the timing for these functions can be changed in this routine, if desired. When the repeater system is in use, this subroutine calls the CW ID module.

The flowchart for the real-time clock routine is shown in Fig. 5. This routine is a continually-running interrupt-driven clock, driven by the NMI interrupt vector. This routine is a much-modified version of another program which appeared in the *First Book of KIM*. This real-time clock routine con-

***The First Book of KIM*, Butterfield, Ockers, and Rehnke, O.R.B, Argonne IL 60439.*

```
0255  A9 00     LDA #$00     TURN INTERRUPT TIMER BACK ON
0257  8D 0F 17  STA 170F
025A  60        RTS          RETURN
025B  86 DD     STX 00DD     MARK SUBROUTINE
025D  A5 E6     LDA 00E6
025F  8D 47 17  STA 1747
0262  A9 01     LDA #$01
0264  8D 01 17  STA 1701
0267  EE 00 17  INC 1700
026A  A6 E7     LDX 00E7
026C  CA        DEX
026D  D0 FD     BNE 026C
026F  2C 47 17  BIT 1747
0272  10 F3     BPL 0267
0274  C6 DD     DEC 00DD
0276  D0 E5     BNE 025D
0258  60        RTS
0279  86 DD     STX 00DD     SPACE SUBROUTINE
027B  A5 E6     LDA 00E6
027D  8D 47 17  STA 1747
0280  2C 47 17  BIT 1747
0283  10 FB     BPL 0280
0285  C6 DD     DEC 00DD
0287  D0 F2     BNE 027B
0289  60        RTS
028A  A6 E2     LDX 00E2
028C  B5 68     LDA 0068,X
028E  60        RTS

                        Code Initialization

028F  00 05 3B 03 44 BB C0 C0 C0 C0 C0 00

                        Courtesy Tone Routine

02C0  A2 10     LDX #$10     SET UP 1 SECOND DELAY
02C2  20 79 02  JSR 0279
02C5  A2 02     LDX #$02     SEND TONE
0207  20 5B 02  JSR 025B
02CA  20 B0 03  JSR 03B0     RESET 3 MINUTE TIMER
02CD  20 AD 00  JSR 00AD     CHECK FOR TIME TO ID
02D0  EA        NOP
02D1  EA        NOP
02D2  A2 30     LDX #$30     SET UP REPEATER TAIL
02D4  20 79 02  JSR 0279
02D7  60        RTS

                        Real Time Clock Routine

0300  48        PHA          SAVE THE ENVIRONMENT
0301  8A        TXA
0302  48        PHA
0303  98        TYA
0304  48        PHA
0305  A9 83     LDA #$83
0307  8D 04 17  STA 1704
030A  2C 07 17  BIT 1707
030D  10 FB     BPL 030A
030F  E6 80     INC 0080
0311  A9 04     LDA #$04
0313  C5 80     CMP 0080
0315  D0 41     BNE 0358     ONE SECOND NOT UP, EXIT INTERRUPT
0317  A9 00     LDA #$00     RESET ONE SECOND COUNTER
0319  85 80     STA 0080
031B  18        CLC
031C  F8        SED          SET FOR DECIMAL ARITHMETIC
031D  A5 81     LDA 0081
031F  69 01     ADC #$01     INCREMENT SECONDS COUNTER
0321  85 81     STA 0081
0323  C9 60     CMP #$60     INCREMENT MINUTES?
0325  D0 13     BNE 033A     NO, SERVICE 3 MINUTE TIMER
0327  A9 00     LDA #$00     YES, RESET SECONDS COUNTER
0329  85 81     STA 0081
032B  A5 82     LDA 0082
032D  18        CLC
032E  69 01     ADC #$01     INCREMENT MINUTES COUNTER
0330  85 82     STA 0082
0332  C9 60     CMP #$60     RESET MINUTES COUNTER?
0334  D0 04     BNE 033A     NO, SERVICE 3 MINUTE TIMER
0336  A9 00     LDA #$00     YES, RESET MINUTES COUNTER
0338  85 82     STA 0082
033A  A5 8C     LDA 008C     3 MINUTE TIMER
033C  18        CLC
033D  69 01     ADC #$01     INCREMENT SECONDS COUNTER
033F  85 8C     STA 008C
0341  C9 60     CMP #$60     INCREMENT MINUTES?
0343  D0 13     BNE 0358     NO, EXIT INTERRUPT
0345  A9 00     LDA #$00     YES, RESET SECONDS
0347  85 8C     STA 008C
0349  A5 8D     LDA 008D
034B  18        CLC
034C  69 01     ADC #$01     INCREMENT MINUTES COUNTER
034E  85 8D     STA 008D
0350  C9 60     CMP #$60     RESET MINUTES?
0352  D0 04     BNE 0358     NO, EXIT INTERRUPT
0354  A9 00     LDA #$00     RESET MINUTES COUNTER
0356  85 8D     STA 008D
0358  D8        CLD
0359  A9 F4     LDA #$F4     TURN INTERRUPT TIMER BACK ON
035B  8D 0F 17  STA 170F
035E  68        PLA          RESTORE THE ENVIRONMENT
035F  A8        TAY
0360  68        PLA
0361  AA        TAX
0362  68        PLA
0363  40        RTI

                        Remote Control Routine

0380  AD 02 17  LDA 1702     CHECK FOR TURN ON COMMAND
0383  29 01     AND #$01     GROUND PB0 TO TURN RPT ON
0385  F0 03     BEQ 038A     JMP TURN ON
0387  4C 8E 03  JMP 038E     NO, JUMP SHUTDOWN
038A  58        CLI          TURN ON, CLEAR INTERRUPT
038B  4C 00 00  JMP 0000     RESTART PROGRAM
038E  A9 00     LDA #$00     SHUTDOWN, TURN TX OFF
0390  8D 00 17  STA 1700
0393  58        CLI          CLEAR INTERRUPT
0394  4C 94 03  JMP 0394     SHUTDOWN LOOP

                        3 Minute Timer Reset Routine

03B0  A9 00     LDA #$00
03B2  85 8C     STA 008C     RESET SECONDS
03B4  85 8D     STA 008D     RESET MINUTES
03B6  85 8E     STA 008E     SET RPT ACTIVE FLAG
03B8  60        RTS
```

tains two independently running real-time clocks, each of which is capable of keeping time from 0 seconds to 1 hour and then resetting. These two timers comprise the ID interval timer and the time-out timer.

Immediately following the real-time clock routine is the remote-control routine. The flowchart for this routine is shown in Fig. 6. This routine is entered after the computer receives a request for an interrupt from the IRQ interrupt line on the KIM-1. To take the repeater off the air, all you need to do is to have your remote control circuitry give a logic 0 pulse to the IRQ line. The remote-control routine will then put the program in a tight loop, not allowing the repeater to be activated. To turn the repeater back on, your control circuitry must apply a logic 0 to PB0 of the KIM and a logic 0 pulse to the IRQ interrupt line. The control system will then exit the tight loop and restart the control program. The repeater will immediately come on the air with the CW ID. This routine might seem overly simple to some, but it gets the job done quite nicely.

The last subroutine is the three-minute time-reset routine. This routine has not been flowcharted because of its simplicity. The only function of this routine is to reset the three-minute timer upon initial repeater key-up and after the courtesy beep.

If you look at the program listing, you will notice that all of page 1 in the KIM-1 memory is empty. At present, this area is available entirely to the stack. All of this space is not needed for the stack, and the

Hex dump.

```
0000   A9 00 8D FA 17 A9 03 8D FB 17 8D FF 17 A9 80 8D
0010   FE 17 A9 F4 8D OF 17 20 9A 00 20 00 02 20 A0 00
0020   20 8F 00 D0 03 4C 2C 00 58 4C 1D 00 A2 10 20 79
0030   02 20 8F 00 F0 03 4C 1D 00 20 B0 03 A9 04 8D 00
0040   17 20 8F 00 F0 06 20 C0 02 4C 31 00 A5 8D C9 03
0050   F0 03 4C 41 00 A9 00 8D 00 17 20 8F 00 D0 03 4C
0060   5A 00 20 BC 00 4C 1D 00
0080                                                EA
0090   EA EA EA EA AD 02 17 29 20 60 A9 00 85 81 85 82
00A0   A9 FF 8D 01 17 A9 00 8D 00 17 8D 03 17 A5 82 C9
00B0   07 F0 03 10 01 60 A5 8E C9 00 D0 0D 20 00 02 A9
00C0   00 85 82 85 81 A9 FF 85 8E 60
0200   A9 00 8D 07 17 A9 04 8D 00 17 A2 0C BD 8F 02 95
0210   E2 0A 10 F8 A2 08 20 79 02 A2 03 20 79 02 20 8A
0220   02 AA E6 E2 C9 60 D0 03 4C 19 02 C9 FF D0 03 4C
0230   50 02 8A 85 DF 06 DF F0 E0 B0 0D A2 01 20 5B 02
0240   A2 01 20 79 02 18 90 ED A2 03 20 5B 02 18 90 F0
0250   A2 08 20 79 02 A9 00 8D 0F 17 60 86 DD A5 E6 8D
0260   47 17 A9 01 8D 01 17 EE 00 17 A6 E7 CA D0 FD 2C
0270   47 17 10 F3 C6 DD D0 E5 60 86 DD A5 E6 8D 47 17
0280   2C 47 17 10 FB C6 DD D0 F2 60 A6 E2 B5 66 60 00
0290   05 3B 03 44 BB C0 C0 C0 C0 C0 00
02C0   A2 10 20 79 02 A2 02 20 5B 02 20 B0 03 20 AD 00
02D0   EA EA A2 30 20 79 02 60
0300   48 8A 48 98 48 A9 83 8D 04 17 2C 07 17 10 FB E6
0310   80 A9 04 C5 80 D0 41 A9 00 85 80 18 F8 A5 81 69
0320   01 85 81 C9 60 D0 13 A9 00 85 81 A5 82 18 69 01
0330   85 82 C9 60 D0 04 A9 00 85 82 A5 8C 18 69 01 85
0340   8C C9 60 D0 13 A9 00 85 8C A5 8D 18 69 01 85 8D
0350   C9 60 D0 04 A9 00 85 8D D8 A9 F4 8D 0F 17 68 A8
0360   68 AA 68 40
0380   AD 02 17 29 01 F0 03 4C 8E 03 58 4C 00 00 A9 00
0390   8D 00 17 58 4C 94 03
03B0   A9 00 85 8C 85 8D 85 8E 60
```

lower portion of page 1 is available for future expansion.

In order to use this control system in your repeater, a word is in order about connecting to the KIM-1 and interfacing into the receiver and transmitter. First, the NMI interrupt line (pin 6, KIM-1 expansion connector) should be connected to PB7 (pin 15, KIM-1 application connector). This will allow the real-time clocks to function.

Next, PA0 (pin 14, KIM-1 application connector) should be connected to the repeater's transmit audio, as this line will have the CW tones on it. The next line that you need to hook up is the transmitter keying line. This line is PA2 (pin 3, KIM-1 application connector). This line provides a logic 1 when the transmitter is supposed to be on. You will have to interface this to turn your transmitter on.

This connection cannot be a direct one as a KIM-1 I/O pin will sink only about 1 mA of current. In the repeater I used to develop this controller, my transmitter was solid state and drew 15 mA to ground to key the transmitter. A buffer IC was connected to PA2 and this was sufficient to sink the 15 mA directly. Depending on the type of transmitter you are using, you may need to have a buffer IC drive a transistor or even a buffer IC to drive a transistor and have the transistor drive a relay to operate your transmitter.

Next, you need to connect a COR output from your repeater's receiver to PB5 (pin 16, KIM-1 application connector). Your COR output must be a logic 0 when receiving a signal. When the receiver is squelched, the voltage on the COR output line going to the computer should be less than 5.5 V to prevent possible damage to the computer. In my system, using a transistorized receiver, I hooked up a COS (carrier-operated switch) to the receiver and connected that transistor directly to PB5. In order for this system to work, the grounds of this controller, any interface circuitry, the receiver, and the transmitter should be connected together—no floating grounds are allowed. Also, the power line to the computer should be as well filtered as possible.

If you are using the remote-control portion of this control system, then you also must connect PB0 (pin 9, KIM-1 application connector) and IRQ (pin 4, KIM-1 expansion connector) to the appropriate points of your control circuitry. The last thing you need to do before putting this system on the air is to put a CW ID into the controller. This is explained in Table 2 and you can use the example in the program listing for DE WD8CHH/RPT CLE as further help.

This control system has been exhaustively tested and all of the bugs should be out by now. However, if you have a problem, contact me and I will provide whatever assistance I can. ■

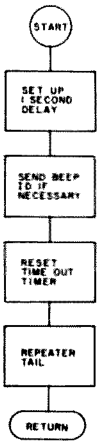

Fig. 4. Courtesy-tone routine flowchart.

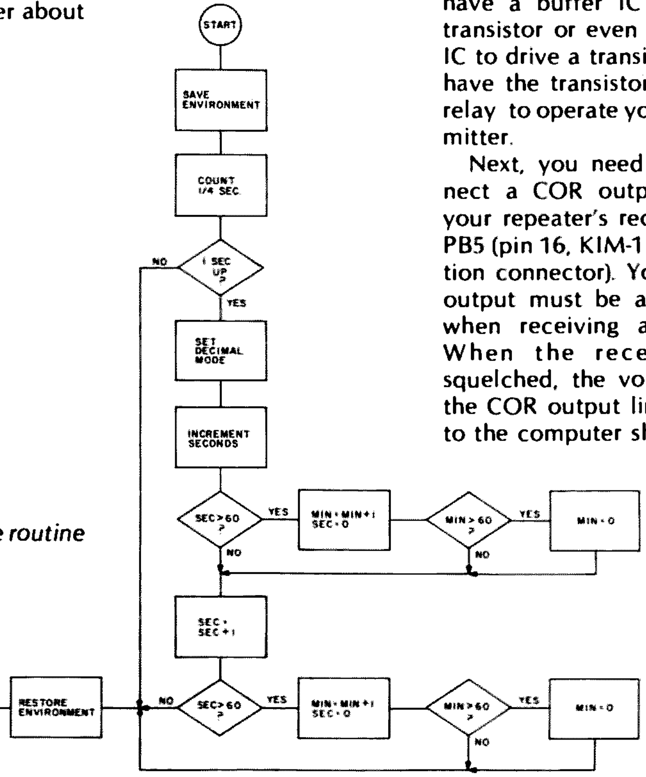

Fig. 5. Real-time clock routine flowchart.

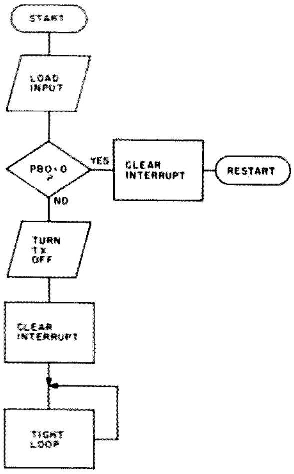

Fig. 6. Remote-control routine flowchart.

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The Fun-Mitter— A Goof-Proof Rf Project

—fail-safe QRP rig uses Radio Shack parts

The purpose of this project was to build a simple transmitter that could be duplicated easily by any amateur.

My main interest as an amateur lies in designing and building my own equipment. During numerous on-the-air conversations, I discovered that home-brewing is not a forgotten art and that many hams are still interested in building at least some piece of equipment for use in the shack. However, it seems that a good portion of newcomers (and not-so-newcomers) are frustrated when trying to find a project that is simple enough to understand, is cheap, and will produce a useful item which is not time-consuming to build, debug, and get operational.

This 5-Watt, 80/40-meter, CW transmitter is all of this and more. All of the parts can be purchased at your local Radio Shack, assembly time is less than an hour, and tune-up time is zero. Using a PC board practically guarantees that the transmitter will work the first time the key is closed. These features should make this a project that both the Novice and old-timer can enjoy.

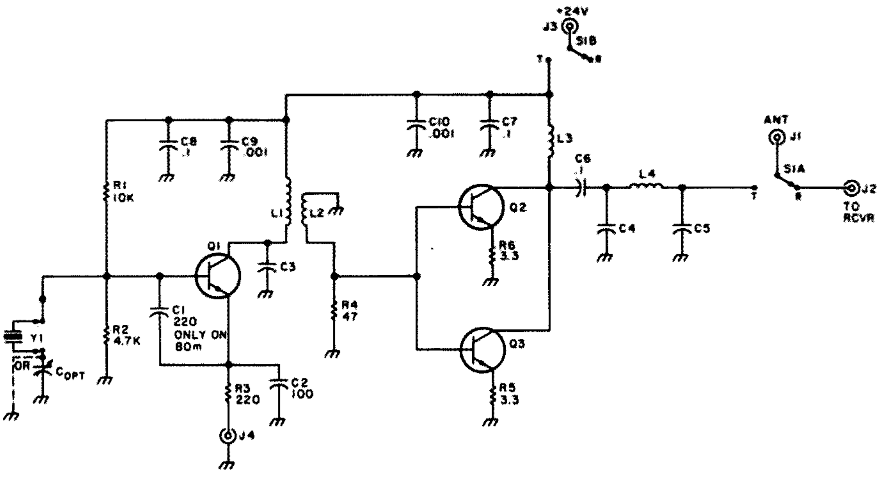


Fig. 1. Transmitter schematic.

My original design called for vfo control of the transmitter, but that required five rather than three transistors. Additionally and more importantly, the components needed to construct a stable vfo cannot be purchased at most Radio Shack outlets. To overcome these problems, crystal control was decided upon. At first thought, crystals conjure up an image of hours of operating without a contact as you wait for someone to happen upon your frequency. That simply isn't the case, as will be shown later. Also, since Novices now can use vfos, there are many crystals lying around in ham shacks everywhere.

The transmitter can be built as a basic unit or with

several options, as shown. The basic unit consists of the loaded PC board soldered to an antenna connector and power source. If the transmitter is to be used for serious operation—which it definitely is capable of—then the options, which require only a little more time and money, should be added. Options will allow T-R switching, some frequency variation, two bands in one box, and a package that is more pleasant to look at and show off.

Photo A. Completed transmitter.

The Circuit

As can be seen from Fig. 1, the transmitter meets the design goal of being simple. Only three transistors are used to generate the 5 Watts of output power. Resonant circuit inductors are formed using iron-core rf chokes. Common-value ceramic capacitors are used either singly or in parallel to obtain the needed capacitance.

Q1 operates as a Pierce oscillator at the crystal frequency. FT-243 crystals, which are inexpensive and plentiful, can be used. Output is taken from Q1 by a five-turn link over L1. Q2 and Q3 comprise the class C final amplifier and are operated in parallel. Parallel operation provides an easy method of obtaining the desired 5-Watt output.

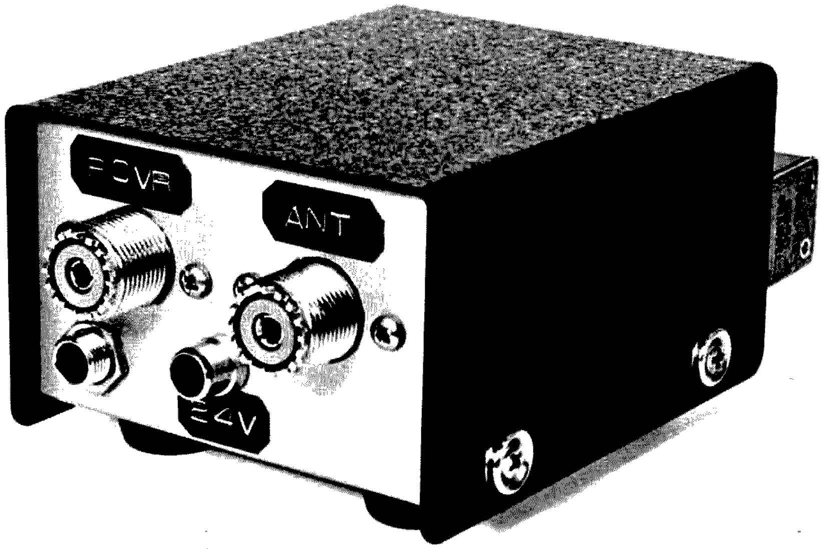


Photo B. Back view.

The parallel combination of Q2 and Q3 presents about a 60-Ohm load to be matched to the 50-Ohm antenna load. This collector impedance is determined from the formula $RL = Vcc^2/2po$, where $Vcc = 24$ V and $po = 5$ Watts.

The impedance transformation is accomplished with a pi-network composed of L4, C4, and C5. This network also offers harmonic attenuation to the signal. The transmitter, as designed, easily meets the FCC regulations for harmonic radiation.

R5 and R6 are used to equalize current flow in the two transistors. In all of the units built thus far, I have detected no "hogging" of current by either transistor. Nothing special has been done in selecting matched transistors. If they run equally hot, they are matched well enough! Heat sinks are needed on both transistors to dissipate the heat generated. Since the type of heat sink needed is not available at Radio

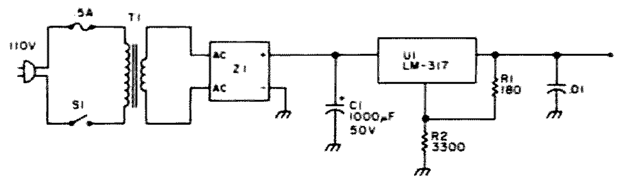


Fig. 2. Power supply schematic.

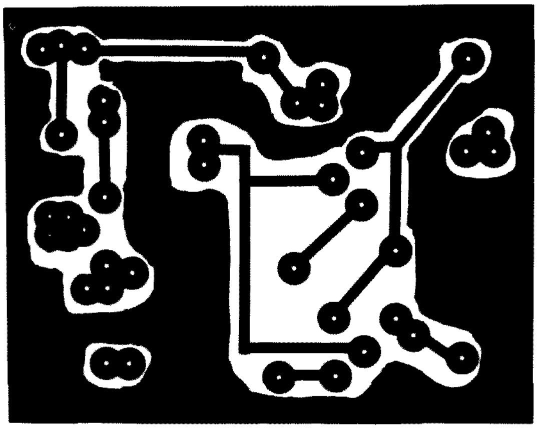


Fig. 3. PC board layout, foil side. (Single-sided, fiberglass, copper-clad board.)

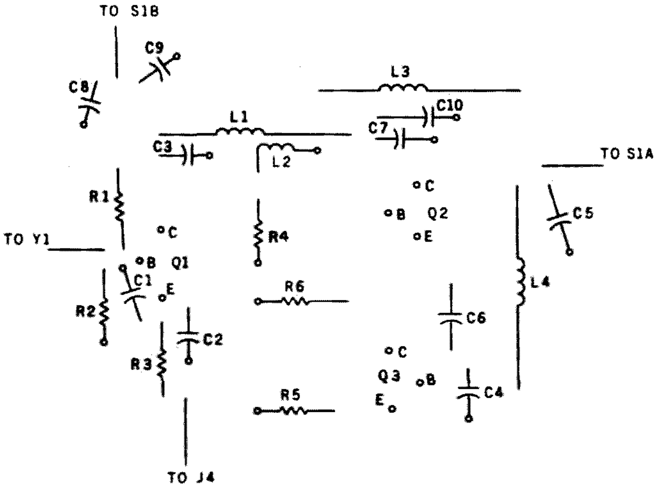


Fig. 4. Component locations.

Shack, they must be constructed by hand. Light gauge aluminum can be used by forming a tightly fitting cap over the transistor.

The design goal of using readily-available parts was realized throughout the rig. Radio Shack disc ceramic capacitors are used and have performed well. Unfortunately, there is a limited variety of these parts. To obtain the desired capacitance, the capacitors, where necessary, are soldered in parallel. This allows for the elimination of variable capacitors to tweak the tuned circuits to resonance. In all units assembled, the resonant circuits and matching networks have worked fine with no tweaking necessary.

To construct L1, remove the required number of turns from the Radio Shack

Parts List
(Radio Shack parts numbers in parentheses.)

Fig. 1.	
C1-C10	—Ceramic disc (272-xxx)
C3	—80m: 220 pF; 40m: 47 pF
C4,C5	—80m: 690 pF (220 and 470 pF in parallel);
	—40m: 420 pF (220, 100, and 100 pF in parallel)
Copt	—BC variable, approx. 30-200 pF
J1,J2	—SO-239 (278-201)
J3	—Phono jack (274-386)
J4	—Phono jack (247-252)
L1	—80m: 8.4 uH, 8 turns removed (273-101)
	40m: 10.0 uH, no turns removed (273-101)
L2	—5 turns wound over side of L1
L3	—Approx. 30 uH, 40% of turns removed (273-102)
L4	—80m: 2.4 uH, 16 turns removed (273-101)
	40m: 1.2 uH, 23 turns removed (273-101)
Q1	—RS-2033 (276-2033)
Q2,Q3	—RS-2038 (276-2038)
R5,R6	—Each is 3 10 Ohm, ½-W (271-001) in parallel
S1	—DPDT toggle (275-1546)
Fig. 2.	
C1	—1000 uF, 50 V (272-1047)
R1,R2	—¼-W carbon (R2 can be made 5k variable
	to provide 3-30-V output)
S1	—SPST (275-324)
T1	—24 V lamp, min. (273-1480 or 273-1512)
Z1	—Full-wave bridge rectifier, 1.4 A, 100 piv (276-1152)

choke. Use this removed wire to form the link winding, L2. Wind L2 over the Q1 side of L1. L3 should be made similarly except that no link is needed. The chokes work surprisingly well as resonant circuit inductors at 3.5 and 7 MHz.

One departure from the norm in this project was the use of +24 V for supply voltage rather than the more common 12 volts. This was done for several reasons. It is much easier to build and get operational a 24-volt supply than it is the additional stages required to realize 5-Watts output using a 12-V supply. This also makes the transmitter simpler and cheaper (other design goals).

A schematic for a very simple 24-V supply is shown in Fig. 2. This supply can be made variable or fixed. It has performed flawlessly at currents up to 1.5 Amps. The regulator contains internal short-circuit protection and is self-contained.

If an ac-operated supply is not desired, four 6-V lantern batteries can be operated in series to provide the needed 24 volts. Many hours of transmitter operation can be achieved from such batteries. Alternatively, and probably cheaper, sixteen D-cells can be soldered in series for the supply voltage. Obviously, the 24-volt supply should not be a deterrent to building the transmitter. It can be used for later projects as well!

Construction

The transmitter is built on a 2¼" by 3" PC board. Assembly time is less than one hour due to the small number of parts used. A number of transmitter boards have been constructed and each one has worked fine when power was applied.

For best operating comfort, the transmitter PC board should be mounted in an enclosure—as mentioned earlier. Any size or type of enclosure will work fine. I used a Radio Shack type, which makes for a nice-looking and compact transmitter.

A crystal socket should be mounted on the front panel to allow for a change of frequency when desired. A variable capacitor can be mounted near the socket to allow for a small amount of frequency excursion from the crystal frequency. On 80 meters, about 1.5 kHz of change has been possible. On 40 meters, this increases

to about 3-5 kHz. The amount of frequency excursion will vary, depending mostly upon the crystal used.

Switch S1, a miniature DPDT toggle type, is used to switch the antenna between receive and transmit. All connections between S1, the PC board, and the SO-239 antenna connectors should be made with coax. RG-174 is preferred, but if it is not available, RG-58 will work fine. The only other additions necessary are a phono connector for voltage and a key jack.

If desired, the 40-meter PC board can be mounted in the same box as the 80-meter board to make a two-band transmitter. Another toggle switch will be needed to switch the two boards to the appropriate circuit points.

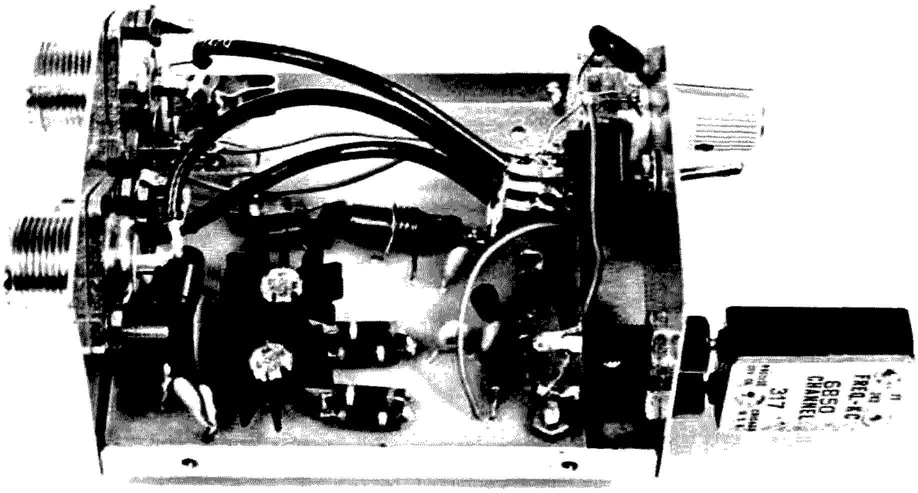


Photo C. Inside view.

Operation

After assembling the PC board and the supporting parts into a cabinet, the transmitter is ready for use. Initially, a dummy load should be connected to the antenna connector. This allows for testing without generating QRM on the air. The dummy load can consist of two 100-Ohm, 2-Watt resistors in parallel. If a VOM (ammeter) is available, it might prove advantageous to hook it in series with the plus side of the 24-V supply. Input power can then be calculated.

After the key is plugged in, the supply turned on, and the crystal installed, switch S1 to transmit and close the key. The VOM should read about 350 mA of current. This indicates an input power of approximately 8.5 Watts (Pi = E × I = 24 × .35). All of the transmitters I have built have had a minimum efficiency (Po/Pi) of around 60 %. This indicates an output power of around 5 Watts. The input (and output) power of your transmitter might vary depending upon the gain of the transistors used.

An antenna now can be hooked to the SO-239 antenna connector. At the same time, a short cable should be run between the receiver-out connector and your receiver.

You are ready now for on-the-air contacts. You probably will be as surprised as I was when you first use your new little powerhouse. Surprisingly, my best success has been in calling CQ. The response ratio has been close to 50%. Using one crystal on 80 meters has resulted in numerous contacts up to 1500 miles away with excellent reports in both strength and quality. The antenna used in conjunction with the transmitter has been a dipole at 20 feet.

Conclusion

The transmitter has met the objectives I set out to achieve. It has been fun to design, build, and to use. Hopefully, this article will encourage you to try to build some type of homebrew gear. A simple receiver board can be constructed easily and in-cluded with the transmitter. Such a receiver is currently being designed. Good luck in home-brewing! ■

LOOKING WEST

from page 14

great deal of time experimenting with antenna systems for VHF and HF. Bob designed and built one of the nation's most exotic repeater systems: WD9GOE, located in his hometown of Marissa, Illinois, some 70 miles outside St. Louis. He also spearheaded the now-annual ARCH Convention in St. Louis and has accomplished so much in his life that it could fill many volumes.

Bob's book is covered in the Review section of this issue of *73 Magazine*.

THE VOCOM ANTENNA DEPT.

Elsewhere in Illinois there exists a company that calls itself VoCom, and they have a rather interesting product. It's a 5/8-wave gain antenna that collapses to 8" and is designed to be used directly on a hand-held fitted with a BNC-type connector. I became interested in this product after moving to our new home. (One thing to mention on my new home: While set in a beautiful canyon, I actually purchased a $70,000 "dead spot" that came complete with "CC & Rs" which prohibit any outside antenna structure. Not that the latter would be of any distinct advantage over what I have in the attic, unless I erected a tower some 650 feet high. I knew what I was getting into when I bought the place and do not regret the move. I bank heavily on a remote-base system atop a nearby peak to keep in touch with the outside world.)

But now and again it's nice just to chew the fat simplex (direct), and my Wilson Mark II is just the ticket at those times. With the supplied rubber ducky, I found my simplex range to be under a mile. I tried a ¼-wave whip and got another mile out of that. In fact, with the ¼-wave, I could be heard through the nearby WR6AHM Magic Mountain repeater. Barely, I grant you, but readable. The Icom 22 and attic-mounted, 4-element beam put me in solidly, but are not convenient when one wants to lie in bed for a chat.

Anyhow, through a friend I heard about the VoCom antenna and procured one. I was very skeptical when it arrived. Taking it out of its shipping container, I found what appeared to be a TV rabbit ear antenna rod designed for an early model Sony TV, mated through a covered coil to a BNC plug. I was not all that impressed.

"Oh, well. What the heck. Let's give it a try," I said to myself. I tried keying up Magic with the ducky so that I would have a basis for comparison. As usual, there was no way to key up Magic with the ducky. Then I substituted the VoCom, extended it out to its full 47 inches and tried again. "You're full quieting, Bill. You using the beam?" was the first report. I was astounded. No way, I thought. I had the station stand by and tried the ducky. No luck. Back on the VoCom I was DFQ. "The bloomin' thing works!" I thought to myself.

Subsequent QSOs on 146.52 have proven to me that the manufacturer's performance claims are in the ballpark (which is something else rare in this age of hype and jive). Last night, under normal conditions, I completed a QSO with a station in the Simi Valley some 45 miles away. Signals were fair both ways. One of these days I'll publish a photo of these surroundings to show the terrain I am up against. If this antenna will work here, I think I can safely say that it will work anywhere. The VoCom HT Gain Antenna is available for $24.95 from VoCom, 65 E. Prospect, Suite 111, Prospect Heights IL 60070. In my opinion, it's worth the asking price and then some.

VOYAGER AND ATV DEPARTMENT

One of the most fascinating places in Southern California is the Jet Propulsion Laboratory in Pasadena. For well over a decade, JPL has been the scene of some of the greatest breakthroughs in the history of man's conquest of the "final frontier." Many of us grew up watching the epic of American space exploration unfold through the eyes of news correspondents and scientists in press conferences.

Saturn and its satellites Tethys (outer left), Enceladus (inner left), and Mimas (right of rings) are seen in this mosaic of images taken by NASA's Voyager 1 on October 30, 1980, from a distance of 18 million kilometers (11 million miles). The soft, velvety appearance of the low-contrast banded structure and increased reflection of blue light near the perimeter of the Saturn disk are due to scattering by a haze layer above the planet's cloud deck. Features larger than 350 kilometers (220 miles) are visible. The projected width of the rings at the center of the disk is 10,000 kilometers (6,000 miles), which provides a scale for estimating feature sizes on the image. Photo courtesy of NASA.

In November of 1980, we witnessed another chapter in this ongoing story as *Voyager 1* had a "Close Encounter of a Special Kind" with the planet Saturn. We saw the close-up photos of Saturn, its rings and its moons, in a manner never seen before. For all the questions answered by the *Voyager 1* flyby, new ones arose. We watched as *Voyager*, a billion miles off in endless space, performed its appointed task flawlessly, sending back television photos of the ringed world. From the comfort of our own homes, we watched as people such as NBC's Roy Neal brought these pictures to us via our own TV set. Together we lived through another great moment in man's conquest of the unknown.

Among the first to see some of these epic photos were those of us who are amateur radio operators. This because there exists at JPL one of the nation's most active amateur radio clubs, an organization well known for doing its part to help commemorate events such as this. In the past, whenever a close encounter such as this took place, the JPL Amateur Radio Club went on the air sending slow-scan photos and offering commemorative QSL cards which have become collectors' items. The *Voyager 1* Saturn flyby was no exception, as those of you who QSOed W6VIO (*Voyager* in Outerspace) during this time period are well aware. For the better part of November, W6VIO was operational on a daily basis. Hot from the JPL imaging department, photos were aired on various amateur bands worldwide, using slow-scan television techniques. But that was not all. For the *Voyager 1*

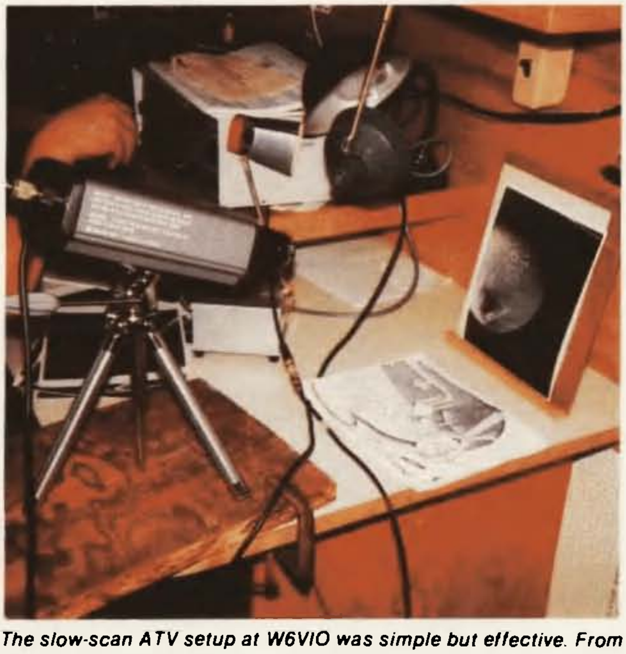
One of the visitors to W6VIO during the Saturn encounter was Mike Davis WD6FFV. Many of you will remember Mike. Two years ago, at age 13, he coordinated the rescue of three people aboard a sinking boat in the Caribbean.

Those JPL employees operating at W6VIO did so on their own time. These two manned the 220-FM position and ate lunch at the same time. Talk about dedication!

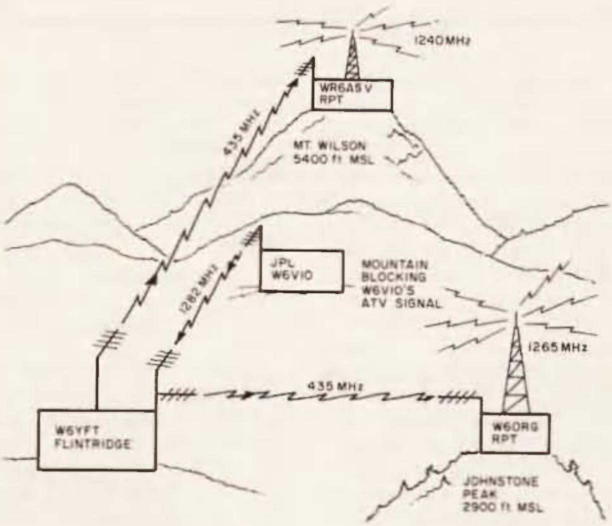
Saturn encounter another dimension was added: regional fast-scan television using facilities provided by Tom O'Hara W6ORG of P.C. Electronics and the Southern California ATV Club.

The fast-scan installation was rather unique. The idea was to get the video signals from W6VIO into two area ATV repeaters, one located on Johnstone Peak near Pomona, California, and the other on Mt. Wilson. As you can see from the accompanying pictorial, while JPL may lie in the shadow of Mt. Wilson, it is not line-of-sight to it. JPL also is effectively blocked from Johnstone Peak by other hills. One of the places it could see easily, however, was the Flintridge area, so a decision was made to install an intermediary link at the home of Dr. Dale Hauck W6YFT. Television was then generated at W6VIO, relayed to W6YFT and into the two crossband ATV repeaters, affording the ever-growing ATV community out here a chance to see things first hand.

The fast-scan operation was every bit as successful as was the slow-scan. There were reports of reception as far away as Riverside and San Diego, and it was of good quality color photos many times accompanied by descriptive audio of what was being seen. The fast-scan was so well received that plans already are being made to repeat the setup next summer when *Voyager 2* encounters the ringed planet and scientists again try to unravel some of the mysteries of space. In the meantime, if you were among those fortunate enough to QSO W6VIO, I urge you to send for one of their QSL cards. Be sure you are a "logged contact," and send your own QSL confirming the contact along with a #10 self-addressed, stamped envelope to W6VIO at their *Callbook* address. When you receive yours, you might want to frame it. Not only to protect it, but so that it will stand out among the rest as a symbol of your personal participation in a rather monumental achievement of mankind.



The slow-scan ATV setup at W6VIO was simple but effective. From this position, pictures were seen worldwide.



CONTESTS

from page 19

Work as many QCWA members as possible and apply for the several Special QCWA Certificates which you have qualified for in the QCWA Parties: Worked 50 States, Worked 60 Chapters, Worked 100 Members, and Worked 500 Members.

ARRL INTERNATIONAL DX CONTEST—CW

0000 GMT February 21
2400 GMT February 22

The ARRL-sponsored contest is open to all amateurs worldwide. Note that the basic contest format has been returned to that of 1979, with W/VE stations working the world and everybody else working W/VE stations only. The changes to single-band categories and the expanded awards program proved very popular and remain unchanged. Use all bands, 1.8 to 30 MHz.

Operating categories include: single operator allband and single-band, multi-operator single transmitter or multi-transmitter, QRP single transmitter only with 10 Watts input or less (5 Watts output or less).

Your callsign *must* indicate your DXCC country (KL7XYZ/2 in NJ, FG0AAA/FS on St. Martin, etc.). One operator may not use more than one callsign from any given location during the contest period. The same station may be worked only once per band. No crossmode, crossband, or repeater contacts. Aeronautical and maritime mobile stations outside the USA and Canada may be worked for QSO credit only by W/VE stations. All transmitters and receivers must be located within a 500-meter diameter circle, excluding directly-connected antennas. This prohibits the use of remote receiving installations. However, multi-operator stations may use spotting nets for multiplier hunting only.

EXCHANGE:

W/VE stations (includes 48 contiguous United States and does *not* include Canadian islands of St. Paul and Sable) send RST and state/province. DX stations send RST and transmitting power as a 3-digit number.

SCORING:

W/VE stations count 3 points per DX QSO. The multiplier is the sum of DXCC countries (except US and Canada) worked per band. DX stations score 3 points per W/VE QSO. The multiplier is the US states (except KL7 and KH6), VE1-7, VO, and VE8/VY1 worked per band. Maximum of 57 per band. Final score is total QSO points times the total multiplier.

AWARDS:

Various plaques and certificates to top scorers. Certificates to each DX entrant making more than 500 QSOs. ARRL affiliated clubs compete for gavels on three levels: unlimited, medium, and local clubs. Details should have appeared in the January, 1981, *QST*.

ENTRIES:

All entrants are encouraged to use forms available from ARRL (include an SASE or one IRC). Logs should indicate times in GMT, bands, calls, and exchanges. Multipliers should be clearly marked in the log the first time worked. Entries with more than 500 QSOs must include cross-check sheets. All operators of multi-operator stations must be listed. Entries must be postmarked by April 7, 1981, and addressed to: ARRL, 225 Main Street, Newington CT 06111. Any entries received after mid-July may not make *QST* listings. Usual entry conditions and disqualification criteria.

G-QRP-CLUB
CW ACTIVITY WEEKENDS

0900 GMT February 28
2300 GMT March 1
0900 GMT September 12
2300 GMT September 13

All amateur radio amateurs interested in QRP are invited to take part in the club's activity weekends. No special exchange information was mentioned in the information provided by the club. The operating schedule for the two weekends is as follows:

3560 kHz = 0900-1000, 1700-1800, and 2200-2300 GMT
7030 kHz = 1200-1300, 1500-1600, and 1900-2000 GMT
14060 kHz = 1000-1100, 1400-1500, and 2100-2200 GMT
21060/28060 = 1100-1200, 1600-1700, and 2000-2100 GMT

Reports on the Activity Weekends are welcomed by Christopher J. Page G4BUE.

In addition to the above, members of the G-QRP-Club have a weekly Activity Period on Sundays from 1100-1230 and from 1400-1530 GMT on the International QRP frequencies (3560, 7030, 14060, 21060, and 28060). All radio amateurs interested in QRP are invited to join in.

For information regarding membership in the G-QRP-Club, write: George Dobbs G3RJV, 17 Aspen Drive, Chelmsley Wood, Birmingham, England B37 7QX. The club publishes a quarterly magazine called *SPRAT* and promotes an extensive awards program for QRP achievements.

HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time away from other duties to decipher cryptic notes scrawled illegibly on dog-eared post cards and odd-sized scraps of paper. Please type or print (neatly!), double spaced, your request on an 8½" × 11" sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a "1" look like a "1," not an "l," which could be an "el" or an "eye," and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.

I need information on using a solid-state oscillator in HBR receivers by Ted Crosby. I will answer and send postage. Thanks.

Owen Laughlin KA8CXK
719 Hemphill
Ypsilanti MI 48197

I need a working charger for the Motorola HT-220 transceiver. I am a senior citizen ham, so I need a low price, please.

Bob Clark W5BTZ
8260 Wateka Road
Richardson TX 75080

I need a copy of the manual for the Gonset GSB-201—an original or photocopy would be OK. I'll be happy to pay for all costs.

Steven Bein K6MBP
3044 Danalda Dr.
Los Angeles CA 90064

I have a Hammarlund Super Pro receiver, military no. BC-779-B. It does not cover 10 or 15 meters, which I would like to have. It has one band marked 100-200 KC and the other, 200-400 KC. There was a conversion kit but the company no longer has them.

If anyone has a conversion kit for this receiver or a BC-794-B or BC-1004 C, even though it doesn't work, and if the price is right, I would like to get it.

Donald B. Watkins
428 Oak St.
Warren AR 71671

I need a schematic and/or manual for a keyboard having the following markings: #2815051-01A. Unit has 91 keys and PC board has LICON 80-55157CS1-1 on it. It may have been used in a UNIVAC system. I will reimburse copying cost, will copy and return promptly, or purchase manual.

John Zowtiak N7BFX
750 Little Matterhorn Dr.
Salt Lake City UT 84107

Where can I get a replacement cabinet back for my Hallicrafters Model S38-B shortwave receiver? Mine was damaged and I've been unable to get a replacement from Hallicrafters. There must be distributors somewhere that have some of these and would be glad to sell them.

Duerson Prewitt K4ZCD
129 N. Maysville St.
Mt. Sterling KY 40353

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

from page 11

The crowding of Tokyo has forced much of the growth to go underground. This is a small part of the four-floor shopping complex which is involved with the Sunshine Prince hotel, where we stayed. There are two McDonalds restaurants in this one complex! There is also an almost infinite number of other restaurants, running from snack bars to very posh eateries. Multilayered underground shopping malls are growing rapidly in Tokyo.

Hmmm, octopus chips! Well, much better than cow chips, anyway . . . and free!

This is one of the Golden Arches attached to the hotel. It was a handy place to get milk. Not being a big Coke fan, I didn't pursue the nickel Coke offer. I did invest in their egg McMuffin for breakfast now and then.

Obviously, eating is an all-consuming interest for me. Here's a typical department store basement with its hundreds of food concessions. The happy innocents running these booths put out free samples to attract business. They also attract frugal Yankees, who are able to make a whole meal out of the samples.

Here's one of the food displays. The tempura jumbo shrimp are $7.50.

The subway system is easy to use, though it takes guts to try it the first time. You get the hang of it quickly. It's clean, fast, and well marked.

Each station is marked in both Japanese and English, with the stations at the ends of the line indicated so you know which train to take.

Yep, ice cream, too. The sundae prices are a bit high, but not out of line with the New York prices at $3 for the big banana split. Soft ice cream cones are usually around 75¢ and are sold all over the place.

You like grapes? Here are boxes of grapes... absolutely delicious grapes. The green ones are $20 a box and the smaller box of purple grapes is only $12.50.

To help dispel the idea that eating in Japan is expensive, here is a picture of a musk melon. This is a typical fruit product that I saw in dozens of fruit stores and fruit counters in department stores. To translate the Yen into dollars divide by 200. Thus, this melon is a mere $50 in American money.

In the Akihabara (radio row) section of Tokyo, there are hundreds of shops selling radios, parts, hi-fi, computers... everything in consumer electronics. With a bit of shopping, you can knock around 35% or so off the US prices, so I loaded up with new gadgets from Casio and Sharp. That's Sherry looking over the cassette bargains.

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received two months prior to the month in which the event takes place. They should be sent directly to Editorial Offices, 73 Magazine, Pine Street, Peterborough NH 03458, Attn: Social Events.

MIAMI FL
FEB 7-8

The 21st annual Tropical Hamboree and 1981 ARRL Florida State Convention will be held on February 7-8, 1981, at the Flagler Dog Track, Miami FL. Registration is $3.00 in advance and $4.00 at the door. Swap tables are an additional $12.00 for both days, $7.00 for Saturday only, and $6.00 for Sunday only. Events will include tech talks and forums, over 100 exhibit booths, 400 swap tables, ladies' programs, group meetings, and many awards. There will be free overnight RV parking for self-contained units at the site (advance registration is recommended). Special gatherings are planned for QCWA/OOTC/SOWP and DXers. For further information and special hotel rates, write Dade Radio Club, PO Box 350045 Riverside Station, Miami FL 33135.

MANSFIELD OH
FEB 15

The Mansfield midwinter hamfest auction will be held on February 15, 1981, at the Richland County Fairgrounds, Mansfield OH. Doors will open to the public at 8:00 am. Tickets are $1.50 in advance and $2.00 at the door. Features will include prizes, an auction, and a flea market, all in a large heated building. Talk-in on 146.34/.94. For additional information, advance tickets, and/or tables, send an SASE to Harry Frietchen K8HF, 120 Homewood Road, Mansfield OH 44906, or phone (419)-529-2801.

FAYETTEVILLE WV
FEB 15

The Plateau Amateur Radio Association will hold Its 3rd annual hamfest on Sunday, February 15, 1981, at the Memorial Building, Fayetteville WV. The doors will open at 9:00 am and admission is $2.50, with children admitted free. Flea market tables are $2.00. Activities (all indoors) will include ARRL displays, forums, exhibits, door prizes, and XYL programs. Hot food, refreshments, and free parking will be available. Talk-in on 146.52 and 146.19/.79. For more Information, contact Bill Wilson WA8YTM, 302 Central Avenue, Apartment #2, Oak Hill WV 25901, or phone (304)-469-9910 or (304)-574-1176.

VERO BEACH FL
FEB 21-22

The Treasure Coast Hamfest will be held on February 21-22, 1981, at the Vero Beach Community Center. Admission is $3.00 per family, in advance, and $4.00 at the door. Features will include prizes, drawings, and a QCWA luncheon. Talk-in on 146.13/.73, 146.52/.52, 146.04/.64, and 222.34/223.94. For information, write PO Box 3088, Beach Station, Vero Beach FL 32960.

LIVONIA MI
FEB 22

The Livonia Amateur Radio Club will hold its 11th annual LARC Swap 'n Shop on Sunday, February 22, 1981, from 8:00 am to 4:00 pm, at Churchill High School, Livonia MI. There will be plenty of tables available. Other features include door prizes, refreshments, and free parking. Talk-in on 146.52. For further information, send an SASBE (4" × 9") to Neil Coffin WA8GWL, c/o Livonia Amateur Radio Club, PO Box 2111, Livonia MI 48150.

AKRON OH
FEB 22

The Cuyahoga Falls Amateur Radio Club will hold its 27th annual electronics equipment auction and flea market on Sunday, February 22, 1981, at North High School, Akron OH, from 8:30 am to 4:00 pm. Tickets are $2.50 at the door and $2.00 In advance. Even though It is suggested that you bring your own tables, some will be available for $2.00 each. Featured will be refreshments and prizes, including a first prize of a Kenwood TS-130S and two more prizes of Icom IC-2ATs. There will be plenty of room for buyers and sellers, including free parking. Talk-in on 146.04/.64. For more details, write CFARC, PO Box 6, Cuyahoga Falls OH 44222, or phone K8JSL at (216)-923-3830.

LANCASTER PA
FEB 22

The Lancaster Hamfest will be held on February 22, 1981, at the Guernsey Pavilion, located at the intersection of Rtes. 30 and 896, east of Lancaster PA. General admission is $3.00, except children and XYLs. Doors will open at 8:00 am. All inside spaces are available by advance registration only and are $4.00 each for an 8-foot space, which includes a table. There is a limit of 2 non-commercial or 6 commercial tables; the registration deadline is February 13, 1981. All vendors must set up between 6:00 am and 8:00 am on Sunday; reservations will not be held past 9:00 am without prior arrangement. Free tailgating will be available in a specified area outside if weather permits. Food will be served at the hamfest. Also, there are excellent restaurants and accommodations In the area. Call (717)-768-8271 for motel reservations under Sercom. Talk-In on 146.01/.61. For more information, write Sercom, Inc., PO Box 6082, Rohrerstown PA 17603.

VIENNA VA
FEB 22

The Vienna Wireless Society will hold its annual WINTERFEST™ on February 22, 1981, at the Vienna Community Center, Park Street, Vienna VA. The event will begin at 8:00 am.

MARLBORO MA
FEB 22

The Algonquin Amateur Radio Club will hold its annual indoor ham radio flea market on Sunday, February 22, 1981, at the Marlboro Jr. High School, off Rte. 85 on Thresher Avenue, Marlboro MA. Doors will be open from 10:00 am to 2:00 pm and sellers will be admitted starting at 9:00 am. Admission is 50¢. Tables reserved by February 15, 1981, are $5.00; after that date, they are $7.50. Talk-in on .52. For more information or reservations, contact Charles McCarthy W1BK, 128 Forest Avenue, Hudson MA 01749.

MINONG WI
FEB 22

The Wild Rivers Amateur Radio Club will hold a mid-winter swapfest on Sunday, February 22, 1981, from 10:00 am to 3:00 pm at the Minong Village Hall, Minong WI, 45 miles south of Duluth-Superior, 90 miles north of Eau Claire on Highway 53, and 135 miles from Minneapolis-St. Paul. Admission is $1.00 and tables are free. There will be a raffle drawing for a scanner. Talk-in on .28/.88 and .52. For information, contact Roger Doehr W9DLY, Route 5, Box 452, Hayward WI 54843.

LAPORTE IN
FEB 22

The LaPorte Winter Hamfest will be held on February 22, 1981, at the LaPorte Civic Auditorium (main floor), LaPorte IN, 50 miles southeast of Chicago.

Donations are $2.00 in advance or $2.50 at the gate. There will be plenty of room, good food, and tables which are $1.00 each. Talk-in on .01/.61 and .52. For more information, write LPARC, PO Box 30, LaPorte IN 46350.

GLASGOW KY
FEB 28

The Mammoth Cave Amateur Radio Club will hold its annual Glasgow swapfest on Saturday, February 28, 1981, from 8:00 am to 5:00 pm CST at the Glasgow Flea Market Building, 2 miles south of Glasgow on Highway 31E. There will be a large heated building with plenty of free parking. Each exhibitor will be provided one free space with table and chair. Additional spaces are available for $3.00 each. The building will be open for exhibitors at 7:00 am CST. There will be no forums or meetings—just door prizes, free coffee, and a large flea market. Admission is $2.00. Talk-in on .34/.94. For additional information, contact WA4JZO, 121 Adairland Ct., Glasgow KY 42141.

DAVENPORT IA
MAR 1

The Davenport Radio Amateur Club will hold its tenth annual hamfest on March 1, 1981, from 8:00 am to 4:00 pm at the Davenport Masonic Temple, Highway 61 (Brady Street) and 7th Street, Davenport IA. Tickets are $2.00 in advance, $3.00 at the door. Tables are $4.00 each with a $2.00 additional charge for an electrical hookup (limited number). Features will include over $2,000 worth of major prizes. Hotel discounts and refreshments will be available. There will be a pre-hamfest Saturday night banquet with Paul Graver, midwest ARRL SCM, as guest speaker. Banquet tickets are $8.00 and reservations must be paid by February 18, 1981. Talk-in on 146.28/.88, W0BXR. For advance tickets, dinner, and table reservations, write Dave Johannsen WB0FBP, 2131 Myrtle, Davenport IA 52804.

GRAND JUNCTION CO
MAR 7

The Grand Mesa Repeater Society will hold the second annual indoor Western Slope Swapfest on March 7, 1981, at the Lincoln Park Barn, 12th and Gunnison, Grand Junction CO. Doors will be open from 10:00 am through 4:00 pm and admission is free. Swapfest tables are $4.00 in advance. Attractions will include commercial exhibitors, a flea market, an auction, and prizes. Raffle tickets for the grand prize of a Tempo S-1 are $2.00 each. Talk-in on 146.22/.82. For further information, send an SASE to Larry Brooks WB0ECV, 3185 Bunting Avenue, Grand Junction CO 81501, or call (303)-434-5603.

MAUMEE OH
MAR 22

The Toledo Mobile Radio Association, Inc., will hold its 26th annual auction and hamfest on Sunday, March 22, 1981, at the Lucas County Recreation Center, Key Street, Maumee OH. Hours are from 8:00 am to 5:00 pm. The free auction starts at 10:00 am. There will be ample free parking all day and overnight. Tickets are $2.00 in advance and $3.00 at the door. Flea market tables are available; displays are limited to electronics and ham gear. There will be commercial exhibits, refreshments, door prizes, and a big raffle—all inside. Prizes include a Kenwood TS-130 with power supply, two Icom IC-2AT HTs, a Bird Wattmeter, and many more. There will be an additional ladies' program. Bring your YL, XYL, or OM and make a day of it. Talk-in on 146.52/.52. Area repeaters are 146.01/.61, 146.19/.79, 146.34/.94, 147.87/.27, and 147.975/.375. For additional information, write J. Honisko N8BGH, 1733 Parkway Drive N., Maumee OH 43537.

AWARDS

from page 23

enclose only three (3) IRCs with your application.

Joe Onizuka JE1WIH mailed me information about the NKDXC Award. Unless you work a lot of Japanese stations, the requirements are not as easy as it seems.

NKDXC AWARD OF JAPAN

The Northern Kyushu DX Club, Inc., issues the NKDXC Award to any licensed amateur or SWL station in the world.

Applicants must submit proof of confirmation of QSO with at least 20 different stations which enable you to spell "NORTHERN KYUSHU DX CLUB" using the last letter of each callsign. A station may be used only once in your spelling effort.

There are no band or mode restrictions, but special endorsements will be rendered for single mode or band achievements.

Do not forward QSLs. GCR apply. Forward your verified list with five (5) IRCs to: NKDXC Award Manager, PO Box 11, Yawata, Kita, Kyushu, Japan 805.

50-MHZ DX AWARD OF JAPAN

The award is issued in four levels of difficulty: Class EX—applicant must make 20 DX country contacts; Class A—applicant must make 10 DX country contacts; Class B—5 DX countries must be worked; and Class C—only 2 DX country contacts need be made.

While applicants are not required to submit QSL cards, they must have them on hand and verified by at least two amateurs or a local radio club secretary. Keep in mind, however, that all contacts must be made on six (6) meters, 50 MHz, utilizing any mode authorized.

Forward your claim and award fee of 8 IRCs or $3.00 to: Eiichi Konno JA7GZA, Awards Manager, 8-3 Tenjinmae, Henaizumi-town, Nishiiwai-gun, Iwate 029-31, Japan.

TEXAS INDEPENDENCE DAY

Brenham Amateur Radio Club will be operating its second annual special event QSL station to commemorate Texas Independence Day and its observance at the site where independence was declared from Mexico on March 2, 1836, Washington on the Brazos, Texas.

We plan to operate from 1600 UTC, Saturday, February 28, until 2300 UTC, Sunday, March 1, during times when the bands are open (no nets are scheduled) on the following frequencies plus or minus QRM: 3944, 7244, 14,344, 21,144, 21,444, and 28,544 kHz.

For an historic QSL card and information brochures, amateurs are asked to please QSL with an SASE (4¼" × 9" or larger) to BARC, WB5STR/5, PO Box 44, Brenham TX 77833.

Amateurs who worked WB5STR/5 last year should so indicate on their QSL and will be recognized this year.

We are grateful to Robert Fitzwilliam of Kay, Texas, for the use of his call which will be used with the phonetics, Washington on the Brazos, 5, Star of the Texas Republic.

LOVE OUR LIBRARY

The Lawrence County Amateur Radio Association is sponsoring a Valentine's Day theme special event from downtown New Castle, Pennsylvania, at our new public library on February 13-14, 1981.

We will be operating from the new library and the theme will be "I love my new library." The call in use will be KA3X, and the operating frequencies are: 147.795/.195 (our local repeater), 29.000, 21.400, 14.300, 7.250 and (CW) 7.125 MHz.

All frequencies plus or minus QRM (except 2 meters). Operating times are 1400-2200 GMT. Your QSL and $1.00 will bring a certificate.

For further information, contact John Hudak KA3X, 422 Galbreth Avenue or Zach Allerton KB3MC, 124 Richelieu Ave., New Castle PA 16101.

HAM HELP

I am in need of a schematic for a Micro-Z FM36 frequency counter with prescaler. I will be glad to pay copying costs and postage.

Dennis L. Cornell WD4HRO
7835 Captain St.
Millington TN 38053

Simon Langton Grammar Schools in Canterbury, England, are celebrating the centenary of the founding of the school in 1881. To this end, we shall be operating a special events station, active on all HF bands under the call GB4SLS, on February 22-28, 1981. During this time, we are anxious to contact as many past pupils of the school as possible, especially those who are licensed amateurs and residing in the United States.

Anyone interested in making a sked with us should contact either me or G3LCK, c/o G3OSL, Simon Langton Grammar School for Boys, Nackington Road, Canterbury, Kent, England.

Andrew P. Smith G4BBW
40 Virginia Road
Tankerton, Whitstable
Kent, England

I've had a bundle of letters and calls from readers requesting a source for the positive resist that I used in my article on easy PC artwork (*73*, June, 1980).

Yesterday, I found a source that you may want to know of since I am buying a private-label brand locally. The national brand is by GC Electronics, Rockford, Illinois. The catalog number is 22-233.

Route Electronics, Rt. 22, Springfield NJ, sells it for $13.60 for a large aerosol can. They do not mail order.

Ed Eggert W3HIK
2220 Marietta Ave.
Lancaster PA 17603

I need a copy of a complete schematic diagram or a manual for a Hallicrafters SX-100 receiver. I would prefer to copy at my end, but would pay for other costs.

K. Gilhuly KA8EWH
650 Ann Street
Harbor Springs MI 49740

I have a Regency HR-2A 2-meter transceiver that is sick. Anyone who can provide a circuit and servicing information would greatly assist me. I will pay for all expenses to copy them.

Harvey Horn WB2NMN
21 Skylark Lane
Stony Brook NY 11790

Searching for pre-32S-1 Collins transmitter in any condition to put on RTTY. If you have an old Collins AM/CW transmitter gathering dust and would part with it reasonably cheap, please send specifications, condition, and price. XYL is contemplating murder if I spend much money. I also need a CV-89 RTTY TU. Thanks.

Roger L. Arnold N5CAO
214 Hill Lane
Red Oak TX 75154

I need a schematic for a Kuhn model 357C VHF receiver and would like to copy and return a service manual for IC-21/DV-21 2m VHF gear.

Jung Y. Lem KB6BO
5222 Coringa Dr.
Los Angeles CA 90042

Does anyone have schematics for a Utica 650A 6m transceiver and a Gonset Super Six converter? Expenses will be reimbursed.

Howard Robb AF0W
340 So. 5th
Bird Island MN 55310

I would like to get in touch with someone who has completed the 220 transverter by Frank Kalmus WA7SPR in the October, 1979, issue of *73*.

Paul Ashmore WA9HEP
833 S. Chestnut
Litchfield IL 62056

Does anyone have any info on a lower sideband addition for a MULTI-2000? Also, who is handling the MULTI-2000 now? Any help would be appreciated.

Lloyd W. Locke K1COS
236 Walnut St.
Reading MA 01867

FUN!

from page 26

9) A4XAA is:

1) The call used during a world-famous 1956 DXpedition
2) The Sultan of Oman
3) A four-land call that will eventually be assigned by the FCC.
4) A made-up callsign

10) Which of the following is a former reciprocal callsign held by Jordan's King Hussein, JY1?

1) EP1JY
2) 4Z4KH
3) RG8U
4) 7X2HM

ELEMENT 3—TRUE-FALSE

		True	False
1)	The newly self-proclaimed "Shah of Iran," son of the late Shah, is a ham.	_____	_____
2)	Until his recent automobile "accident," YN1AS was former Nicaraguan dictator Anastaslo Somoza.	_____	_____
3)	The DX Country Club Award is sponsored by *73 Magazine*.	_____	_____
4)	KA2BQ is a DX callsign; KA2BQV is not.	_____	_____
5)	To officially qualify as DX, a signal must travel more than 150 miles, no matter the mode or frequency.	_____	_____
6)	WWV, JJY, LOL, MGM, BOT, and RID are all standard time and frequency stations.	_____	_____
7)	The DX Operating Code says you should always call a DX station *exactly* on his frequency.	_____	_____
8)	KP2 is the new prefix for KV4.	_____	_____
9)	BV2A and BV2B are the only licensed ham stations in the Republic of China. Both stations are operated by the same person.	_____	_____
10)	"QDX?" is a Q signal meaning, "Is there any DX on frequency?"	_____	_____

ELEMENT 4—HAM ACROSTIC

Guess the words defined and write them over the numbered dashes. Next, place each letter in the correct square in the puzzle. The black squares show word endings. The completed puzzle will form a statement relating to amateur radio. (Illustration 2)

A) Five hundred miles is DX in this region 6 45 20
B) Popular DX mode 28 29 21 64 32
C) Twenty meters, for instance 42 60 74 76
D) "Shared" band 41 26 4 66 50
E) DXer's "shoes" 59 9 35 19 77 7
F) FCC authorization 49 73 51 5 40 23
G) Semi-automatic key 39 58 10
H) Conversation 12 33 43
I) Scarce DX 37 56 2 75
J) Distress Signal 71 22 13
K) Splatter 3 55 27
L) DE 72 1 52 44
M) Lots of DX in a row 8 61 25 62 53 36
N) When to work DX 34 24 57 46 31
O) Lids 54 63 17 18 11
P) Venezuelan prefix 78 15
Q) Temerarious DXer 48 47 65 67
R) To tell a DXer something 69 14 16
S) Computerized DX 70 30
T) Irish prefix 38 68

THE ANSWERS

Element 1:
See illustration 1A.

Element 2:
1—3. More than one budding DXer has made his first African contact through this fine service. Net time is 1800 UTC, daily.
2—3. A DXer's best friend.
3—1. Obviously not the 21st cycle in the history of the Earth, but only since man started counting—around 1750.
4—2. You may need a "long radio antenna" for this band, but that has nothing to do with LORAN.
5—4. If you chose "Cuba," I'll bet you didn't get your General ticket while the FCC was using its circa 1968 tests. A question similar to this one went a long way to giving the FCC its reputation for using tricky testing techniques.
6—4. Since six is allocated to broadcasting and other services throughout the most of the world, there aren't even 100 6-meter countries on the air.
7—1. When DXing on 80, it pays to know the allocations.

■	1	■	2	■	3	4	5	■	6	7	■	8	9	10	11	■	12	13	14
■	15	16	■	17	18	19	■	20	21	22	23	■	24	25	26	27	■	28	29
30	31	32	33	■	34	35	■	36	37	38	39	40	■	41	42	■	43	44	■
45	46	47	48	49	50	■	51	52	53	54	55	56	57	58	59	60	61	62	63
64	65	■	66	67	68	69	■	70	71	■	72	73	74	75	■	76	77	78	■

Illustration 2.

C	L	I	P	P	E	R	T	O	N		D
O	D			I		F	O		B	O	X
N	E	P	A	L			G	O		X	P
T		E		E	U	R	O		N		E
E		I	T	U		U		D	E	A	D
S	V			P	A	N	T		W		I
T	O	W	N		R		A	M	S	A	T
I	M	I			S	U				I	I
N		N	O	W		D	X	B	U	R	O
G	E	N	E	V	A		F	L	A		N
		E			G	N		I		E	
W	O	R	K	I	N	G	S	P	L	I	T

Illustration 1A.

8—3. But avid DXers also have many other picturesque terms for list-takers.
9—2. Ever get the feeling there's enough royalty in ham radio to form a club?
10—1. More royalty! King Hussein held this Iranian call before Khomeini. Ayatollah you so.

Element 3:
1) True—His call was EP1MP. Guess he's EP1MP/SU now.
2) True—And he was listed in *QST* as a Silent Key.
3) True—The more realistic DXCC.
4) True—KA2BQ would be one of the "U.S. Personnel in Japan." KA2BQV would be an amateur in New York or New Jersey.
5) False—If you ran ½ milliwatt at 300 GHz, twenty feet would be DX!
6) False—"BOT" and "MGM" are not stations.
7) False—Not really. The DX station's frequency should be left clear so everyone can hear him. In reality, this never happens.
8) True—Why? Only the FCC knows for sure.
9) True—Tim Chen, operator of both stations, uses BV2A on CW and BV2B on phone.
10) False—And "QRX?" means, "Are there any receivers on frequency?"

Element 4:
A—UHF, B—PHONE, C—BAND, D—FORTY, E—LINEAR, F—TICKET, G—BUG, H—QSO, I—RARE, J—SOS, K—QRM, L—FROM, M—STRING, N—OFTEN, O—GOONS, P—YV, Q—RASH, R—SAY, S—IO, T—EI. The completed message reads: R R QRK UR SIGS QSA VY ONE FOOT FROM PHONES ON GREBE FB OM HEARTY CONGRATULATIONS THIS IS FINE DAY. So began the first amateur European-American QSO on November 27, 1923, an exchange between French station 8AB and U.S. 1MO that opened the age of ham DX.

SCORING

Element 1:
Twenty points for the completed puzzle, or ½ point for each question correctly answered.
Element 2:
Two points for each correct answer.
Element 3:
Two points for each correct answer.
Element 4:
Two points for each correct definition. Give yourself 10 extra points if you unscrambled the message.

Okay, DXers, let's see how you *really* measure up. Remember, big guys, your 100-foot towers won't help you here!

1-20 points—Once heard a DL on 20
21-40 points—80 countries worked, 25 confirmed
41-60 points—DXCC material
61-80 points—250 + countries confirmed
81-100 + points—Honor Roll candidate

Next month: How Hams View Themselves

	R		R		Q	R	K		U	R		S	I	G	S		Q	S	A
	V	Y		O	N	E		F	O	O	T		F	R	O	M		P	H
O	N	E	S		O	N		G	R	E	B	E		F	B		O	M	
H	E	A	R	T	Y		C	O	N	G	R	A	T	U	L	A	T	I	O
N	S		T	H	I	S		I	S		F	I	N	E		D	A	Y	

Illustration 2A.

HAM HELP

I have some two-meter crystals that I would like to sell or trade. Frequencies available are: T 146.880, TR 146.250/.850, TR 147.840/.240, R 147.330, R 146.060, T 146.460, R 147.060, T 146.040, and T 147.930.

All above fit in HC-25/U holders. Specs are transmit fundamental mode and parallel resonant with 30-pF load. Divide transmit frequency by 12 to obtain crystal frequency. Receive specs are overtone mode, series resonant. Subtract 10.694 MHz and divide by 3 to obtain crystal frequency.

Crystals I need are 146.01/.61, 146/.47, 146.22/146.88, 146.28 transmit, and 146.46 receive.

If anyone will trade or tell me the going price of used good crystals or knows who can tell me, it will be greatly appreciated.

Kevin Neal
Route A, Box 221A
Flippin AR 72634
(501)-453-8412

I need a complete schematic of the Hallicrafters S-118 receiver.

Keith Stowell WA0YQO
10 E. 40th-400
Kansas City MO 64111

from page 65

front-panel keyboard which selects all of the radio's functions. All memory data and command instructions are permanently programmed into the memory unit which is an integral part of the microprocessor IC. As such, the 2008 cannot be altered to receive or scan frequencies other than those in its regular VHF/UHF bands.

The rig is unique in the fact that it is the only available synthesized scanner which does not have a searching capability. This should not prove to be much of a handicap, however, as many people who purchase a scanner are interested only in hearing the action on a predetermined set of frequencies. Thus, it is an ideal unit for the person who desires the convenience and economy of frequency synthesis, but who doesn't need a searching capability.

An interesting feature on this unit is a recessed button on the rear panel marked "Reset." This button is similar to the Clear key on a calculator and functions to erase all data which is stored in the scanner's eight-channel frequency/status memory. This is used to erase incorrect information on those few occasions when the microprocessor fails to initialize.

Memory data is retained when the unit is unplugged and during power outages by using a 9-volt battery stored in an easily-accessible compartment on the rear panel. During normal usage, the battery will last up to one year. If the radio is to remain out of service for more than several months, however, it is best to remove the battery to avoid possible damage due to electrolyte leakage.

An innovation over previous Realistic models is the selectable scan-delay circuit, which allows the user to program a two-second delay on individual channels. The channel lockout function is accomplished in a similar manner, using the front-panel keyboard. Delays and lockouts remain programmed even when the scanner is turned off.

Frequency and status information is presented on a bright, blue fluorescent display which includes the channel number and indication whether the channel is programmed with a delay or lockout, and the six-digit frequency readout.

The PRO-2008's more common features include on-off/volume and squelch controls, a 3" front-mounted speaker, front-mounted headphone jack, scan/manual control, telescoping indoor antenna, external antenna jack, and ac power cord (the scanner is not designed for dc mobile operation).

The scanner's circuitry is composed of an LSI microprocessor system, LSI phase-locked loop (PLL) frequency generation system, eight integrated circuits, 24 transistors, and 40 diodes. These semiconductors, along with a host of passive components, team up to bring you a superheterodyne dual-conversion receiver capable of synthesizing 18,160 frequencies.

The synthesizer circuitry is capable of being programmed to receive any frequency in the 30-50- and 144-174-MHz bands in 5-kHz steps, and between 410-512 MHz in 12.5-kHz steps.

The receiver sensitivity (for 20-dB signal-to-noise ratio) is 1.0 uV on the VHF and low bands, and 2.0 uV on UHF. This proved to be adequate for local reception using the built-in antenna. For serious listening, an external antenna is highly desirable.

Selectivity ratings for signals within 9 kHz of the intended frequency are down 6 dB, and those signals within 17 kHz are reduced at least 50 dB.

The scanner operates at a rate of 10 channels per second.

Audio output is two Watts maximum with the internal speaker. The unit consumes about 15 Watts when operating.

The large volume and squelch controls make for easy adjustment. Each control is marked with numerical logging indicators, making it easy to return to a particular volume/squelch setting.

Frequency coverage of the 2008 is a real plus; it will receive signals in the entire 410-420-MHz US Government band. While the lack of a searching function tends to limit the advantage of having this band, it didn't take me long to find a few noteworthy stations hiding out in this "forbidden" part of the spectrum. With a little luck and a copy of one of the better known federal frequency guides, anyone should be able to make a number of educated guesses concerning active frequencies in this band. Verifying your guesses is the fun part!

All in all, the Realistic PRO-2008 seems to be a good choice for the amateur who desires a synthesized scanner for use at home, office, or around the shack. While it has its shortcomings, it should be seriously considered by anyone who is planning on buying a quality crystalless base station VHF/UHF receiver.

The Realistic PRO-2008 is priced at $259.95. For further information, contact *Radio Shack, 1300 One Tandy Center, Fort Worth TX 76102.* Reader Service number 479.

Louis A. Smith II N3BAH
Latrobe PA

GDX-1 DISCONE ANTENNA

With the flurry of activity in VHF/UHF scanner radios, it isn't surprising that someone has come out with a high quality discone antenna. Most antennas for scanner reception at present are simple vertically-polarized dipole clusters.

But the GDX-1 from TET-America is a different breed. Not only does it provide wideband reception, but it also is suited for transmitting as well.

Discone antennas are inherently wideband. The GDX-1 is designed for continuous coverage from 80-480 MHz. Feedpoint impedance is 50 Ohms unbalanced, so no matching balun transformer is necessary. The connector is a standard SO-239. Gain is stated as 3.0 dB, with a vswr typically less than 1.5:1 throughout its passband.

During transmit, the GDX-1 will safely handle 500 Watts PEP making it suitable for virtually any communications application. The antenna is deceptively sturdy, weighing a healthy 2.9 kg (6.4 pounds).

Our Field Test

The GDX-1 arrives in disassembled form with an instruction/parts-list sheet. Step-by-step assembly is a snap following the sequence. Hole tolerances are excellent, with elements and hardware lining up perfectly.

Our model, one of the first off the assembly line, had an unfortunate problem: The connector was threaded in metric! We notified the factory and were assured that subsequent runs had the problem corrected.

The parts count worked out perfectly after we figured out that a "biss" is a bolt and a "clipper" is a clamp. Something was lost in the translation. Purists may find the clamps slightly loose, but they may be bent slightly to tighten down on the elements.

The elements are solid rod, and high-quality tooling is apparent throughout the antenna. It is obviously thoughtfully designed and manufactured.

On the air, the GDX-1 performed better than most monitor antennas and had the additional flexibility of being frequency-agile continuously from 80-480 MHz. This allows operation on 3 amateur bands as well as reception on the 225-400 MHz military aeronautical band. (It's better not to transmit there!)

All things considered, especially with the assurance that the metric oversight has been rectified, the GDX-1 is capable of excellent performance as well as rugged immunity to wind. For further information, contact *TET USA, Inc., 425 Highland Parkway, Norman OK 73069.* Reader Service number 477.

Robert B. Grove WA4PYQ
Brasstown NC

MFJ-1040 DELUXE RF PRESELECTOR II

An unusual combination of accessories in one cabinet has been released by MFJ, a company noted for their large catalog of accouterments for radio communications.

The new 1040 Deluxe Rf Preselector II houses both a flexible receiver preselector and an adjustable-delay relay to protect the delicate circuitry when used with a transceiver. Very thoughtful and very effective.

Designed with applications agility in mind, the 1040 features at least 20 dB of preamplification. More important, the 1040 doesn't introduce considerable circuit noise as do some other rf preamplifiers.

Q is sharp, awarding the listener with good out-of-band rejection of unwanted signals. Gain may be continuously varied by a potentiometer or attenuated by 20 dB in one increment by pressing a button.

Circuit protection is automatic; when transmitted rf is detected by a high-gain sampling circuit, the antenna relay is automatically switched, bypassing the preamp. A front-panel pot may be adjusted to tune the receive delay—a sort of VOX—to prevent constant relay dropout during SSB excursions. Delay may be varied from 0 to about 2 seconds.

The dc amplifier used to control the relay consists of two direct-coupled bipolar transistors; sampling from the antenna circuit is through a 12-pF capacitor and rectified by two 1N34 diodes.

The preamplifier circuit is built around a 40673 dual-gate MOSFET. Preselection is accomplished in four bands (1-54 MHz), switching among four standard rf chokes, each of which becomes part of a tuned tank when connected across the 320-pF main tuning capacitor.

Rear-apron connectors in a row (SO-239s and phono jacks in parallel) allow selection between two antennas and two receivers by front-panel pushbuttons.

When the 1040 is switched on, a red LED signals the status. When switched off, the antenna circuit automatically bypasses the electronics so that the rig feeds the antenna straight through.

The preselector may be powered by an external source of 9 to 18 volts dc or by its companion ac adapter.

Our Test

We were impressed at the small size and large flexibility of the MFJ-1040. Two tests were performed, one with a general coverage receiver, the other in a full transceive mode.

First, the 1040 was connected to the antenna input of a Kenwood R-1000 receiver; a 135-foot dipole was connected to the input of the preselector.

With the preselector still switched off, signals came into the receiver, business as usual. But with the preamplified preselector switched on and adjusted to frequency, dead bands came alive! Keep in mind that 20-dB gain is equivalent to more than 3 S-units, and that amount of signal brought up out of the noise can be heard!

Tuning the receiver throughout the range of the 1040 (up to 30 MHz—we did not try it through 54 MHz although there was no question that it would work there), we determined that its gain was high and its selectivity was sharp. Out-of-band images and intermod were reduced considerably and in many cases eradicated. The continuous adjustability of the gain stage made custom preamplification a snap.

The contacts on the antenna-selecting push-buttons showed good isolation; high-level signals were barely detectable when the receiver switch was pushed to an alternate output.

A rear-apron jack provides the ability to remote-control the unit from a pair of shorting (or grounding) contacts in the transceiver.

Next, the 1040 was connected to the station rig, a Triton II. Since the preselector is rated to withstand 350 Watts PEP, we weren't concerned that we might cause injury pumping 150 Watts or so into the unit.

Trying the combination first on ten meters, we were astounded at the increase in signal levels *without* a corresponding increase in background noise. Double-checking this performance, we cranked the Triton's gain control down to just below signal threshold; switching the 1040 on, signals came in loud and clear!

We repeated the exercise on all five bands with equal success.

Next, we decided to try to burn the unit out with rf! During transmit, the relay responded instantly. Releasing the mike button, we heard the reassuring sound of the relay drop back to receive, accompanied by signals once again.

Transmitting again, we varied the settings of the VOX delay control as we spoke into the microphone and then released the button. Delay times were adjustable from 0 to roughly 2 seconds, which would accommodate any amateur mode: CW, AM, FM, SSB, RTTY, and even SSTV!

For older rigs of questionable sensitivity, or even when used with modern rigs where threshold signals must be improved, the MFJ-1040 is hard to beat. Its preselection should improve the performance of virtually any receiver or transceiver operating within its design range. For further information on this $99.95 product, contact *MFJ Enterprises, PO Box 494, Mississippi State MS 39762.* Reader Service number 476.

The MFJ-1040 Deluxe Rf Preselector II.

Robert B. Grove WA4PYQ
Brasstown NC

THE PRACTICAL HANDBOOK OF AMATEUR RADIO FM AND REPEATERS

Anyone who regularly reads Bill Pasternak's *Looking West* column in this magazine undoubtedly will have more than a passing interest in his new book, *The Practical Handbook of Amateur Radio FM and Repeaters*, written with Mike Morris and published in 1980, at $9.95, by TAB Books. Actually, anyone who has more than a passing interest in FM and repeaters will find this book a valuable addition to his technical library. This 538-page volume is more than just a practical handbook—it's a complete one! Among the topics covered are the history of repeaters and FM, how to determine your needs when planning a repeater, frequency coordination, ATV and RTTY repeaters, and a wealth of other general topics.

There are several chapters on the "people" end of repeaters, with extensive detail for repeater users and repeater owners. There is solid useful information on handling malicious interference and the "wild turkey." Hams looking for specific technical information won't be disappointed either; using no references other than this book, you could build a sophisticated repeater system incorporating every bell and whistle known to the repeater world. The operative word here is thorough!

Perhaps your interest in FM and repeaters is limited to kerchunking local machines with the synthesized transceiver you got for Christmas. Maybe you are a trustee or technical consultant for a big repeater operation. Whatever your level of interest or expertise, this book will enrich the hours you spend involved with FM and repeaters. For further information, contact *TAB Books, Inc., Blue Ridge Summit PA 17214.*

Paul Grupp KA1LR
***73 Magazine* Staff**

THE ARRL OPERATING MANUAL

The ARRL Operating Manual, recently published, continues the League's tradition of supplying the ham with some of the best book bargains available today on the subject of amateur radio. Inexpensively priced at $5.00, this large-format, paperbound edition is a compendium of up-to-date information on all phases of amateur radio.

What the League's *Handbook* does for the technical aspects of our hobby, the *Operating Manual* does for the stylistic. In short, it can help almost anyone become a better operator, and it will be particularly useful to those of us who find ourselves getting involved in some new aspect of the hobby such as computer RTTY, OSCAR, traffic handling, or even contesting.

The *Manual* provides an interesting solution to the problem of publishing an authoritative text on all the diverse aspects of our hobby. Rather than trying to do the impossible (finding one author conversant with all phases of ham life), the *Operating Man-*

ual incorporates the talents and knowledge of fourteen authors, each of whom writes a chapter on his/her specialty. The result is a definitive collection of chapters on subjects as diverse as traffic handling and DXing, written by enthusiasts who know what they're talking about.

Other subjects covered include: rules and regs., SWLing, emergency communications, contesting, awards chasing, FM and repeaters, VHF/UHF operating, satellites, visual communications, and microcomputers.

In addition to being well edited, the *Operating Manual* is liberally Illustrated. The extensive use of figures, photos, tables, charts and even an occasional cartoon provides a refreshing change from the staid layouts of other League publications.

For example, the chapter on contesting has several sample logs and dupe sheets. The chapter on DXing includes sample propagation charts, a tabular listing of countries organized by rareness of prefix, a list of international ten-meter beacons, and a sample azimuthal, equidistant map of the world used to determine great-circle bearings. The chapter on visual communications features slow-scan TV picturers, weather satellite photos, and even some efforts at RTTY art.

These chapters are typical of the treatment most topics receive in the *Manual*. While it is impossible to discuss all the subtleties of some of the more technically complex topics in a single chapter, the *Manual* does provide the neophyte with more than enough information to allow him to get oriented in unfamiliar terrain. In this vein, each chapter usually suggests additional reading material or supplies lists of information sources.

The ARRL Operating Manual is filled with good things, and the very richness of its content reflects the incredible diversity of our hobby. It will be a valuable reference work for anyone exploring the vast landscape of amateur radio. If you are as concerned about your operating style and skill as you are with the purity of your emissions, or if you plan to become involved in some new aspect of the hobby, you'd do well to get a copy. The chances are good that it will answer lots of questions you've had in your mind. For further information, contact the *ARRL, Newington CT 06111*.

Chris Brown KA1D
***73 Magazine* Staff**

10-METER FM FOR THE RADIO AMATEUR; THE 10-METER FM HANDBOOK

One of the most interesting aspects of ham radio is building or modifying your own equipment. Unfortunately, equipment has gotten so complex and expensive that most hams have restricted their building and modifying activities to small accessories for their stations. Digital clocks and electronic keyers abound, but if a device is part of the station's rf chain, the chances are that it has the nameplate of a commercial manufacturer affixed to it, and its owner shakes with fear at the thought of taking a soldering pencil closer than three feet to his/her thousand-dollar electronic baby. Now, that's all well and fine; with today's crowded band conditions, I am somewhat relieved that such fine commercial gear is available. Most hams do not have the facilities to build and properly adjust their own SSB equipment to the level of quality available from manufacturers, and even if we could compete technically, we'd find the expense (time as well as money) prohibitive.

OK, so we intellectually accept the need for that expensive little box on the ham-shack table, but somehow that doesn't stop the urge to warm up the soldering iron and jump into something feet first. You say you have three digital clocks and two electronic keyers, and you still want to build something? I know the feeling. Relax. How about 10 FM?

Yup. There is a lot of FM activity up around 29.6 MHz. Very little QRM, the atmosphere is freewheeling, the technology is up to date, and yet the equipment is very cheap. If you know someone who is active on 10-meter FM, the chances are good that he uses a converted CB. Whatever he is using, he'll tell you that he is having a lot of fun.

What all this is leading up to is the recent release of two rather good books on the subject of 10-meter FM. If this mode interests you, you really should have copies of them. While each author emphasizes a different aspect of the mode, both give an excellent introduction to all the various facets of 10-meter FM. Both cover repeater operation, frequencies, antennas, equipment, and equipment conversion.

How do they differ? Dave Ingram's book goes into greater detail on a wider variety of subjects, but Bob Heil's book (the *Handbook*) is the most complete source of information available on converting CB rigs that use the popular PL02A three-crystal-synthesizer configuration. If you are planning to convert a rig that uses this configuration, Bob Heil's book will prove to be extremely useful. If you are planning to get on the air using a different approach, or just want to know more about this mode, Dave Ingram's book might be more interesting to you. Both books tell you all you need to know to begin enjoying 10-meter FM, and at $4.95 each, these 1980 publications are relatively inexpensive; I'd get both of them! For further information, contact *Melco Publishing, PO Box 26, Marissa IL 62257* for Bob Heil's book and *TAB Books, Inc., Blue Ridge Summit PA 17214* for Dave Ingram's book.

Paul Grupp KA1LR
***73 Magazine* Staff**

DIGITAL ELECTRONICS: A HANDS-ON LEARNING APPROACH

Digital electronics has really arrived, and it's here to stay; it's getting hard to find a piece of ham gear that doesn't incorporate some digital circuitry. All of us have absorbed a remarkable amount of the new technology, but many hams have wished for a complete, step-by-step introduction to the subject. If you learned electronics the way I did, by reading whatever books and magazine articles you could get your hands on, you just might find this book useful. The author assumes that the reader has no previous knowledge, so nothing is skipped or glossed over. He begins by explaining how resistors and diodes work, but when you are through with the book you'll be comfortable with microprocessors. Best of all, the book is a true hands-on approach, so most subjects include a carefully explained project to carry out on a solderless breadboard. You say you don't have a solderless breadboard? Shame on you! As the author points out, if you really want to learn about this stuff, you are going to have to jump in and *do* it.

Fortunately, doing it is exactly what the author has in mind, and he has provided lots of valuable information on the mechanics of building digital circuits. He has thoughtfully included chapters on troubleshooting, circuitboard construction, and even the electronic color code. He starts with very simple projects, but the meat is there too; after working your way through this book you won't have to make excuses for your lack of knowledge on the subject. The digital revolution has been going on for a long time now; why not join the fun! Copies of *Digital Electronics: A Hands-On-Approach* (by George Young, 1980) are available at $8.95 from the *Hayden Book Company, Inc., Rochelle Park NJ.*

Paul Grupp KA1LR
***73 Magazine* Staff**

HAM HELP

I recently purchased a Hy-Gain model 623 23-channel AM/SSB CB rig for conversion to 10 meters. Unfortunately, I have found no information on converting this radio. Does anyone have any information on this?

Wayne T. Mohrhauser N0BUY
Rt. 1, Box 134
Chester IA 52134

I need a copy of National Semiconductor's *Optoelectronics Handbook* for 1975. I would prefer to purchase one outright, but will pay a reasonable cost for a copy.

Lou Slaton WD5IBD
5959 Cyrus Ave.
Baton Rouge LA 70805

I need a schematic for a National NC-46 receiver. I will be glad to pay any expenses involved.

Floyd Williams
121 N 59th St.
Philadelphia PA 19139

NEW PRODUCTS

from page 30

board. It is designed for the 50, 144, and 220-MHz bands and may be modified for use on adjacent commercial and government bands. It is used for control links, repeater service, telemetry, and other applications for which a small unit is required. A multichannel adapter is also available to extend operation up to 5 channels.

Features include low-impedance dynamic mike and high level audio inputs; crisp, clear modulation; low spurious output; pre-wound coils; adjustable output level, and built-in test points for easy alignment. A commercial-grade, frequency-stability option is available.

Another new development at Hamtronics is the availability of XV2 2-meter and 1¼-meter transmitting converter kits with 6-meter inputs.

For further information, contact *Hamtronics, Inc., 65F Moul Rd., Hilton NY 14468.* Reader Service number 481.

PALOMAR ENGINEERS TRANSCEIVER PREAMPLIFIER

Palomar Engineers has announced a new preamplifier which is continuously tunable and covers all amateur bands from 160 through 6 meters. It provides 20 dB of gain with a dual-gate FET for low noise figure. The gain and low noise figure improve reception on most receivers, particularly on the higher frequency bands. The added selectivity reduces image and spurious response.

Gain is continuously variable to prevent overloading the receiver. An rf-sensing circuit allows the unit to be used with transceivers; the preamplifier automatically bypasses itself during transmit. The fail-safe switching circuit handles transceivers to 350 Watts. Connectors are SO-239. The preamplifier measures 8" × 5" × 3" high and features brushed-aluminum control panels.

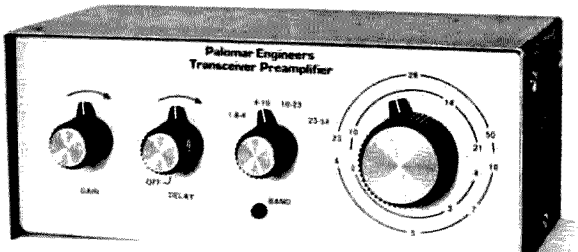
For a free descriptive brochure, write *Palomar Engineers, PO Box 455, Escondido CA 92025.*

CDE HAM ROTOR FOR THE VISUALLY-IMPAIRED OPERATOR

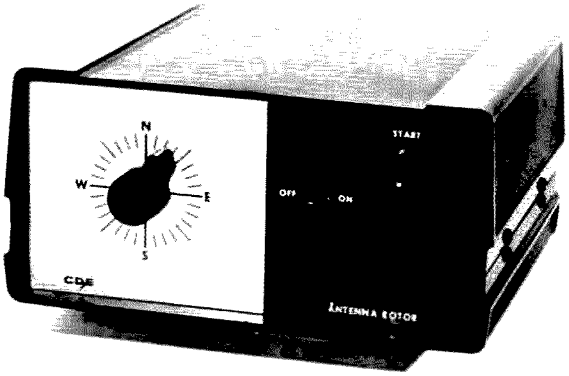
Cornell-Dubilier Electronics has produced a rotor system especially designed for sight-impaired amateurs. The Ham-SP is a combination of the Ham-IV rotator and a solid-state control unit.

All operation functions of the control unit, 360° compass dial, on/off switch, and push-to-start button, are marked visually as well as by Braille. To operate the system, the desired antenna direction is selected by turning the large dial. The start button is then pressed. Electronic circuitry will automatically retract the wedge brake and start the rotator turning to the desired direction. During the time the rotator is turning, a high-pitched tone is emitted. When the rotator reaches the predetermined direction, power is removed from the motor, it is allowed to coast down about 5 seconds, and then the wedge brake is engaged. When the rotator stops, the tone stops, indicating that the antenna is now at the desired location. (Neither the rotator nor the control unit are compatible with other CDE rotor systems.)

For further information, write to *Cornell-Dubilier Electronics, Department SP, 118 East Jones Street, Fuquay-Varina NC 27526.* Reader Service number 484.



The Palomar Engineers Transceiver Preamplifier.



The CDE Ham rotator for visually-impaired amateurs.

HAM HELP

I am in need of any libraries of *73, QST, HR, CQ,* or any other amateur or electronics oriented publications. Anyone wishing to clean out the bookshelves, please contact me on any offerings. Thank you!

Ralph Francavilla KA2BTD
154 Redneck Ave.
Little Ferry NJ 07643
(201)-641-9494

A disabled amateur needs the generous help of some warm-hearted hams. I had to move to small, limited space QTH, due to my roommate's marriage and my severe medical problems. I now live alone and ham radio is my only form of entertainment.

I need the donation of tower sections to erect a 50-foot tower with a rotor. If you can help, please write (I don't have a phone). Thank you.

Allen Halliday
64 West Center St., #3
Midvale UT 84047

I need manuals and schematics on the following equipment: Hickok 288X signal generator, 533A tube tester, and 760 video scanner, and alignment procedures on a Hallicrafters R-44/ARR-5 (the military version of the S-27). I will gladly pay postage and copying costs.

Bill Fraser KAØFEX
6220 Parkwood Rd.
Edina MN 55436

Is anyone out there using a Heath H-89 on CW or RTTY? What do I need to get mine going?

D. Kight WA5RER
3732 NW 48th Circle
Oklahoma City OK 73112

Connecticut summer camp seeks counselors (21 +) to work with teenagers in its ham radio program during July and August. Apply to Buck's Rock—K1PGQ, 140 Riverside Drive, New York NY 10024; (212)-362-2702.

Louis Simon, Director
New York NY

RTTY LOOP

from page 16

terminal. "Stupid," you ask? Well, a dumb terminal, commonly called a glass Teletype, just inputs what you type and displays what it gets. Smart terminals can do all kinds of fancy editing and other neatniks. This one is somewhere in between. With the resident 6800 and some RAM it could be given some smarts with the appropriate programming, but remains of limited usefulness if what you really need is a computer terminal.

Next month I will take a look at some bells and whistles available for the ATR-6800 and describe a typical on-the-air session. It promises to be a real eye-opener!

LETTERS

from page 28

the communication . . . phase of the art." as listed in Part 97.1(d).

Thanks for lending an ear. I like *73* much better than "the other one," but I agree that perhaps you might have at least one feature for the beginner or Novice operator.

Cindy Dalmadge KA0IMG
Colorado Springs CO

NO PRICE

Your editorials are *first* reading! I agree—the advertisers who put no price on a new piece of gear make me so damn mad that I won't buy it.

I need an antenna switch and saw a new one advertised in *73*—but no price. Should I spend 15 cents and my time for a letter to the manufacturers?

I know what I can afford. So if it's out of my price class, I'd like to know *now*.

John Cowley WA6PBM
Rosamond CA

GOLDWATER

Enjoyed the article in the November *73* issue on Barry Goldwater K7UGA. I had a short QSO with him a few years ago.

Here is a man who has supported amateur radio in that maze of bureaucracy in Washington DC for many years. The Senator is a man who for years has told the general public just the way it is. We have too many politicians who beat around the bush and tell each group just what they want to hear, sometimes distorting the truth.

Wish we had more people in his position who would support our hobby. We as hams must speak up and band together before we find ourselves on the outside looking in.

Alfred L. Pedneau K5HKG
Pineville LA

BUY AMERICAN

Thank you for your comments in Never Say Die and especially DX. I feel the comments on the amateur situation are well taken. Just today I wrote another magazine to criticize an editorial on basically similar topics. This other magazine recommended dropping the code requirement and relaxing the testing standards to allow thousands of new "amateurs" to come into our ranks. The proposed reason for this was to help the American radio manufacturers compete with the Japanese companies.

It is my opinion that we already have too many undisciplined amateurs causing interference. Just recall the recent hurricane nets. If the code and theory requirements do nothing else, they do force one to discipline one's self to learn these.

In coming into amateur radio, I believed the purposes were those set forth in the FCC rules, not to see how many radios we can sell. I am pleased to hear about all the experimentation which amateurs are doing even in modifying new, commercially-built rigs.

Amateur radio can fulfill a useful purpose in the country as long as it remains organized and disciplined. This should be more than a hobby. Let us not invalidate our purposes by making it a glorified CB band.

This other magazine I referred to also indicated that Japanese equipment was better made than American. I have had the most recent solid-state HF rigs from Yaesu, Kenwood, and Drake, and find the TR7 to be better than any of the others. The Japanese rigs looked good and had all the bells and whistles, but my experience thus far has been that some of the knobs, such as noise blanker, speech processor, i-f shift, notch filter, etc., did not work or worked poorly. However, with the Drake, I had to pay extra for many items, but they seemed well engineered and worked well. It is not so much the looks but how it performs that counts. It seems in many cases that you still get what you pay for. I find nothing revolting in the suggestion we attempt to buy American first.

Tim Johnson N5BTE
Bristow OK

BLUE FROG

I read with interest your explanation of why your radar jamming didn't work as well as why commercial units don't work. I must agree that they do not. However, I can't agree with you on the reason why.

You state that if the jammer is a mere 3 kHz off of the radar gun frequency that the radar gun will not pick up the jammer. This is not so; radar guns are very wide on receive and drift a huge amount on transmit. The 3 kHz you mention is nothing. I can change the frequency of a gun oscillator that much by blowing on it. If you don't mind, let me explain the error of radar jamming and how to correct it.

First of all, the thing that people do not realize or tend to ignore is that police radar is built to display the fastest speed from many doppler signals. Now, if you jam at, say, 50 mph, as most commercial units do and drive over that speed, the radar unit will first pick up 50 because the jamming signal will be stronger than your reflection. But as soon as you come within normal range if you are driving faster then the jam speed, he will pick up your speed just like the jammer wasn't working.

So, the only thing you can do is to jam at a much higher speed than what you are traveling, hoping that the policeman will not believe his radar unit. Let's say you like driving at 70; you should jam at around 110 so that his unit will pick up 110 and he won't believe you are traveling that fast. He will then ignore the reading and you. But this only works with still radar. For moving radar you must use a different method.

Moving radar is really taking two readings, the police car speed and the combined speed of his car and your car. It first picks up the signal bouncing off a tree or grass, etc., and gives his speed, then it looks for a much higher speed which is that of your car approaching his. It then subtracts his speed from his and your combination which leaves your speed. But moving radar, like still, looks for the fastest speed.

So, if you jam at 110 and drive 70 and he is moving 50 then his unit sees two speeds. The jam of 110 minus 50 which gives 60 and 120 minus 50 which gives 70. His unit will display 70 and you are in for another ticket. So, we are back to giving him a reading that he won't believe if you want to jam him.

Let's say you like to drive 70, then a good choice for a jam speed is 150. If he is driving 55 or less, then his moving radar will show 95 or more which he probably won't believe. The faster you travel, the faster you jam at. The best all around jam speeds seem to be between 150 and 170. This way you will get still, as well as moving units.

In cities or where the speed limit is something other than 55, you must modify this method to the best speed. Also, the modulation is important. The best results are gotten with a square wave with a 50% duty cycle. Radar units tend to ignore sine waves. I would dare say that if you modulated your 10-GHz transmitter the proper way and for the proper speed, it would do a fine jamming job even if it is in the ham band. A good modulator can be made from a 555 driving a voltage regulator driving the Gunn source.

All of what I have said is based on my personal experience. Some friends and I have worked many months with our own radar units to perfect a good jammer. It has never failed to jam any X-band radar unit I have come across and you should see the look on the small-town policeman's face when you drive through at 20 and he reads 90.

But all in all, it's not worth the risk because jamming is never a sure thing. The best thing to do is get the best detector on the market and take your chances.

I must say that you are welcome to print this but not my name or address. I don't need the law knocking at my door as well as the kooks of this world. So, for my protection, just sign me,

Blue Frog

OK, Blue, serves me right for listening to "experts" on radar. You sure won't see me messing around with jammers and then trying to explain in court that I really wasn't going 110, as the radar read out.—Wayne.

NO DUMBBELL

I have just completed a CW chat with a relatively new Extra whose fist was comparable to that of a brand new Novice!

The point I am trying to make is that this learned gentleman is being given the privileges of a full-blown Extra class amateur, but cannot perform the simplest of Novice requirements in the field of sending code. At the same time, I and many other Generals are being deprived of the few additional privileges of an Advanced class license because we don't know what a reflex klystron is used for, and because Dick Bash came up with an idea for teaching aspiring hams some inside facts about radio theory and how to pass the FCC tricky-tests.

The fact is that the ARRL and Ameco came out with FCC questions and answers a long time ago, with complete approval of FCC. I know, because I studied them until I could answer them forward and backward, and I studied every other piece of information I could get my hands on that dealt with the outline FCC said we would need to understand when we took the test. I knew how, when, where, and why but what I got was a set of questions that were far afield from the FCC outline and the test was as simple as if it had been written in Greek.

A friend heard about Bash and got his *Final Exam*, studied it diligently for weeks. You see, Mr. Bash teaches how problems are worked and why the answers are what they are. He teaches the subject while he gives the answers. My friend passed easily...so I got the Bash book.

My test came one month after by friend had taken his and by that time, the FCC had decided to go after Bash. Again, I had added Ameco and ARRL to my studies, along with the Bash book, but again they beat me to the draw and I got a set of questions printed on brand new, crisp paper. Three questions were similar to the ones in the Bash book but *six* were taken almost word for word from the ARRL questions and answers in the Extra class section of their training manual!

Another friend of mine went to Tulsa the following month, after having failed (as I did and all but one of the other Advanced aspirants did who took the test in Oklahoma City), but he ordered Mr. Bash's updated *Final Exam* that contained something like four hundred questions and answers! He, too, had studied every other book he could get his hands on. Imagine his chagrin when, for the third time he was handed a crisp, new set of questions, which dealt with doodads he had never heard of!

Let me close by saying that I am a retired airplane driver. I logged some twenty thousand hours of accident-free pilot time and taught scores of others to fly, including Military Cadets, but I can't design an airplane, weld a piece of tubing, splice a cable or spray paint a fuselage. I passed every written test I took from FAA on the *first* try, so I think I am no dumbbell!

If an Extra class amateur can get his ticket and all those privileges when he sends code like a new Novice, why are we Generals flunked because the FCC wants to annihilate Dick Bash for doing what ARRL has done for years and we don't happen to know what the angle of conduction is in a Class AB amplifier?

Loren Carlberg WB5WDG
Muskogee OK

CORRECTIONS

In my article and computer program, "The Odd Couple," in the November, 1980, issue of *73 Magazine*, page 110, a line of code was dropped somewhere. Please insert this statement so that the channel 6 calculation will work: 620 L=23•F. Also, a parenthesis should be put around part of line 405: 405 J=95.8−(1.48•D)

For those not familiar with Level I "shorthand" and who are trying to translate the listing, see the accompanying table.

Level I	Level II Standard
CLS	clear screen
P.	PRINT
G.	GOTO
IN.	INPUT
( )+( )	Logical AND (see lines 130 and 1003)

Rich Casey WA9LRI
1818 Hemlock
Garland TX 75041

HAM HELP

If you were a civilian radar field service engineer working with the military, in uniform, overseas during WWII, please get in touch with me regarding possible official US recognition for your services. Thank you.

Bill Faik K7WJF
PO Box 171
Apache Junction AZ 85220

I am blind and bedridden with spinal arthritis for 11 years now. I am a UCLA grad, class of 1958, in History. I'd like to listen to good, clear shortwave overseas radio broadcasts if I could get a small shortwave radio receiver like a Kenwood, Drake, Sony, etc.

I am writing to *73 Magazine* in hopes that someone might help me get this radio donated somehow, used or new. I need a compact, solid-state radio since I am cramped for space in my small hospital room.

Richard Jastrow, Ward 800B
Long Beach General Hospital
2597 Redondo Ave.
Long Beach CA 90806
(213)-426-4936

I am in need of a schematic for a Yaesu FT DX-570. I will pay for a copy and postage. Thank you very much.

Todd Greenleaf KA1CFQ
108 Edward Ave.
Pittsfield MA 01201

I would like to contact someone who has been able to put the RT-594/ARC-38A on the air. Thank you.

Murle Mattern KA6DOV
1111 Warburton
Santa Clara CA 95050

DEALER DIRECTORY

San Jose CA

Bay area's newest Amateur Badio store. New & used Amateur Radio sales & service. We feature Kenwood, ICOM, Azden, Yaesu, Ten-Tec, VHF Engineering & many more. **Shaver Radio, Inc., 1378 So. Bascom Ave., San Jose CA 95128, 998-1103.**

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Specializing in Amateur Radio Test Guides. We publish the most accurate F.C.C. exam preparation material in the country according to letters on file from hams nationwide. General, Advanced, and Extra Class manuals available. **Bash Educational Services, 519 Estudillo Avenue, P.O. Box 2115, San Leandro, CA 94577, 352-5420.**

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Experimenter's paradise! Electronic and mechanical components for computer people, audio people, hams, robot builders, experimenters. Open six days a week. **Gateway Electronics Corp., 2839 W. 44th Ave., Denver CO 80211, 458-5444.**

Uncasville CT

Cushcraft, Bencher, Hy-Gain, Telex, Barker & Williamson, Nye-Viking, Hustler, MFJ, Callbook, Murch, Unadilla, OK, Saxton, ARRL Books, Used equipment, Electronic parts and accessories, free catalog. **Donovan Electronics, Inc., 2510 Norwich, New London Tpke, Uncasville CT 06382, 848-3434.**

Columbus GA

KENWOOD—YAESU—DRAKE

The world's most fantastic amateur showroom! You gotta see it to believe it! **Radio Wholesale, 2012 Auburn Avenue, Columbus GA 31906, 561-7000.**

Boise ID

Adzen, Amidon, Ameco, ARRL, B&W, Callbook, Collins, CushCraft, Dentron, Hustler, ICOM, Jim-Pak, KDK, MFJ, NPC, Nye, Sams, SST, Swan, Ten-Tec, Wanzer, Wilson. **Custom Electronics, 1209 Broadway, Boise ID 83706, Bob W7SC 344-5084.**

Preston ID

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Terre Haute IN

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PROPAGATION

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Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	21	7A	7	7	7	7	7	7	7A	14A	21A	21A
ARGENTINA	14A	14	7	7	7	7	14A	21A	21A	21A	21A	21A
AUSTRALIA	21A	14A	7B	7B	7B	7B	7B	14B	14	14	21	21A
CANAL ZONE	14A	14	7A	7	7	7	14	21	21A	21A	21A	21
ENGLAND	7	7	7	7	7	7	14	21A	21A	21	14	14B
HAWAII	21A	14	7A	7	7	7	7	7	14	21	21A	21A
INDIA	7	7	7B	7B	7B	7B	14	14A	14	14B	7B	7B
JAPAN	21A	14	7B	7B	7B	7	7	7B	7B	7B	14	21
MEXICO	21	14	7	7	7	7	7A	14	21A	21A	21A	21A
PHILIPPINES	21	7A	7B	7B	7B	7B	7B	7	7	7A	14	14A
PUERTO RICO	14	7	7	7	7	14	14	21	21A	21A	21	21
SOUTH AFRICA	14	7A	7	7B	7B	7A	14A	21A	21A	21A	21A	21
U. S. S. R.	7	7	7	7	7	7B	14	21A	21	14	7B	7B
WEST COAST	21A	14	7	7	7	7	7	14	21	21A	21A	21A

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	21	14	7	7	7	7	7	7	7A	14A	21A	21A
ARGENTINA	21A	14	7A	7	7	7	14	21A	21A	21A	21A	21A
AUSTRALIA	21A	14A	14	7B	7B	7B	7B	7B	14	14	21	21A
CANAL ZONE	14A	14	7	7	7	7	14	21	21A	21A	21A	21
ENGLAND	7B	7	7	7	7	7	7B	14	21A	21	14	7B
HAWAII	21A	21	14	7	7	7	7	7	14	21	21A	21A
INDIA	7B	14	7B	7B	7B	7B	7B	7B	14	7A	7B	7B
JAPAN	21A	14	7A	7B	7B	7B	7	7	7	14B	14	21
MEXICO	14	14	7	7	7	7	7	14	21	21A	21A	21A
PHILIPPINES	21A	14A	7	7B	7B	7B	7B	7	7	7A	14	14A
PUERTO RICO	21	14	7	7	7	7	7A	21	21A	21A	21A	21
SOUTH AFRICA	14	14	7	7B	7B	7B	7A	14A	21A	21A	21A	21
U. S. S. R.	7B	7	7	7	7	7B	7B	14	21	14	7B	7B

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	21	14A	7	7	7	7	7	7	7	14	21A	21A
ARGENTINA	21A	14A	14	7	7	7	7B	14	21A	21A	21A	21A
AUSTRALIA	21A	21A	14	14	7B	7B	7B	7B	14	14	21	21A
CANAL ZONE	21	14A	14	7	7	7	7	14	21A	21A	21A	21A
ENGLAND	7B	7	7	7	7	7	7B	7A	21A	21	14B	7B
HAWAII	21A	21A	14A	7A	7	7	7	7	14	21	21A	21A
INDIA	14	14	7B	7B	7B	7B	7B	7B	14	7A	7B	7B
JAPAN	21A	21A	14A	7B	7B	7	7	7	7	14	14	21
MEXICO	21	14A	14	7A	7	7	7	14	21	21A	21A	21A
PHILIPPINES	21A	21A	14A	14	7B	7B	7B	7	7	14	14	21
PUERTO RICO	21	14	14	7	7	7	7	14	21	21A	21A	21A
SOUTH AFRICA	14	14	7	7B	7B	7B	7B	14	21	21A	21A	21
U. S. S. R.	7B	7B	7	7	7	7B	7B	7B	14A	14	7B	7B
EAST COAST	21A	14	7	7	7	7	7	14	21	21A	21A	21A

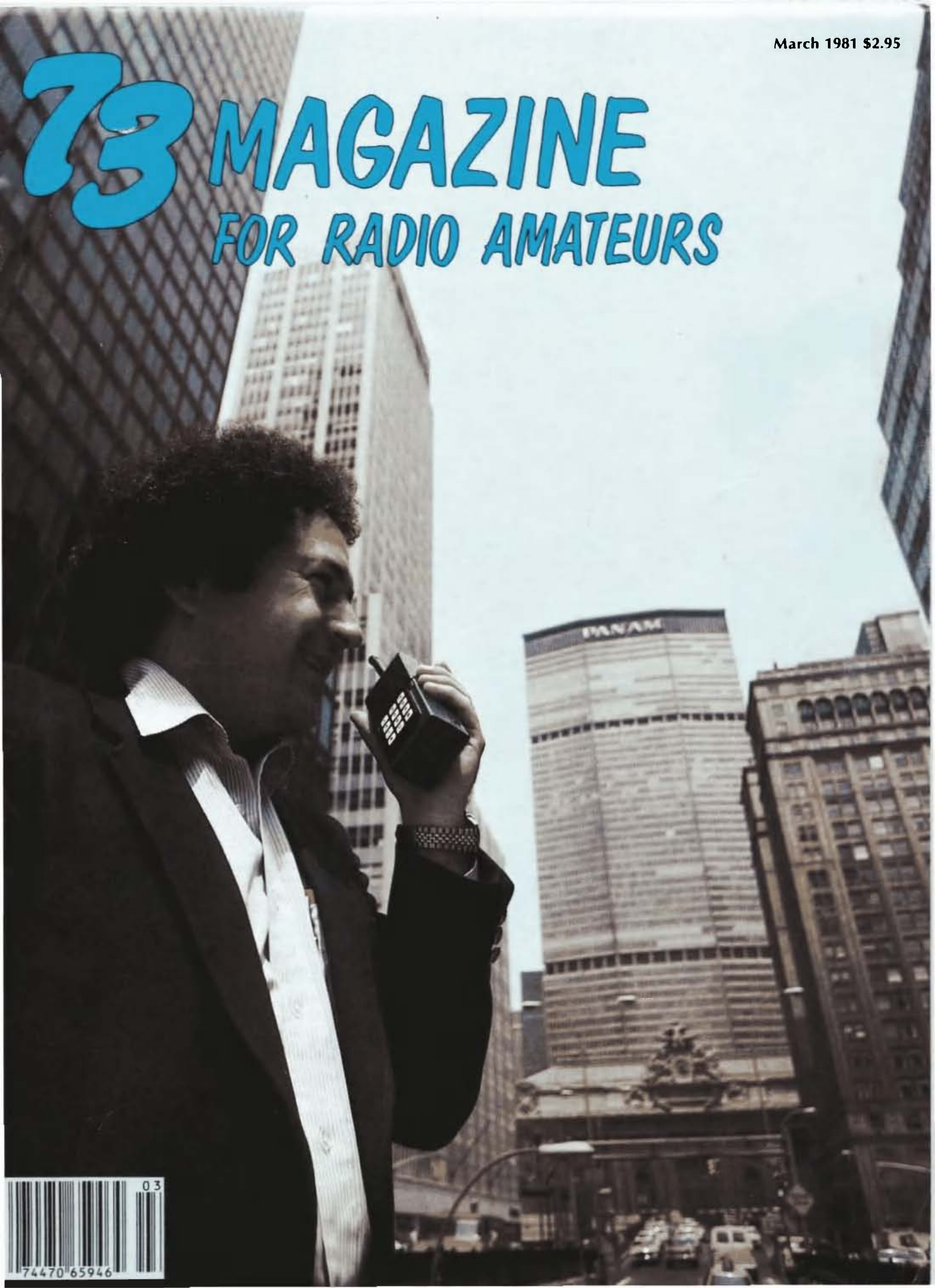
A = Next higher frequency may also be useful
B = Difficult circuit this period
F = Fair   G = Good   P = Poor
SF = Chance of solar flares

february

sun	mon	tue	wed	thu	fri	sat
1 F	2 G	3 G	4 G	5 G	6 G	7 F
8 F	9 F	10 F/SF	11 F/SF	12 P/SF	13 F	14 G
15 G	16 G	17 F	18 F	19 G	20 G	21 G
22 G	23 G	24 G	25 G	26 G	27 G	28 G

March 1981 $2.95

73 MAGAZINE
FOR RADIO AMATEURS



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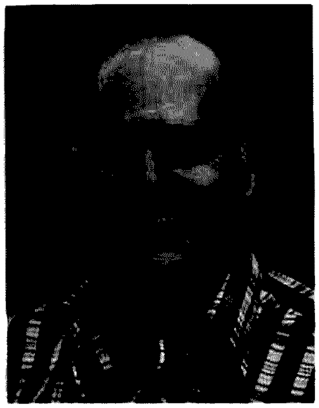
W2NSD/1 NEVER SAY DIE

editorial by Wayne Green



BUY AMERICAN

The other day I met a chap who mentioned that *he* had bought an American car and thus was not supporting the Japanese. Some of our American ham manufacturers are waving a similar flag. As the user of Japanese ham rigs, Japanese cards, Japanese hi-fi, Japanese cameras, Japanese calculators, Japanese cassette players, etc., perhaps I can put this into some more realistic perspective.

Firstly, in case there is any red-neck reaction that I'm not a patriotic American, I would like to point out that I was right along there with everyone else in WWII. Secondly, having now visited nearly 100 different countries I am in a position to say with authority that I have yet to visit another country that I would prefer to the US. I am not in any way blind to the manifest faults of our country, it's just that even with them it is better than the others.

Those of you who have read my editorials know that I am not reticent about writing about things which I feel should be improved about our country. It is in that respect that I would like to comment upon the subject of imports. One of the great hopes that I have is that the Reagan administration will be able to curb the growing socialism which has weakened our country and that they will be able to stop the growth of government control of us all. There may indeed be ways that some of the more obvious agencies can be made to provide value to all of us, but until then I can only be distressed by HEW, OSHA, FTC, and some agencies which I don't even dare to name for fear of reprisal. They have unlimited funds to harass me and a history of using them for that purpose on others.

The United States could be competitive with other countries but for several problems. One is the tax situation. I've just recently opened a production plant in Ireland to put out Instant Software packages for sale in the European and Middle Eastern countries. If I want to buy a piece of production equipment in the US, I not only have to pay for it up front, I also have to buy it from profits. This means that in essence I have to pay double for it...less a small amount for an investment tax credit. If I want to put up the same machine in Ireland, I find that not only are there no requirements for using profits for this, but that the government is standing ready to put up about 50% of the cost of the equipment. Thus the bottom line to me is a cost of about four times as much to get the new equipment for production in the US as in Ireland.

Much has been written about the efficiencies of foreign production through their use of modern production equipment. This keeps cost down and makes a firm more competitive. Until such time as the tax situation here changes, I fear that the US can only fall further behind in production efficiency. Productivity, it is called.

In the car industry there are other problems. No doubt you've seen pictures of the automated Japanese car plants. Why don't we have those here? One reason is the high cost, where the machinery needed costs several times as much because of taxes and no government help. Another is the fierce resistance of the auto unions to anything which will cut down on the number of workers needed. That would be okay if all other countries would do the same. Unions, as a matter of course, bitterly fight automation. Add to that the wages achieved by our auto unions...double the average American wage...and you see why Detroit has no chance of being competitive with foreign firms.

Should we set up limitations on imports? This will bring on similar limitations on our products...and not so much on those which are not competitive as those which are. That is a losing battle and it takes a keen insensitivity to history to recommend limitations on imports.

Three years ago I foolishly went out and ordered an American car. I have lived to regret that impulse. It was a Dodge. The first thing that happened was that I was ripped off by the dealer for $200. I put down a payment with my order...and though the dealer was unable to provide the car, he still kept the $200. I complained to Chrysler and they said, in effect, tough. I did get the Dodge from another dealer when the first was unable to get it in a reasonable time. The car worked for a few weeks and then the engine stopped being dependable, stalling and being unstartable more often than not. The local Chrysler garage tried to fix this, coming up with many approaches. None has succeeded and it still goes through the process of starting up...running for a few minutes and then stopping. Oh, it *can* be started if you take the engine cover off (it's a van) and pour gas into the carburetor directly.

INFO

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Contributions in the form of manuscripts with drawings and/or photographs are welcome and will be considered for possible publication. We can assume no responsibility for loss or damage to any material. Please enclose a stamped, self-addressed envelope with each submission. Payment for the use of any unsolicited material will be made upon acceptance. All contributions should be directed to the *73* editorial offices. "How to Write for *73*" guidelines are available upon request.

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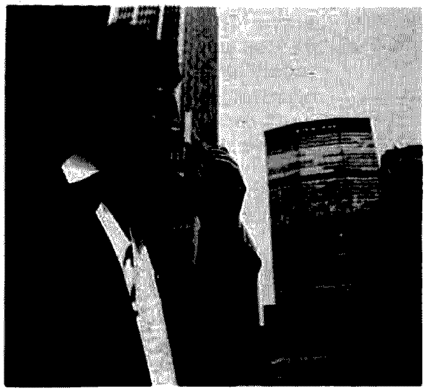
march 81 73 MAGAZINE



COVER: Talk to the world through your 2-meter handie-talkie! Metroplex, the New York City metropolitan area's most sophisticated system of inter-linked repeaters, has over 400 members, including 50 overseas amateur radio operators!

Metroplex was conceived in January, 1978, by K2KLN and WB2MGB to: establish repeaters on *all* allocated FCC frequencies; use all available modes; provide 24-hour emergency communications; and provide a forum for east coast and worldwide amateur radio operators, via a 2-meter/10-meter FM link. Club members have already contacted over 35 countries on 4 continents through the 10-meter link.

Autopatch facilities are completely computerized and are part of a large long-distance network which includes trunk lines, satellites, and emergency speed-dial numbers. All frequencies are coordinated through T-SARC.

Listen to Metroplex FM on 29.640/29.540 in, and on 145.450/144.850, 223.720, and 443.950. For further information, write PO Box 237, Leonia NJ 07605, or call the 24-hour club phone, (201)-592-1579, to request an information package. (Photo of Hank Goldman WA2OVG by Larry Mulvehill WB2ZPI, Cold Spring NY.)

Nothing else known to man will start it.

The purpose of the van was to provide a work area for me while I was traveling to club meetings and on business trips. The van bounces so badly that it is useless for this. The shocks rattle, the thing falls apart faster than a team of ours can put it back together. It is a disaster.

Compare that to the Mazda RX-7 which goes like spit, has caused virtually no problems, does not bounce or rattle, and gives us almost twice the gas mileage. It does not have quite the room of the van and seats two instead of ten, admittedly. It does not have room to mount a typewriter, but then what good is a typewriter if one can't hit the right keys because it is bouncing around so much? The Chrysler reaction to my problems has mainly been one of it being my fault for buying the car, not any serious effort to see what they can do to solve the problems.

Much has been written about the problem of productivity, but the basic reasons for it are still untouched. I think that American firms could compete with the Japanese if we had just two major changes. One would be a tax change which would encourage automation and modernization. The other change needed is some sort of enormous growth in the number of hams in America so we would again be competitive technologically.

When I bring up growth of amateur radio, I'm no longer thinking in terms of trying to get back to the 11% growth we had before Incentive Licensing was proposed in 1963, when we went to a negative growth. We're over one million technicians and engineers behind where we should be and we desperately need to play catch-up.

The future is electronic, whether you are looking at computer, entertainment, communications, or automation. We're heading into an era of satellite communications which will reach right down to every office and home. We're looking at more and more of our home and office equipment going electronic. Just a few weeks ago I saw the prototype of a microprocessor controlled ski binding. We're going to have to adjust to electronics playing an important role in our life over the next twenty years and that means that we must have the engineers and technicians to design, build, install, operate, and service all of this stuff.

In that light we don't need a 10% growth, we need a 50% to 100% ham growth for a few years. Whether this is something which can be done under the present regulations or not, I don't know. It may be that Radio Shack can help. It may be that an aggressive approach by ham clubs, invading our high schools, will do the job. We may need every attack we can think of... but somehow we must get growth of amateur radio if we don't want to see our industries fall further and further behind.

250,000 NEW HAMS?

The fantastic success Tufts Electronics has had in getting new hams licensed gave me an idea. First, let me explain that Tufts took a back part of the store and set up an area where Novice classes could be held. The classes have been gaining in popularity and the graduation of about 90% into licensed hams has been experienced.

One minor note. Tufts contacted the League for help in getting an outside ham to come in and give the Novice license exams. The chap they recommended was contacted and my understanding is that he refused to give the exams except for $5 each... however, for that price he guaranteed that everyone would pass... presumably even if he had to help them do the test.

At any rate, the idea that came to me one morning was to try to interest Radio Shack in setting up ham classes in all of their 5,000 company-owned stores. If they were to set up to handle ten to twenty people, it would not take a lot of room, and would have a large number of benefits to Radio Shack... and obviously to amateur radio, too.

If these stores only provided 50 Novices per year, this would be a total of 250,000 new hams per year. At that rate we might catch up with Japan in engineers and technicians within five years and have a chance at getting back the technological ball in electronics.

The plan would be for the classes to run for ten weeks, with class time spent mostly in teaching the students the theory they will need for the Novice ticket and as a foundation for the General ticket later on. They would also be taught the rules and regulations, plus all sorts of background about amateur radio which they will need as amateurs. The teaching would be largely by way of video tapes which I would provide. I'm set up to make tapes now and have the experience of our audio cassettes on Novice exams.

Well... I Can Dream, Can't I? **by Bandel Linn K4PP**

"We were just driving by and noticed how low your antenna is! Is it all right if we put it up 200 feet... just for kicks?"

The Morse code would be taught mostly via audio cassettes. . .and we *do* have the best series for that yet produced by anyone. The study manual would also be available from *73* . . .one of the few study manuals which stresses understanding the basics instead of just memorizing questions and answers.

New hams need to have some background in how to operate, how to tune a rig, what swr is and how to use an swr meter, etc. They should know about DX and how to work it. . .understand about contests and the many other phases of amateur radio such as RTTY, SSTV, FAX, microwaves, repeaters, and so on. These are a natural for video tape. This would make the courses both interesting and informative, providing constant lifts of enthusiasm for the hopefuls. It can get very discouraging at times, so one has to remember that these classes *are* show business.

The exams and help with questions could be provided by nearby ham clubs.

The course should not be given free since that encourages people to drop out when some conflict makes them miss one class. I suggest a charge of $50 to cover the costs of the space, the code tapes, the study manual, a code practice key and buzzer, and the use of the video tapes. This would bring in at least $12.5M for Radio Shack at the 250,000 Novice level.

A side benefit to Radio Shack would be the generation of a bunch of new customers who are used to coming to their stores. If they put out a Novice rig at, say, $350, they would be able to generate another $85M or so in sales, bringing the whole project up to around $100M.

As long as the computer sales don't falter in their growth, Tandy will continue to have a healthy stock price. But perhaps, in view of the softness of the product through their lack of adequate software and with the impending invasion from Japan, it might just be prudent for Tandy to have a new project in the wings which can keep profits growing in case the computer line falters.

Radio Shack has tried several other fields for possible development into major consumer sales, but they have fallen through. Perhaps ham radio is one which would click. Between the ham clubs and local advertising and promotion to get in high school students, I think that 250,000 per year is not a difficult goal for such a program. That would only require one evening per week for the stores. Two evenings a week, average, would bring out 500,000 new hams a year. We might have to get real busy and develop some of the plans for coping with that number of hams if that came about.

Despite the seeming crowds on our ham bands today, the technical developments we see immediately ahead would enable us to cope with at least ten times as many hams as we have right now. It would be one of the best things to ever happen to amateur radio.

The classes would help to focus the attention of our country on the need for amateurs as a way to regain our lead in electronic technology. . .making ham radio and Radio Shack the heros. Perhaps in five to ten years the damage done by "Incentive Licensing" can be undone.

VIVA ARRL

Every now and then I meet a ham who really believes that I am anti-League. Gracious, nothing could be further from the truth! I have long been a steadfast and loyal supporter of this organization which is devoted to the relaying of messages by amateur radio. Indeed, where would our country be without this free message service?

Oh, I must admit to a bit of pique when some of the ideas which I have suggested to the League have been given short shrift. But these ideas were only for the purpose of improving their image and bringing more glory to amateur radio. For instance, I can only ascribe the refusal to institute the Singing Hamgram to the classical Not-Invented-Here mentality.

It stands to reason that if amateur radio relaying is ever going to be successful it is going to have to take cognizance of the competition and meet it with similar or better services. Older-timers will remember the triumphs of the past. What old-time ARRL member isn't moved to tears over the memory of the Postal Telegraph being forced out of business? I've got my 40-year membership pin and I'm pulling for us to topple Western Union. We've got 'em on the ropes, but we must keep up the pressure.

As an answer to those mentally retarded illiterates who insist that I am not 100% pro-ARRL, I pledge to find something positive to say about the organization. After looking over the situation carefully, I believe that I will be able to come up with a very positive statement along in June or July. This will take some research on my part, but it will be worth every minute of it if I can counter the calumny which has been spread by people who are trying to hurt *73 Magazine*.

AFRICAN POWER

While it sure would be nice to both perk up the action in the African countries with more hamming and to know that amateur radio is doing its thing for these countries by providing them with a reservoir of young hams who can then go on to being engineers and technicians . . .much as was done in Jordan, there are some special problems facing most African countries which have to be taken into consideration.

It is a fact that most African countries are paying heavily for their technical work to be done. They have to import European engineers and technicians at substantially higher salaries than would have to be paid for citizens. In many cases, where the country goes to the expense of sending its own citizens to the US or Europe for technical training, these people remain abroad since their opportunities are far better there than at home.

Amateur radio could solve a lot of that problem for these countries, if it were given a chance. The country would have to support the establishment of ham stations and ham study groups within their youth clubs. They would have, as did Jordan, to set up some people to make the rounds of these clubs and provide the technical training needed.

My friends in these countries assure me that there are teenagers in these countries with brains and the drive to go far in electronics, if only a ham program could be instituted. There is no shortage of the raw materi-

Continued on page 102

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

ARRL INTERNATIONAL DX CONTEST—PHONE

0000 GMT March 7 to 2400 GMT March 8

The ARRL-sponsored contest is open to all amateurs worldwide. Note that the basic contest format has been returned to that of 1979, with W/VE stations working the world and everybody else working W/VE stations only. The changes to single-band categories and the expanded awards program proved very popular and remain unchanged. Use all bands, 1.8 to 30 MHz.

Operating categories include single operator allband and single-band; multi-operator single transmitter or multi-transmitter; QRP single transmitter only with 10 Watts input or less (5 Watts output or less).

Your callsign must indicate your DXCC country (KL7XYZ/2 in NJ, FG0AAA/FS on St. Martin, etc.). One operator may not use more than one callsign from any given location during the contest period. The same station may be worked only once per band. No crossmode, crossband, or repeater contacts. Aeronautical and maritime mobile stations outside the USA and Canada may be worked for QSO credit only by W/VE stations. All transmitters and receivers must be located within a 500-meter-diameter circle, excluding directly-connected antennas. This prohibits the use of remote receiving installations. However, multi-operator stations may use spotting nets for multiplier hunting only.

EXCHANGE

W/VE stations (includes 48 contiguous United States and does not include Canadian islands of St. Paul and Sable) send RS and state/province. DX stations send RS and transmitting power as a 3-digit number.

SCORING

W/VE stations count 3 points per DX QSO. The multiplier is the sum of DXCC countries (except US and Canada) worked per band. DX stations score 3 points per W/VE QSO. The multiplier is the US states (except KL7 and KH6) and VE1-7, VO, and VE8/VY1 worked per band. Maximum of 57 per band. Final score is total QSO points times the total multiplier.

AWARDS

Various plaques and certificates to top scorers. Certificates to each DX entrant making more than 500 QSOs. ARRL-affiliated clubs compete for gavels on three levels: unlimited, medium, and local clubs. Details should have appeared in the January, 1981, *QST*.

ENTRIES:

All entrants are encouraged to use forms available from ARRL (include an SASE or one IRC). Logs should indicate times in GMT, bands, calls, and exchanges. Multipliers should be clearly marked in the log the first time worked. Entries with more than 500 QSOs must include cross-check sheets. All operators of multi-operator stations must be listed. Entries must be postmarked by April 7, 1981, and addressed to ARRL, 225 Main Street, Newington CT 06111. Any entries received after mid-July may not make *QST* listings. Usual entry conditions and disqualification criteria.

BOY SCOUT EXHIBITION STATION

The Playground Amateur Radio Club (PARC) of Fort Walton Beach, Florida, will operate a special event station at the 1981 Boy Scouts of America Choctawhatchee District Scout Exhibition. PARC members will operate station WB4SFU (Scouts For Unity) from 0000 to 2400 GMT on March 14, 1981. The station will be operating on 14290, 21370, and 28600 kHz on SSB. A special commemorative QSL card will be sent to those who QSL with an SASE. The QSL manager is PARC, c/o Joe Giangrosso WD4JZG, PO Box 3075, Fort Walton Beach FL 32548.

QCWA QSO PARTY—PHONE

0001 GMT March 14 to 2400 GMT March 15

Contacts with the same station on more than one band can be scored only once. Contacts made with "captive" stations, such as when operating in local nets, are not valid.

EXCHANGE:

QSO number, operator's name, and QCWA chapter identification (official number or name). Members not affiliated with a chapter should use "AL." If a member belongs to several chapters, then *one* must be chosen and used for the QSO Party. If desired, you may use one chapter for the CW Party and another one that you belong to for the Phone Party.

FREQUENCIES:

Any authorized amateur frequency is permissible. The following suggested frequencies have been selected to minimize interference to others:

3900-3930, 7230-7260, 14280-14310, 21350-21380, 28600-28630.

SCORING:

Each contact made with another QCWA member will count as a single point. Add up the contacts with QCWA members and then multiply this number by the number of chapters represented.

AWARDS:

Plaques for the top scorers; certificates will be given for the 2nd through 5th runners up. Standings and scores will be published in the *QCWA NEWS*, summer, 1981, issue.

ENTRIES:

Logs should include the following information: time (GMT), call, QSO numbers, name, chapter number or name, state or country. It is the responsibility of each contestant to provide a legible log (no carbon copies) and to list all claimed contacts. The total contacts for each page will be recorded at the bottom of each page. The total contacts for the Party should be recorded

CALENDAR

Mar 7-8	1981 SSTV Contest
Mar 7-8	ARRL DX Contest—Phone
Mar 14	Boy Scout Exhibition Station
Mar 14	DARC Corona 10-meter RTTY Contest
Mar 14-15	QCWA QSO Party—Phone
Mar 14-15	ERAA QSO Party
Mar 14-15	South Carolina QSO Party
Mar 21-22	Bermuda Contest
Mar 21-22	CARF Phone Commonwealth Contest
Mar 21-22	Tennessee QSO Party
Mar 21-23	BARTG Spring RTTY Contest
Mar 28-29	Spring VHF QSO Party
Mar 28-29	CQ World Wide WPX—SSB
Mar 28-29	YL ISSB QSO Party—CW
Mar 28-29	NA/SA RTTY Flash
Apr 18-19	YL ISSB QSO Party—Phone
Apr 18-20	QRP QSO Party
Apr 25-26	Helvetia Contest
May 10	DARC Corona 10-Meter RTTY Contest
May 23-24	Europe and Africa Giant RTTY Flash
Aug 8-9	European DX Contest—CW
Sep 12-13	European DX Contest—Phone
Sep 12-13	G-QRP-Club CW Activity Weekend
Sep 12-14	Washington State QSO Party
Sep 26	DARC Corona 10-Meter RTTY Contest
Nov 8	DARC Corona 10-Meter RTTY Contest
Nov 14-15	European DX Contest—RTTY
Dec 26-31	G-QRP-Club Winter Sports

at the top-right of the first page of the log. Log sheets will not be returned. Make sure you have correct postage when you mail your logs. Send logs no later than March 31, 1981, to: Pelican Chapter QCWA, Arthur M. Monsees W4BK, 1407 48th Avenue NE, St. Petersburg FL 33703. Separate logs and scores must be submitted for both the CW and Phone Parties. The decision of the Pelican Chapter of QCWA will be final with respect to scores and rules. In the event of errors or a disagreement, keep all details off the air and write either the Pelican Chapter or QCWA Headquarters.

Work as many QCWA members as possible and apply for the several Special QCWA Certificates which you have qualified for in the QCWA Parties: Worked 50 States, Worked 60 Chapters, Worked 100 Members, and Worked 500 Members.

1981 INTERNATIONAL SSTV CONTEST

Saturday, March 7, 1500 to 2300 GMT
Sunday, March 8, 1500 to 2400 GMT

SPONSOR — *73 Magazine*, Peterborough NH 03458 USA

OBJECT — To exchange SSTV pictures with as many stations in as many parts of the world as possible during the contest periods.

FREQUENCIES — All amateur frequencies between 3.5 and 29.7 MHz where SSTV is permitted.

EXCHANGE — Exchange of pictures must include callsign, RST report, and consecutive contact number starting with 001. FCC rules require a verbal exchange of callsigns for US stations. Do not include the contact number in the verbal exchange.

CREDITS — One (1) point for each station worked. A station may be worked once on each band for credit. One (1) point for each US state or Canadian province worked. Five (5) points for each country worked. Five (5) points for each continent worked. Each state, province, country, and continent may be counted only once for credit. Total score is the sum of all credits.

ENTRIES — Activity sheets should show station worked, state or province, country, continent, and band (80, 40, 20, 15, 10). Summary sheets should show number of stations worked, number of states and provinces worked, number of countries worked, number of continents worked, and total score. Entries become the property of the contest committee. Excessive discrepancies in a contest entry may cause disqualification. Contest entries must be postmarked no later than April 30, 1981. The decisions of the contest committee are final.

AWARDS — The top scorer will receive a certificate and a one year subscription to *73 Magazine*. Certificates will also be awarded to the station working the most countries and to the station working the most continents.

Send all entries to:
R. Brooks Kendall W1JKF
10 Stocker St.
Saugus MA 01906

or David Ingram K4TWJ
Eastwood Village, #1201 South
Rte. 11, Box 499
Birmingham AL 35210

DARC CORONA 10-METER RTTY CONTEST

1100 to 1700 GMT March 14

This is the first of four tests during the year sponsored by the DARC eV to promote RTTY activity on the 10-meter band. Each of the four tests is scored separately. Use the recommended portions of the 10-meter band.

EXCHANGE:

RST, QSO number, and name.

SCORING:

Each station can be contacted only once. Each completed two-way RTTY QSO is worth 1 point. Multipliers include the WAE and DXCC lists and each district in W/K, VE/VO, and VK. The final score is the total number of QSOs times the total multiplier.

AWARDS:

Plaques will be awarded to the leading stations in each class with a reasonable score present. Operating classes include: (1) class-A for single or multi-op and (2) class-B for SWLs.

ENTRIES:

Logs must contain name, call, and full address of participant. Also show class, times in GMT, exchange, and final score. SWLs apply to the rules accordingly. Logs must be received within 30 days after each test. Send all entries to: Klaus K. Zielski DF7FB, PO Box 1147, D-6455 Erlensee, West Germany.

The other contest periods are on May 10, September 26, and November 8, 1981.

SOUTH CAROLINA QSO PARTY

1700 GMT March 14 to 0500 GMT March 15
1500 to 2400 GMT March 15

The QSO party is again sponsored by the Colleton County Contestors. The same station may be worked on each band and mode. SC stations may work other in-state stations. Novice and Technician stations must sign /N or /T for identification purposes.

EXCHANGE:

RS(T) and state, province, country, or SC county.

SCORING:

SC stations score two points per QSO; SC Novice and Technicians score five points per QSO. Multiply QSO points by the number of SC counties + states + provinces + countries. All others score two points for each SC contact, five points if with a Novice or Technician in SC. Multiply total QSO points by the number of SC counties worked (46 max.).

FREQUENCIES:

PHONE—3900, 7260, 14300, 21360, 28600, 50.110, 144.2 (simplex—no repeaters!).

CW—1810, 3550, 3710, 7050, 7110, 14050, 21050, 21110, 28050, 28110.

AWARDS:

Certificates to top-scoring station in each SC county, state, province, and DX country. Also to top-scoring Novice and Technician in each SC county and each state.

ENTRIES:

Include a summary sheet with your entry showing scoring and other information. Mailing deadline is April 18, 1981, to: Colleton County Contestors, c/o Elliott Farrell, Jr. WA4YUU, PO Box 994, Walterboro SC 29488. Include a large SASE for a copy of the results.

ERAA QSO PARTY

1400 GMT March 14 to 0200 GMT March 15

The Edison Radio Amateurs' Association (ERAA) WA8SVA of southeastern Michigan will host a QSO party to commemorate ERRA's 40th anniversary. Those wishing to participate should exchange signal report and state with the ERAA QSO Party group. Phone operation only; suggested frequencies are 3930, 7240, 14300, 21400, 28800, 146.52 simplex, and 144.73/145.33 (ERRA repeater). The ERAA QSO Party group will be operating from Thomas Edison's first power station, Station A, in historic Greenfield Village, Dearborn, Michigan. QSL via WA8SVA, 12806 Royal Grand, Detroit MI 48239. Participants will receive a certificate by enclosing a business-sized SASE.

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RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
4006 Winlee Road
Randallstown MD 21133

Last month we took a look at the Microlog ATR-6800, one of the new breed of RTTY stations. This month shall be an examination of what it takes to put a unit like this on the air, and what operation itself is like.

To begin with, let me take a moment to describe the situation in the station when the ATR-6800 arrived. The station here is nothing fancy, consisting of basic equipment which may be found at many a ham's shack (see Fig. 1). The transmitter is a Heathkit® SB-401, with an SB-303 receiver. A SB-650 digital display makes readout of the receive frequency easy, although when in the RTTY mode the display is offset by the BFO frequency, in the 3-kHz range—makes things tough! Incoming RTTY signals are demodulated by a HAL ST-6, and normal printing is on an old Teletype® Model 15. Paper-tape equipment is in the loop, but not used too much. Keying of the transmitter is by the circuit described some time ago in *73*, off a magnetic reed relay in the loop.

In the interests of modernization, I will add that a 6800-based computer resides in the shack. By cabinet it is an SWTPC, but the guts are an amalgam of SWTPC, Smoke Signal Broadcasting, GIMIX, and Leavey Labs. A versatile RTTY program is often booted in to interface with the ST-6, and take the chores away from the Model 15.

Enter the ATR-6800! The unit is provided with an assortment of cables which already have the special connectors required attached to one end, and several common plugs to mate with many types of amateur equipment. In order to receive signals, the ATR-6800 must, of course, be provided with receiver output. Unlike many other units which only accept speaker audio, albeit the most common input provided, the Microlog will accept digital (TTL), RS-232, or audio, depending on the mode, and with Morse will even accept a hand key. Now, that's versatility. Nevertheless, I connected the audio output of the SB-303 to the ATR-6800. Connecting the RCA-type plug, which was provided, to the prewired cable was all of a five-minute job.

Again, a great variety of outputs is available, from grid-block compatible keying for Morse to RS-232 on Baudot and ASCII. I selected the standard AFSK tones, which I fed to the SB-401 through another phono plug. Connection to a scope is optional; the input and output are enough to get you on the air.

Turning the transmitter on produced an unpleasant surprise: The transmitter keyed and stayed on, no matter what the status of the ATR-6800. Some quick diagnostics revealed the problem. I was feeding the audio directly into the SB-401, and depending on the presence or absence of AFSK out to activate the transmitter through the VOX circuit in the transmitter. Unfortunately, the AFSK was always present, transmit or receive. The designers thought of this, however, and one quick cut and jump was done to set the unit up for the correct mode of operation.

I recommend that if you are purchasing one you should specify whether you want to use the audio out to key a VOX circuit. The change is not difficult—if you have a factory representative there to do it, as I did!

Now we scanned the dial looking for stations. Several were noted in the eighty- and twenty-meter bands, and most could be tuned with little difficulty. Lacking an external scope, the method of tuning is a bit primitive, at best. One light is provided, labeled as a "Tuning Indicator." This light goes on and off with FSK signals, only it takes quite a bit of practice to get it to flicker just right.

As another aid, a "reference tone" is available. This is an onboard speaker that sounds a tone when you are tuned fairly closely. Only problems are that in a noisy shack, with the speaker blaring, the low level from the small internal speaker is a bit hard to hear, and the triggering is again somewhat ambiguous. Certainly, using an inexpensive scope on the provided outputs makes tuning in signals much easier.

Prior to initiating a call, several memory buffers are available to be filled with callsigns, CW identifier, etc. Using the SHIFT, CONTROL, and ID keys, this can be done relatively quickly. It, again, takes some practice to remember some of the function codes, but they are well detailed in the manual. The end result is a closing identifier that gives the station call in RTTY and Morse, then automatically switches to receive.

After an hour or so of receiving and fooling around, we try to make a few contacts. Problems with the transmitter and receiver aside (it's not the Microlog's fault that the Heathkit RTTY position prevents linking the units together for transceive operation), we set up on frequency and call CQ. After a few calls, an answer sweeps across the ether—and ol' fumble fingers strikes.

You see, there is no button marked "transmit" or "receive" on the Microlog. To transmit, you send a SHIFT-KN; to receive, a CONTROL-SK (the key is actually marked SK/RTN). Now, if you send a CONTROL/KN, instead of a SHIFT-KN, you go to receive, instead of transmit, and clear the buffers. SHIFT-AR, on the other hand, will also go to receive, but only when the text buffer empties out, useful for typing ahead, and SHIFT-BT will switch to RTTY mode from, say, Morse, again when the text buffer is empty. I don't think a SHIFT-SK does anything special.

Confused? Well I was, and when I relayed some of this to Micrometer the answer I got was in the, "it makes *mistakes harder*" vein. It also makes smooth operation harder, guys! To illustrate, Fig. 2 is a summary of functions and their commands. One of the most obvious suggestions would be to label keytops with the SHIFTed or CONTROL function, just as they are now labeled with special Morse characters.

One of the advertised features of the ATR-6800 is that it can be hooked up to a computer to act as a terminal. It can be, but there are some problems. First of all, the normal 40- character-by-24-line display is a bit small for most work. Further, the system is set up so that lowercase is displayed when the shift key is depressed, backwards from most true terminals (modified TRS-80s excepted). Moreover, several of the commonly used symbols, such as brackets, up-arrow, and backslash, are not represented, and lowercase letters are a bit abnormal, with raised "p", "q", "g", and "y".

What is more intriguing is to use the ATR-6800 as a standalone computer itself, a possibility that is on the horizon. Several programs are currently available which allow the unit to output SSTV as three lines of six characters per line, function as a mailbox, autostart/WRU, or several other modes. All of these programs are available on tape, and load from a conven-

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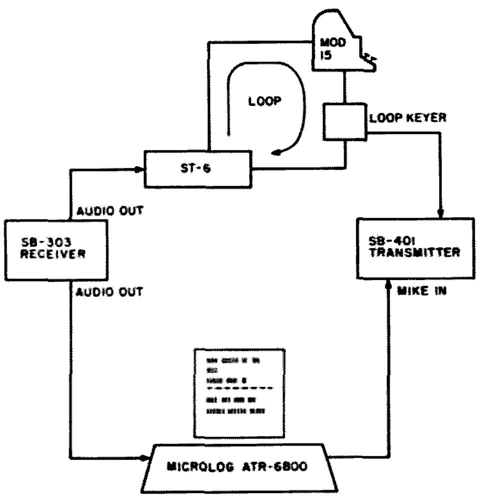

Fig. 1. Station wiring.

LETTERS

R/CERS UNITE

I wish to express some opinions in regard to the recent FCC deregulation of the 6-meter band.

In a band use proposal, In Looking West, I was shocked to note the complete lack of consideration given to the radio-control enthusiast.

As I am sure you know, 53.1, 53.2, 53.3, 53.4, and 53.5 MHz are actively used by amateur radio operators for R/C purposes. Commercial as well as kit equipment is manufactured using these standard R/C frequencies.

Bill Pasternak WA6ITF mentioned in one of his follow-up reports that few if any negative comments were received by him regarding the 6-meter band proposal. Since these 6-meter frequencies are used by amateurs in R/C clubs throughout the United States, a change of this sort would not be welcome.

Further, the Academy of Model Aeronautics, the major R/C organization in the United States, also recognizes the present 6-meter frequencies as standard amateur assignment. I recommend that amateurs not interested in R/C work at least consider those that are.

It is unfortunate that many amateurs interested in R/C do not have interests in other modes of emission. This being the case, it is difficult to find out what is going on and what is being proposed. But, when we think about it for a minute: When was the last time any major amateur publication had *any* coverage on radio control?

Norman W. Pedersen KB6KQ
Bellflower CA

HAVE A STROKE!

This letter is addressed to all the kooks who have nothing better to do than QRM the traffic nets.

On August 21, 1980, my OM, W1GMA, suffered a massive stroke at 6:00 am Costa Rica time. Living way out in the country, we do not have a telephone. None of our near neighbors has a phone. It is four miles by road to the nearest phone.

My husband, "Doc," is a large man and I was unable to move him from the bathroom floor where he was unconscious. I hastily threw blankets over him to keep him warm and ran to the ham shack. I called In a triple break on 14313 where Dick KV4IJ was net control.

Dick said, "The person calling break break break. . . Do you have an emergency?"

I said, "You better believe it, Dick."

I identified and said that I thought my husband had just had a stroke and I had no phone. Could he raise someone in Costa Rica to get an ambulance for me? I gave instructions for the way to my home and within a half hour TI4FHC arrived followed by an ambulance.

This, my friends, is what ham radio is all about! Talk about service? I probably couldn't have done so well with a phone with my lousy Spanish.

I regret that the stroke was so massive that there has been little hope that I will ever regain the beautiful man I had the day before, but he is now at Walter Reed Army Medical Center and getting the best possible therapy. I have returned to Costa Rica temporarily, after a month in Washington. I will return to the states from time to time to check on his progress. When he is well enough, we will both return here to live the lovely life we have.

My profound gratitude to the 14313 nets, to TI4FHC, and to all who assisted in this ordeal. To the K4 who insists on operating ½ kHz above the net: *HAVE A STROKE!*

Kayla Hale W1EMV/TI5
Alajuela, Costa Rica

APPLIANCE USERS

With regard to the letter from Alan Davis KB7HM and Wayne's reply, "Let's hear it for the code-free, theory-free license," December, 1980, *73 Magazine,* I must agree that most modern day hams are appliance users. With the state-of-the-art what it is, how many hams have the laboratory test equipment to produce commercial-quality ham equipment? It is cheaper to purchase the store-bought equipment, even if one could locate the components to build good ham equipment.

However, I cannot quite go along with the idea of the code-free, theory-free ham license. Eleven meters speaks against such a concept. Throughout the years, hams have been admired and respected for the effort that they were willing to put forth in order to obtain a ham license. Most hams do not regret having expended that time and effort. Of course, there always has been, and always will be those who want something for nothing, and this type of person keeps on demanding more. As a compromise to these something-for-nothing demands, I would like to offer the following suggestions.

Leave the frequency allocations for both CW and phone exactly as they stand at the present time. Those who wish to operate nothing but phone could be granted a code-free/theory-free license, which would allow them full phone privileges in all presently established phone bands. This could be handled in the same manner CB licenses are handled.

Those people who desire to upgrade their status from appliance user to radio operator and still retain full phone privileges would be required to pass the following code tests:

5-wpm code speed for operation in the Novice class CW bands.

13-wpm code speed for operation in the General class CW bands.

15-wpm code speed for operation in the Advanced class CW bands.

20-wpm code speed for operation in the Extra class CW bands.

All code tests except the 20-wpm test to be given by a certified volunteer examiner, being at least one grade above the person being examined. The 20-wpm code test should be administered only at a field office of the FCC. This proposition would take a lot of the work load off of the FCC and give them more time and money to chase rule violators, jammers, bootleggers, etc.

Many people who would like to become hams but have never been willing to buckle down and earn the license will probably find this stupid idea very appealing. However, I doubt that very many already licensed hams will find much appeal in this idea.

I know that if this proposal was to be carried out, it would not cure 100% of ham radio's ailments. However, it would give the freeloaders something for nothing and still leave something to be gained for those who were willing to expend a little bit of time and effort. Regardless of what a few people may try to lead us to believe, CW is by no means dead, and it still has its place in the radio hobby.

Verle D. Francis W0SZF
McCook NE

TREASURE ISLAND

Wayne, I enjoy your magazine now as I have for 15 years. No, your editorials are not too long for some of us, the mixture of nostalgia and modern topics blends into an interesting few minutes of reading.

Yes, at Treasure isle in 1942-43, I did carve W6ECB into one of the desks that you apparently sat in at a later date and I was amazed that you copied several of the calls to remember 30 or so years later in one of your writings.

Like you, I joined the Navy in early 1942, took an accelerated EE (without calculus) course at the University of Houston, on to T.I., then to New London for sub school where I was detained for 18 months to teach code to some of the "90-day wonders"! I went to the South Pacific on the *Green Hornet* AS-23 sub tender, and had a few rides on the *USS Archer Fish* before ending the war in the Subic Bay! We heard stories about the *USS Drum* but we also had our hands full in the China Seas and I can't remember feeling necessarily sorry for you!

Amateur radio (W6ECB, licensed in 1934) has given me many friends, a Navy way of life, many hours of pleasure, many dollars spent, and many (40) years of married bliss (because I was home).

I agree that we must get more

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AWARDS

Bill Gosney WB7BFK
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

This week I received a very nice letter from Lynn Hansen KA0CLQ who represents the Central Iowa Radio Amateur Club. In her letter Lynn provided me with the details of their new award entitled the Tallcorn DX Award.

TALLCORN DX AWARD

Applicants wishing to meet the requirements of this DX award program must confirm contact with three or more members of the Central Iowa Radio Amateur Club. While there are no band or mode restrictions, there is the need for complete and accurate logbook information for each contact made. This DX award is issued free, but, applicants are asked to submit a large business-sized SASE and 50 cents to defray cost of postage.

The members of the Central Iowa Radio Amateur Club are active in various modes of operation. You may find them on CW, phone, RTTY, and SSTV. Should you wish a single-band or specific mode qualification, I suggest you write the club directly and arrange a roster of the membership and at the same time arrange a schedule with a few of the operators.

Inquiries may be directed to the Central Iowa Radio Amateur Club, PO Box 39, Marshalltown IA 50158.

WORKED ALL LYNCHBURG LADIES AWARD

The Lynchburg Amateur Radio Club announces the availability of a new piece of "wall paper." This award, the Worked All Lynchburg Ladies Award, may be earned by working three YL members of the Lynchburg Amateur Radio Club. If you think that's difficult, sympathize with Lynchburg area amateurs. They must work five Lynchburg Ladies on modes other than repeater operation.

This award is available at no charge. The applicant should submit the usual logbook information and it would be advisable to enclose a small donation to offset any postage expense. Submit your entry to Rachel Bush, 1109 Dandridge Drive, Lynchburg VA 24501.

73 MAGAZINE AWARDS PORTFOLIO

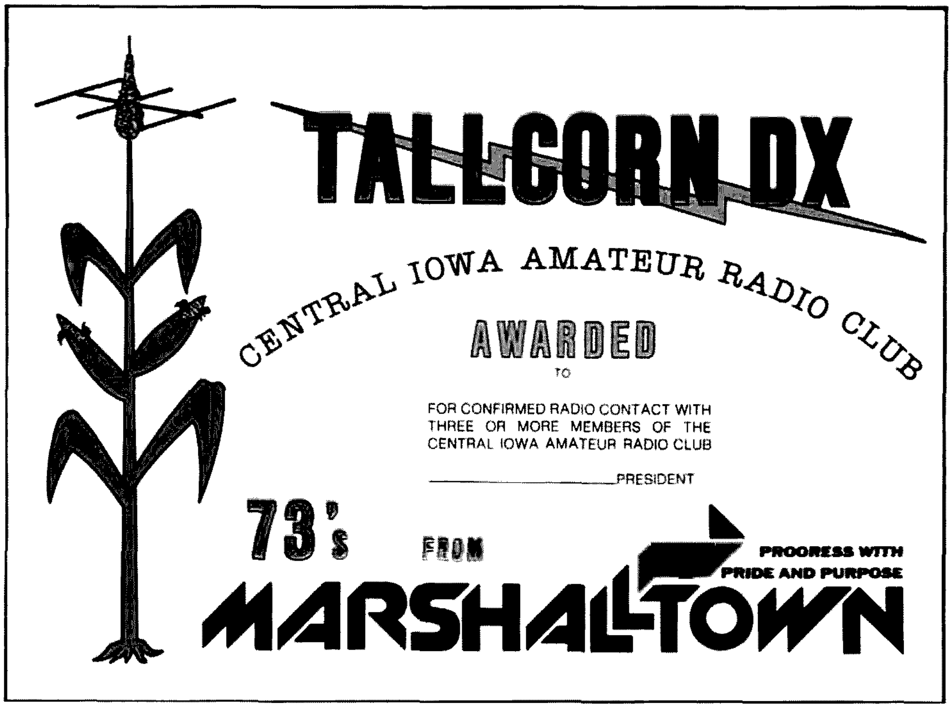
If readers are still seeking copies of our detailed awards program, find your September and October, 1980, back issues, as all nineteen award incentives for both the domestic and DX award hunters are listed there. Each was designed to be the ultimate in operating achievement. Back issues of the September and October, 1980, editions are available by writing or calling our Bookstore.

SWISS BEAR AWARD

The New Bern Amateur Radio Club is sponsoring the Swiss Bear Award. This award will be given for working 3 different amateur stations in the New Bern area within the period of October 23, 1980, and October 23, 1981.

Extracts from logs for QSOs during this period, along with an SASE, or in case of DX stations two IRCs, should be sent to: New Bern Amateur Radio Club, Inc., PO Box 2483, New Bern NC 28560.

The Award consists of a certificate depicting the Swiss Bear, symbol of both Bern, Switzerland, and New Bern, North Carolina, and stating that the station has met the requirements for this award.



Glancing at my wall full of DX awards, it's staggering how much investment is represented just in postage costs to gather the required QSL cards to qualify for these achievements. Just as a guesstimate, I must have spent well over a thousand dollars in IRCs and greenbacks over the past three or four years. Well, the expenses for stateside confirmation aren't much better. Finally, however, we are pleased to learn of a new stateside QSL service that promises to relieve much of the formal expense in getting the job done. Known as the US OSL Service, it is founded and managed by N7BMY and KB7JW, both of Mulino, Oregon.

US QSL SERVICE

Can you believe it? One address for all your domestic QSLing, both incoming and outgoing, for all ten call districts, including Alaska and Hawaii? Unbelievable, you say!

Available now to all licensed amateurs in all fifty states, the service uses professional file clerks to ensure accurate, speedy, and ongoing QSL handling. Emphasis is placed on hiring the disabled, people who want to be self-sufficient but need an opportunity to do so. The service asks for a very minimal 25¢ for each incoming batch of up to 20 QSL cards. This covers wages and operating costs incurred in processing the correspondence.

In comparison, to show how the service can be of benefit to all of us, consider the present cost of sending twenty QSL cards. At 10¢ each, you'd spend $2.00 in postage alone. In addition, you have to look up all twenty addresses, which can be difficult, expensive, and more or less frustrating after you go through a stack of cards. Chances are some of the contacts were new calls, not yet listed in the *Callbooks*, or perhaps a new address has not yet been inserted in the present address listing. Need we say more? Now, to send these same QSL cards to the US QSL Service costs you up to 85¢ (30¢ postage, 30¢ on two SASEs, and 25¢ handling charge). Think of it this way: You have to only lick three or four stamps instead of 20!

Who are the founders and

Continued on page 100

REVIEW

YAESU FT-707 HF TRANSCEIVER

Checked any equipment prices lately? When it comes to equipment, hams have never been able to get so much quality and performance for so little money. The new Yaesu FT-707 HF transceiver is a good example. It offers features and performance equal or superior to top-dollar rigs of a few years ago. Today, the FT-707 is one of Yaesu's least expensive rigs. It says a lot for the state of the art when a relatively inexpensive transceiver offers the features this new Yaesu does. Let's take a good look at it.

The FT-707 is similar in size to rigs like the Kenwood TS-120S, the Icom IC-701, and the Atlas 150. It covers all present and planned bands between 80 and 10 meters, including the new WARC bands. The bandswitch itself has a very precise feel, clicking smoothly into place, rather than thunking noisily as do bandswitches on many other rigs. Just to the right of the bandswitch is the vfo knob which also seems to have been engineered for the proper feel.

Yes, the 707 has the digital frequency readout that we now take for granted on high quality gear, but it also offers a well-calibrated and easy-to-read analog display, useful when the companion external vfo and memory unit is in use. Just above the vfo knob are four status LEDs, telling which vfo is in use, if the marker generator is switched on or off, and whether a crystal-controlled frequency has been selected.

The Yaesu 707 line.

The display that attracts the most attention is the front-panel meter, which is a multi-segment bar-type LED display. The lower-value segments glow green, higher readings are yellow, and the highest readings show red. This display does more than impress your friends. It allows you to keep tabs on signal strength, relative power output, and alc level.

Whether LED displays are really better than regular meters has been a subject of much debate lately. For the purposes it serves on the 707, the LED display works admirably, particulary in mobile installations where a traditional meter would be difficult to read while maintaining safe operation of a vehicle.

Other goodies on the front panel include an effective noise blanker, an i-f shift control, a 25-kHz marker generator, VOX controls, an RIT control, and an eight-conductor microphone plug that permits scanning from the mike if the rig is equipped with the FV-707DM external vfo. Also worth mentioning are the rf gain control, fast/slow agc switch, and fixed-channel operation switch. Along with the usual antenna, key, and power connectors, the rear panel sports an rf output jack for use with transverters, and sockets for the external vfo and accessories. Yaesu has managed to squeeze a lot into a small package!

Hands-On

Unpacking a new rig and wiring it into the ham station is an activity that most hams enjoy, and the hams at *73* are no exception! We had the 707 and its accessories wired to ground, power, and our Alpha 374 amplifier in no time at all. The human engineering that went into this rig is obvious; few other rigs we've seen have interfaced with such ease. Like the Icom 701, this rig has a relay box that is necessary if you plan to use both an amplifier and the external vfo. Even if you will only use an amplifier, this accessory is worth purchasing; it makes interfacing much simpler.

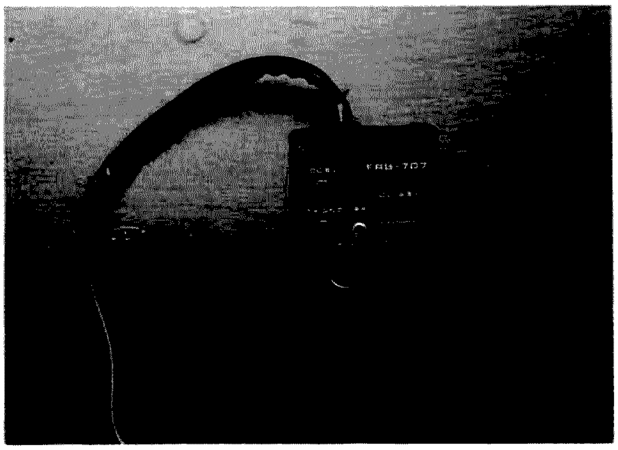
As soon as the rig was in place, the manual read, and basic operating parameters checked, we put the rig through the infamous *73* wringer. We connected the 707 to our Drake DL-1000 dummy load and checked the power output in the CW mode. A Bird wattmeter confirmed Yaesu's claim of full output on all bands. Our sample put out 100 Watts ±10%, with highest output on 80 and 20 meters, and lowest on 40 and 10 meters. Several other rigs we have tested have dropped by as much as 50% on 10 meters. The Yaesu's performance is admirable.

While we had the 707 on the dummy load, we checked out Yaesu's protection circuits. Like most of its solid-state brethren, the FT-707 finals are protected with a high swr shutdown device. As the swr climbs, the rig automatically reduces power to protect itself. Many rigs carry this to a fault, and almost any swr at all on the line causes a significant reduction in power output.

Yaesu's engineers seem well acquainted with the real world, and they designed the 707 to shut down only slightly at 2:1 or lower. Limiting action is heavy at 3:1 or higher, shutting the output down to a small percentage of its capabilities. This is a sensible arrangement, since many hams operate their equipment into transmission lines with moderate standing wave ratios. Further, a defect in the feedline or an improperly set coax switch will probably cause the swr to go much higher than 2:1. In short, the FT-707's ability to protect its expensive output devices is hardly curtailed, yet the annoying side effects of such protection have been mercifully banished.

Other protection circuits include a temperature-controlled fan and a thermal shutdown circuit. The instruction manual recommends a key-down period of no longer than 30 seconds, but we wanted to see how well the 707 protects itself, so we left it key-down for several minutes. Sure enough, the fan came on after a minute or so, and continued to run after switching over to receive. Having the fan run until the finals cool off is an excellent idea. Unfortunately, our unit was cursed with a noisy fan which rattled in a most aggravating manner. This was a problem peculiar to our sample, and it shouldn't be encountered in other 707s.

During normal operation the fan never came on at all, confirming that the fan is only a safety feature; the rig has



The FRB-707 relay box.

enough heat-sink area to dissipate the heat produced in normal operation. We never pushed the finals hard enough during any of our tests to cycle the thermal shutdown device.

On the Air

Operating the 707 is a pleasant and rewarding experience. Its no-tune-up design permits instant operation. Adjust the mike gain on SSB or the carrier level for CW to proper levels as indicated on the front-panel meter, and you are ready to go! Hams who have never operated a solid-state rig are in for an agreeable surprise.

While searching for DX on 20 meters one night, I noticed that tuning in individual signals seemed relatively easy with the 707. Sure enough, when compared to several other popular rigs gracing the *73* ham shack, the 707 came up with noticeably wider bandspread. The only rig in our possession that performed better in this respect was the Icom IC-701, whose digital tuning gives it an unfair advantage.

Selectivity is very good, with two eight-pole i-f filters standard. 600-Hz and 300-Hz CW filters are available as options. The 350-Hz filter was installed in our unit; switching it in provides a startling reduction in interference. Hams who enjoy CW (and Novices in particular) should consider a sharp CW filter necessary equipment for any receiver. The i-f width control is active on both CW and SSB, with performance comparable to other rigs having a similar control.

If you have always yearned for a rig that would allow you to check into an 80-meter AM phone net, or check out the action on 10-meter AM, you are reading the right review! Seriously, with the high level of interest in converted CB equipment, the AM feature allows entry into a world that is denied to owners of many other modern transceivers.

The quality of the manual also bears mention. For whatever reason, manuals for Japanese ham gear do not enjoy a particularly good reputation among hams in the USA. Well, I'm pleased to report that this is one of the good ones. While obviously written by someone for whom English is a second language, the instructions are perfectly clear and understandable.

Servicing information is pretty good, too. We are provided with complete schematics, block diagrams, and a very good circuit description. For those with access to good basic test equipment, there is a section on maintenance and alignment. We haven't seen too many manuals better than this for any transceiver, whatever its country of origin.

As with any piece of equipment, we found a couple of things we'd like to see Yaesu change; in this case, serious complaints were notably absent. The adjustment for sidetone level can't be reached without popping the top cover off—we'd like to see it located where it can be readjusted easily, perhaps on the back panel. It also would be nice if the 707 included some sort of a speech processor. Yes, I know that they are often misused, but there are times when a processor is useful. These are very minor problems, and I almost wish I could find more to gripe about, but I can't!

Power Supply

The matching FP-707 12-volt power supply would be a welcome addition to any shack. Regulation is very tight even under full load and the supply runs quite cool. (Except when testing the rig's protection circuits!) There is one feature of this supply that I was very pleased to discover. When you spend $150 on a power supply, you want to be able to get a lot of use out of it. Most supplies designed to match a specific rig have a special cable permanently attached and there is no way to use the supply to power anything else unless you tear into the case and add your own connectors. Yaesu has solved this aggravating problem by putting two multi-way connectors on the back of the supply, in addition to the cable that goes to the FT-707. These connectors are in the main output circuit and can provide the full supply current output, which is 20 Amps intermittent. Thanks, Yaesu! The power supply is also provided with a front-facing speaker, which performs well for a speaker of its size.

FV-707DM External Vfo

The FV-707 is a truly unique accessory; it changes the whole character of the rig. It resembles a traditional remote vfo in that it allows split-frequency operation, but there the resemblance ends. Measuring only one inch high, the FV-707 is designed to fit underneath the rig rather than beside it, and once installed it seems to become part of the rig itself. The FV-707 can be programmed to store 12 frequencies in its internal memories. Install two AA cells and those frequencies will be held for a year, even when power is turned off! This eliminates the need to buy crystals for often-used frequencies, and it allows an incredible flexibility of operation.

If you are a DX hound, you can scan up and down the band, searching for pileups, and program the frequency of a plieup into each memory, to be recalled later at your whim. If nets are more your cup of tea, the FV-707 will help you keep track of those as well. Indeed, the uses for these memories are limited only by your imagination!

The FV-707 also allows you to scan up and down the band electronically. On the front of the unit are three buttons, marked Up, Down, and Fast. The first two are self-explanatory, and the Fast button works in conjunction with the other two. Normal scan rate is one kHz per second; push the Fast button at the same time as the Up or Down button and the rate increases to 10 kHz per second. With the optional YM-35 microphone, frequency scanning can be accomplished in the same manner using switches mounted on top of the microphone.

FC-707 Antenna Tuner

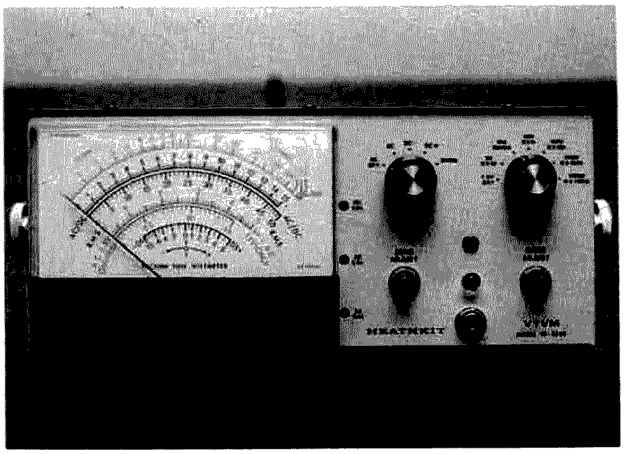
Designed specifically to complement the FT-707, the matching antenna tuner is a compelling little box. Once you have an FT-707 in your possession, the matching tuner is hard to resist. It sports a lighted meter that keeps track of power output with reasonable accuracy, as well as serving as an swr meter. An unusual but extremely handy feature of this tuner is the built-in dummy load, switch-selectable from the front panel.

As far as the actual tuning circuit goes, it is important to realize from the start that this tuner doesn't intend to compete with the larger and much more expensive tuners on the market. Maximum power-handling capability is 150 Watts, and the tuner will only tune coax lines; there is no provision for random-wire tuning.

Still, the tuner performs its intended job well, which is reducing swr on coax lines. Just for fun, we tried tuning up a 15-meter dipole on 40 and 10 meters, and the FC-707 handled the job easily. Naturally, such a lash-up didn't work very well, but it did show off the tuner's capabilities! This little tuner should serve well in both mobile and home installations.

Conclusions

Either on its own, or with its accessories, the Yaesu FT-707 is a truly competent piece of equipment. If you are a compulsive knob twirler, you'll find the digital features of the external vfo impossible to resist. If your quest is for solid performance on both SSB and CW, the 707 offers that, too. Its extremely compact dimensions make it an obvious choice for mobile installations, yet the front-panel layout



Heathkit's IM-5228 VTVM.

is such that it will be just as comfortable in a home station. If you have any interest in the new generation of compact, solid-state transceivers, this new Yaesu deserves your attention.

For further information, contact *Yaesu Electronics Corp., 6851 Walthall Way, Paramount CA 90723*. Reader Service number 485.

Paul Grupp KA1LR
73 Staff

HEATHKIT® MODEL IM-5228 VTVM

When I talk to hams who are thinking of buying a test meter, they invariably seem determined to get one of the fancy new digital meters. Now don't get me wrong, I don't have anything against digital meters; it's just that they aren't necessarily the best meter for everybody, particularly if the budget only allows for one meter. Digital meters are not much help when you are trying to interpret a fluctuating reading, and, of course, they tend to be more expensive then a comparable analog meter.

Recently, while shopping for a new meter for the *73* ham shack, I came across an old friend, the Heathkit IM-5228 VTVM. This VTVM is hardly new to the market; in fact, I think it has been around a lot longer than I have! But that's just what makes it interesting. After all these years, it's still one of the best test equipment values on the market.

The 5228 is a bench-type VTVM. It comes with a gimbled swivel mount that allows easy reading of the meter, no matter where you place the VTVM. A slightly more compact version of the same VTVM is available from Heath for 10 dollars less. Since the bench unit has all its controls on the front panel and also has a larger meter movement, we opted for that model.

Kantronics' Varifilter.

The 5228 measures dc and ac volts and Ohms, and does so on enough scales to allow easy interpretation of any reading. I won't bore you by repeating all the specs here, since they're available in any Heathkit catalog, but I'll list a few to give you an idea of this meter's parameters.

The voltmeter section's ranges extend from 1.5 volts full-scale up to 1500 volts full-scale in seven ranges each for ac and dc. Maximum voltage capability can be extended to 30 kV with an inexpensive accessory probe. Input resistance is 11 megohms on all ranges, permitting accurate in-circuit tests without loading things down. The ohmmeter section will measure 0.1 Ohm to 1000 megohms in six different ranges.

The IM-5228 is capable of extremely accurate measurements, but final accuracy depends on how carefully the kit-builder calibrates his unit. Any test instrument will need recalibration from time to time, and the Heathkit people are quick to point out that one of the advantages of kit-built instruments is the owner's familiarity with the unit. This familiarity encourages the owner to periodically check the accuracy of his meter and align it when necessary, instead of blindly hoping that the factory calibration is still good.

The basic $69.95 kit uses two tubes, which means that the VTVM must be warmed up before use. A conversion kit is available which replaces the vacuum tubes with solid-state devices. We couldn't resist that convenience, so we ordered the conversion kit at the same time as the VTVM.

Construction

Assembly was straightforward and enjoyable. As is usual with Heathkit products, the instructions were clear and easy to follow. Parts identification was easy with the life-sized pictorial provided. The VTVM took about fourteen and a half hours to put together, working at a leisurely pace.

A few minor points should be kept in mind during assembly. Be aware that when directions indicate that a certain number of wires must be present at a soldering point, any wire passing through that point is counted twice: once entering and once leaving. Realizing this may save you a frantic search for something else to add to that connection!

The hookup wire provided was only just enough to do the job. If you cut your leads too long, you may run out. Also, the wire provided was all the same color. Different colors would have made it easier to check connections. Only one error was discovered in our assembly manual: On page 18, wires from lug 4, not lug 3, are to be left free.

It was extremely satisfying to find the VTVM working perfectly the first time it was plugged in. However, the solid-state modification was yet to come. If you plan to install this modification, it is simplest to do it during the initial assembly. The installation is not complicated, but it does require the desoldering and removal of several components. The modification took only a few minutes and the VTVM acquired no problems along with its new solid-state devices. Again, the unit worked immediately upon being plugged in! Construction was easy and the instructions were good. Even a novice kit-builder should have no problems with this one!

The Heathkit IM-5228 VTVM is an old friend in an attractive new cabinet. Hams looking for a high-quality but reasonably-priced voltage and resistance meter will find that this meter still represents one of the best values on the market.

Additional information is available from the *Heath Company, Benton Harbor MI 49022*. Reader Service number 486.

Alyson Grupp N1BEJ
73 Staff

KANTRONICS VARIFILTER

If you've never used an active audio filter to aid reception of signals, you ought to try the Kantronics Varifilter to improve your listening pleasure. What is a Varifilter? Good question. it's a variable filter with variable frequency and bandwidth, and it allows you to select a peak or a notch mode.

Suppose you are an avid CW operator who likes to dig out the weak ones in a pileup. Maybe your receiver is not quite up to par in terms of its i-f selectivity, and you're limited to a minimum bandwidth of, say, 800 cycles. If the big guns also happen to be trying to work the same station you are and their S9+ signals

Continued on page 89

OSCAR ORBITS

Courtesy of AMSAT

The OSCAR satellites are subject to atmospheric drag, of course, and the present period of intense solar activity has accentuated the problem. During this period, our sun has been expelling huge numbers of charged particles, some of which find their way into the Earth's upper atmosphere, increasing the density (and thus the drag) there. It is through this region that the OSCARs must pass. OSCAR 8, in a lower orbit than OSCAR 7, is the more seriously affected of the two.

If the drag factor is not considered when OSCAR calculations are performed, long-range orbital projections will be in error. For example, by the end of 1979, OSCAR 8 was more than 20 minutes ahead of some published schedules. The nature of orbital mechanics is such that extra drag on a satellite causes it to move into a lower orbit, resulting in a shorter orbital period. Thus, the satellite arrives above a given Earthbound location earlier than predicted.

Using data supplied to us by Dr. Thomas A. Clark W3IWI of AMSAT, the equatorial crossing tables shown here were generated with the aid of a TRS-80™ microcomputer. The tables take into account the effects of atmospheric drag and should be in error by a few seconds at most.

The listed data tells you the time and place that OSCAR 7 and OSCAR 8 cross the equator in an ascending orbit for the first time each day. To calculate successive OSCAR 7 orbits, make a list of the first orbit number and the next twelve orbits for that day. List the time of the first orbit. Each successive orbit is 115 minutes later (two hours less five minutes). The chart gives the longitude of the day's first ascending (northbound) equatorial crossing. Add 29° for each succeeding orbit. When OSCAR is ascending on the other side of the world from you, it will descend over you. To find the equatorial descending longitude, subtract 166° from the ascending longitude. To find the time OSCAR 7 passes the North Pole, add 29 minutes to the time it passes the equator. You should be able to hear OSCAR 7 when it is within 45 degrees of you. The easiest way to determine if OSCAR is above the horizon (and thus within range) at your location is to take a globe and draw a circle with a radius of 2450 miles (4000 kilometers) from your QTH. If OSCAR passes above that circle, you should be able to hear it. If it passes right overhead, you should hear it for about 24 minutes total. OSCAR 7 will pass an imaginary line drawn from San Francisco to Norfolk about 12 minutes after passing the equator. Add about a minute for each 200 miles that you live north of this line. If OSCAR passes 15° east or west of you, add another minute; at 30°, three minutes; at 45°, ten minutes. Mode A: 145.85-.95 MHz uplink, 29.4-29.5 MHz downlink, beacon at 29.502 MHz. Mode B: 432.125-.175 MHz uplink, 145.975-.925 MHz downlink, beacon at 145.972 MHz.

At press time, OSCAR 7 was scheduled to be in Mode A on odd numbered days of the year and in Mode B on even numbered days. Monday is QRP day on OSCAR 7, while Wednesdays are set aside for experiments and are not available for use.

OSCAR 8 calculations are similar to those for OSCAR 7, with some important exceptions. Instead of making 13 orbits each day, OSCAR 8 makes 14 orbits during each 24-hour period. The orbital period of OSCAR 8 is therefore somewhat shorter: 103 minutes.

To calculate successive OSCAR 8 orbits, make a list of the first orbit number (from the OSCAR 8 chart) and the next thirteen orbits for that day. List the time of the first orbit. Each successive orbit is then 103 minutes later. The chart gives the longitude of the day's first ascending equatorial crossing. Add 26° for each succeeding orbit. To find the time OSCAR 8 passes the North Pole, add 26 minutes to the time it crosses the equator. OSCAR 8 will cross the imaginary San Francisco-to-Norfolk line about 11 minutes after crossing the equator. Mode A: 145.85-.95 MHz uplink, 29.4-29.50 MHz downlink, beacon at 29.40 MHz. Mode J: 145.90-146.00 MHz uplink, 435.20-435.10 MHz downlink, beacon on 435.090 MHz.

OSCAR 8 is in Mode A on Mondays and Thursdays, Mode J on Saturdays and Sundays, and both modes simultaneously on Tuesdays and Fridays. As with OSCAR 7, Wednesdays are reserved for experiments.

OSCAR 7 ORBITAL INFORMATION FOR MARCH

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
28781	1	0114:49	95.4
28793	2	0014:08	80.2
28806	3	0108:22	93.8
28818	4	0007:41	78.6
28831	5	0101:56	92.2
28843	6	0001:14	77.1
28856	7	0055:29	90.6
28869	8	0149:44	104.2
28881	9	0049:02	89.1
28894	10	0143:17	102.7
28906	11	0042:35	87.5
28919	12	0136:50	101.1
28931	13	0036:08	85.9
28944	14	0130:23	99.5
28956	15	0029:42	84.4
28969	16	0123:56	98.0
28981	17	0023:15	82.8
28994	18	0117:29	96.4
29006	19	0016:48	81.2
29019	20	0111:03	94.8
29031	21	0010:21	79.7
29044	22	0104:36	93.3
29056	23	0003:54	78.1
29069	24	0058:09	91.7
29082	25	0152:24	105.3
29094	26	0051:42	90.1
29107	27	0145:57	103.7
29119	28	0045:15	88.6
29132	29	0139:30	102.1
29144	30	0038:48	87.0
29157	31	0133:03	100.6

OSCAR 8 ORBITAL INFORMATION FOR MARCH

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
15225	1	0037:22	67.0
15239	2	0042:09	68.3
15253	3	0046:56	69.5
15267	4	0051:43	70.7
15281	5	0056:30	71.9
15295	6	0101:17	73.1
15309	7	0106:04	74.3
15323	8	0110:51	75.5
15337	9	0115:38	76.7
15351	10	0120:24	78.0
15365	11	0125:11	79.2
15379	12	0129:50	80.4
15393	13	0134:45	81.6
15407	14	0139:31	82.8
15420	15	0001:06	58.2
15434	16	0005:53	59.4
15448	17	0010:40	60.6
15462	18	0015:26	61.9
15476	19	0020:13	63.1
15490	20	0024:59	64.3
15504	21	0029:46	65.5
15518	22	0034:33	66.7
15532	23	0039:19	67.9
15546	24	0044:06	69.1
15560	25	0048:52	70.3
15574	26	0053:39	71.6
15588	27	0058:25	72.8
15602	28	0103:12	74.0
15616	29	0107:58	75.2
15630	30	0112:44	76.4
15644	31	0117:31	77.6

OSCAR 7 ORBITAL INFORMATION FOR APRIL

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
29169	1	0032:21	85.4
29182	2	0126:36	99.0
29194	3	0025:54	83.9
29207	4	0120:09	97.4
29219	5	0019:27	82.3
29232	6	0113:42	95.9
29244	7	0013:00	80.7
29257	8	0107:15	94.3
29269	9	0006:33	79.2
29282	10	0100:48	92.7
29294	11	0000:06	77.6
29307	12	0054:21	91.2
29320	13	0148:36	104.8
29332	14	0047:54	89.6
29345	15	0142:09	103.2
29357	16	0041:27	88.0
29370	17	0135:42	101.6
29382	18	0035:00	86.5
29395	19	0129:15	100.1
29407	20	0028:33	84.9
29420	21	0122:48	98.5
29432	22	0022:06	83.3
29445	23	0116:21	96.9
29457	24	0015:39	81.8
29470	25	0109:54	95.4
29482	26	0009:12	80.2
29495	27	0103:27	93.8
29507	28	0002:45	78.6
29520	29	0057:00	92.2
29533	30	0151:15	105.8

OSCAR 8 ORBITAL INFORMATION FOR APRIL

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
15658	1	0122:17	78.8
15672	2	0127:03	80.0
15686	3	0131:50	81.2
15700	4	0136:36	82.4
15714	5	0141:22	83.7
15727	6	0002:57	59.1
15741	7	0007:43	60.3
15755	8	0012:29	61.5
15769	9	0017:15	62.7
15783	10	0022:02	63.9
15797	11	0026:48	65.1
15811	12	0031:34	66.3
15825	13	0036:20	67.5
15839	14	0041:06	68.7
15853	15	0045:52	70.0
15867	16	0050:38	71.2
15881	17	0055:24	72.4
15895	18	0100:10	73.6
15909	19	0104:56	74.8
15923	20	0109:42	76.0
15937	21	0114:28	77.2
15951	22	0119:14	78.4
15965	23	0124:00	79.6
15979	24	0128:46	80.8
15993	25	0133:32	82.0
16007	26	0138:18	83.2
16021	27	0143:04	84.4
16034	28	0004:38	59.9
16048	29	0009:23	61.1
16062	30	0014:09	62.3

FCC

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47 CFR Part 97

[FCC 80-634]

Petition for Reconsideration of Academy of Model Aeronautics Concerning Interpretation of Amateur Radio Service Rules To Allow a Nonlicensed Person To Operate an Amateur Radio Station To Control Model Aircraft

AGENCY: Federal Communications Commission.

ACTION: Interpretation of rule.

SUMMARY: The Commission's staff was asked to rule on the question as to whether a person not holding an amateur radio license could operate an amateur radio station to control model aircraft. The staff ruled that § 97.79(d) did not permit an amateur radio station to be operated by an unlicensed person for the purpose of controlling model aircraft since such use constitutes one-way transmission. The basis for the ruling was an interpretation of § 97.79(d) which permits unlicensed persons to participate in two-way amateur radio communications under the supervision of a control operator, but not one-way communications. The Academy of Model Aeronautics petitioned for review of this ruling by the full Commission. The Commission *en banc* affirmed the staff's interpretation.

ADDRESS: Federal Communications Commission, Washington, D.C. 20554.

FOR FURTHER INFORMATION CONTACT: Maurice J. DePont, (202) 254-6884.

SUPPLEMENTARY INFORMATION:

Adopted: November 6, 1980.

Released: November 21, 1980.

By the Commission:

1. The Commission received a letter, dated April 10, 1979, from Mr. Francis E. Morris of San Diego, California, inquiring whether a person not holding an amateur radio license could operate an amateur radio station to control model aircraft. By reply letter of May 18, 1979, Mr. Morris was advised that this was not permissible under Part 97 of our rules. The basis for the ruling was an interpretation of § 97.79(d) which permits unlicensed persons to participate in two-way amateur radio communications under the supervision of a control operator. The Commission's staff ruled that § 97.79(d) did not permit an amateur radio station to be operated by an unlicensed person for the purpose of controlling model aircraft since such use constitutes one-way transmission.

2. The Academy of Model Aeronautics (AMA), the petitioner in this proceeding, learned of the staff's letter to Mr. Morris. On August 27, 1979, AMA requested the Private Radio Bureau (Bureau) to reconsider its interpretation of Rule § 97.79(d). The staff did reconsider the ruling, and on October 15, 1979, advised AMA, through its attorney, Jack R. Smith, that the communications referred to in § 97.79(d) are meant to be two-way communications. The staff further advised AMA that the provisions of Part 97, unlike the Part 95 Radio Control Service Rules, did not extend operating privileges to non-licensed persons to control model aircraft. It is from this decision that the petitioner, AMA, now seeks review by the Commission *en banc*.

3. In its Petition for Review, filed November 14, 1979, petitioner presents three questions:

(a) Whether the Bureau erred in its construction of the term "third party"?

(b) Whether the Bureau improperly interpreted the Part 97 Rules in holding that the radio control provisions were not parallel in all respects to the Radio Control (R/C) Service Rules?

(c) Whether the Bureau's interpretation of "third party" is inconsistent with other Part 97 rules and with long-recognized Amateur practice?

4. At the outset, it will be useful to restate the principal issue in this proceeding. The question is whether or not a person, who is not a licensed amateur radio operator, should be permitted to operate an amateur radio station for the purpose of controlling a model aircraft. It is in this context that we believe that the matter should be addressed. It should also be noted that the Amateur Radio Service and the Radio Control Service are essentially different. The Amateur Radio Service is for technically-inclined persons who wish to learn about and experiment with radio communications equipment and operating techniques. On the other hand, the Radio Control Service is for anyone, whether technically inclined or not, who wishes to use radio for controlling a remote object.

5. One of the fundamental purposes of the Amateur radio service is the recognition and enhancement of the value of the service to the public as a voluntary noncommercial communication service. In furtherance of this aim, a licensed amateur operator may permit a non-licensed person, i.e., a third party, to participate in amateur radio communications from his station, provided that a control operator is present and continuously monitors and supervises the radio communication to insure compliance with the rules. An illustration of this type of third-party traffic is where United States military personnel stationed overseas, who are not amateur operators, are enabled to converse with their families back home via a two-way Amateur radio hook-up. To effect such communications, the countries involved must have assented to third-party traffic and licensed Amateur radio operators must be in control of the respective transmitting and receiving amateur radio stations. It is in this light that the the term "any third party" referred to in § 97.79(d) must be understood.[1] The resultant communications then become the "third-party traffic" which we have defined in § 97.3 (v) as:

> Amateur radio communication by or under the supervision of the control operator *at an amateur radio station to another amateur radio station* on behalf of anyone other than the control operator. (Emphasis supplied.)

Contrary to petitioner's assertion that § 97.79(d) is a broader section than § 97.3(v) and that it defines the scope of permissible participation by non-licensees in amateur communications, those two sections, as well as § 97.114[2] which specifies the conditions under which third-party traffic may be sent, are all inter-related and were in no way intended to provide for the non-licensed amateur communications which the petitioner desires. To hold that the third person referred to in § 97.79(d) includes a non-licensed person engaging in one-way communications to control a remote object is to strain for an interpretation of the rule to fit the petitioner's wish. Worse, it is yet another instance of chipping away at the basic requirement that only licensed operators be permitted to operate amateur radio stations. In our view, *bona fide* third-party communications, as described above, can be distinguished from one-way communications designed to control the movement of a remote object. Although an exception was made to the license requirement for two-way communications, we do not believe that it would be in the public interest to further extend this exception by interpretation of the rule to include one-way communications.

6. In its argument that the Bureau ignored the parallelism between the Amateur and the Radio Control Service Rules (which the petitioner insists exists) the petitioner misstates the basis and purpose of the proposed rule making in Docket No. 19572. That proceeding proposed amendment of Part 97 rules insofar as they pertain to the radio control of remote model craft and vehicles. The petitioner states that: "The purpose of the rules change, the Commission indicated, was to establish comparability between the rules governing like-type operations in the Amateur Radio Service and the Citizens Radio Service.'" However, a close reading of that Notice of Proposed Rule Making will reveal that it was the petitioner in that proceeding (also AMA) who "states a desire for comparability between the rules governing like-type operation in the Amateur Radio Service and the Citizens Radio Service." In fact, the objectives of the Commission's proposal allowing amateur radio stations to be used for control of remote models were simplification of station identification, logging, and portable operation; special provisions requiring the amateur transmitter to bear an identifying marker; and, provision for a maximum mean power output of one watt for transmitters qualifying for operation under these special provisions. In this connection, see *Rock Creek etc. Dist.* v. *County of Calaveras*, 29 Cal. 2d. 7, 9, 172 P.2d. 863, where the court said "the objective sought to be achieved by a statute as well as the evil to be prevented is of prime consideration in its interpretation." Nowhere is it suggested in the Commission's Notice of Proposed Rule Making in Docket No. 19572 that *all* of the rules relating to operation of a radio station in the R/C Service for control of a remote object would be carried over into the Amateur Radio Service when an amateur radio station is so used. This is an important point because much of the petitioner's argument arises from the fact that the staff's decision holds that the provisions of § 95.265(b)(6)[3] are not implicitly contained in the Part 97 rules relating to the use of an amateur radio station to control models. We turn to a fundamental rule of statutory construction to support the staff's position. In *People v. Valentine*, 28 Cal. 2d. 121, 142, 169 p.2d. 1, 14, the court held that where a statute, with reference to one subject contains a given provision, the omission of such a provision from a similar statute concerning a related subject is significant to show that a different intention existed.

The transmission or delivery of the following amateur radio-communication is prohibited:

7. Finally, petitioner alleges that the Bureau erred in adopting an interpretation of "third-party" that is inconsistent with other provisions of the Amateur Radio Service Rules and with Commission-accepted Amateur practice. Specifically, petitioner cites §§ 97.89 and 97.91 as conflicting with § 97.79(d), if § 97.79(d) is read to apply to two-way amateur ratio communications. We do not subscribe to petitioner's theory relating to those sections. The *definition* of amateur radio communications is contained in § 97.3(b). There, such communication is defined as noncommercial radio communication by or among amateur radio stations solely with a personal aim and without pecuniary or business interest. In §§ 97.89 and 97.91, the *uses* of an amateur station are set forth. It may be used to communicate with other amateur radio stations (two-way communications) or to control remote objects (one-way communication) (see § 97.89); or, to engage in certain kinds of additional one-way transmissions such as sending information bulletins, or conducting a net operation, as in a "round-robin" discussion (see § 97.91). Petitioner says that § 97.79(d) should have the term "two-way" in its provisions, and that, since it does not, a non-licensed person should be able to engage in *all* the types of communications permitted by §§ 97.89 and 97.91. We do not agree. The provisions of § 97.79(d) clearly contemplate only two-way communications. For example, that section requires a control operator to be present and continuously monitor the radio communications. Monitoring in § 97.79(d) refers to message content. It would be ludicrous to believe that the Commission would require monitoring of a steady hum or tone-signal, which is the type of signal that is used in a typical one-way communication designed to control a remote object.

8. Petitioner further states that, under the Bureau's interpretation, there must be two-way communications established between unlicensed amateur radio operators before a non-licensee may participate. Petitioner further argues that, if followed through, the Bureau's interpretation would prevent, for example, a non-licensee from sending an informational bulletin at a licensed station, addressed in general, to "all amateurs", since there is no contact with another station involved. We could not agree more. That is precisely what § 97.91 does. It requires that only licensed amateur radio operators send such general bulletins over the air. It is interesting to note that, in practice, it is the American Radio Relay League's station W1AW from which the bulk of such bulletins emanate. All of the persons at the League's headquarters who send such bulletins are duly licensed amateur radio operators. Persons sending such bulletins from any other amateur radio station are likewise expected to be licensed operators. Moreover, in the "round-robin" discussions that § 97.91 allows, it is licensed operators, with an interest in such net operations, that the rule contemplates.

9. Petitioner offers a hypothetical case where Licensee A operates a repeater equipped with "autopatch" (a way of connecting an amateur radio station to the telephone landline circuits). The station in repeater operation operates under A's call sign and A is the control operator. Given these facts, petitioner says that if A makes an autopatch call it would be unlawful under the staff's interpretation of § 97.79(d) because communications between amateur stations do not exist. Petitioner further says that another amateur station that uses the repeater to make an autopatch

Continued on page 101

[1] Section 97.79 Control operator requirements.

(d) The licensee of an amateur radio station may permit any third party to participate in amateur radio communication from his station, provided that a control operator is present and continuously monitors and supervises the radio communication to insure compliance with the rules.

[2] Section 97.114 Third party traffic.

(a) International third party traffic except with countries which have assented thereto.

(b) Third party traffic involving material compensation, either tangible or intangible, direct or indirect, to a third party, a station licensee, a control operator, or any other person.

(c) Except for an emergency communication as defined in this part, third party traffic consisting of business communications on behalf of any party. For the purpose of this section business communication shall mean any transmission or communication the purpose of which is to facilitate the regular business or commercial affairs of any party.

[3] Section 95.265 Operation by, or on behalf of, persons other than the licensee.

* * * * *

(b) Stations may be operated only by the following persons, except as provided in paragraph (c) of this section:

* * * * *

(6) Any person under the control or supervision of the licensee when the station is used solely for the control of remote objects or devices, other than devices used only as a means of attracting attention; and

NEW PRODUCTS

512-MHz FREQUENCY COUNTER FROM HEATH

The IM-2420 features four gate times and 8-digit resolution for precise readings and includes a period function to give cycle time in seconds and a frequency ratio function to provide the ratio between two input frequencies.

A standby power switch can keep the crystal oven warm for maximum frequency accuracy. The oven is proportionally-controlled to keep the internal timebase within 0.1 parts per million over a wide temperature range, with drift controlled to less than 1 ppm per year. The IM-2420 also has provisions for using external timebase signals.

Four gate times and an 0.43-inch-high, 8-digit LED display provide the resolution necessary to measure UHF signals. The IM-2420's 4-15-mV typical sensitivity allows counting of low-level signals. Trigger level control assures stable counting when noise is present, and provides more accurate measurement of complicated waveforms. Frequency measurements can be made by direct connection or by using the optional SMA-2400-1 swiveling telescopic antenna. The IM-2420 frequency counter can be wired for either 120- or 240-V ac operation. *Heath Company, Dept. 350-660, Benton Harbor MI 49022.* Reader Service number 480.

SQUELCH-TAIL ELIMINATOR

Circuit Electronics, Inc., of Salina, Kansas, is introducing three models of a repeater squelch-tail eliminator called the "tail-chopper." All models use temperature-compensated operational amplifiers and digital logic, feature 6-dB SINAD sensitivity, wide temperature range, LED to indicate squelching, and maintain normal hysteresis to 0.1 microvolt.

The TC-2100 is a universal module that can be connected to most repeaters to eliminate squelch tails. It has a squelch enable-disable function if needed for tone operation, simple hook-up for 12 V and discriminator, and transistor or relay out.

TC-2000 is a plug-in module to the rear of Regency's U10R UHF repeater. Simple one-wire hook-up eliminates squelch temperature problems. The existing squelch can remain functional and it does not affect tone operation.

The TC-2200 is a PC board with instructions and may be mounted inside a receiver in a repeater or mobiles.

For further information, contact *R. L. Hruska, 621 Bishop, Salina KS 67401; (913)-825-9463.* Reader Service number 483.

Ten-Tec touts two tuners.

200-WATT ANTENNA TUNERS

Two new antenna tuners from Ten-Tec feature two-inch, 47-tap toroids with silver-plated 18-gauge wire and tape selectors. Used in a wide-range "T" network with variable capacitors, the toroids permit vernier tuning for easy, accurate adjustment.

The tuners match dipoles, inverted vees, long random wires, windoms, beams, rhombics, mobile whips, Zepp, Hertz, and similar antenna types over a frequency range of 1.8 to 30 MHz.

A front-panel five-position antenna selector switch offers a choice of dummy load, one of three different antennas, or tuner bypass for one of the antennas. Also, one antenna may be a long-wire type.

The tuners will match conventional 50-75-Ohm unbalanced outputs to a variety of unbalanced or balanced load impedances. A built-in balun converts one antenna to a balanced configuration if desired (maximum balanced load on 160 and 80 meters is 500 Ohms). Power ratings are 200 Watts, rf, intermittent, 100 Watts continuous (useful for any transceiver with input power up to 200 Watts).

Model 228 has a built-in swr bridge, forward/reverse switch, sensitivity control, and a meter which indicates swr ratios between 1:1 and 5:1. Size is 3-5/8"H × 10-1/2"W × 7-3/4"D; weight is 3-1/2 lbs. Model 227 is identical but without the swr bridge. Size is 3-5/8"H × 8-1/4" W × 7-3/4" D. *Ten-Tec, Inc., Highway 411 East, Sevierville TN 37862; (615)-453-7172.*

PACKAGING AND BREADBOARDING MATERIALS BROCHURE

A new 12-page brochure from Vector Electronic Company describes 109 professional electronic packaging and breadboarding products that are

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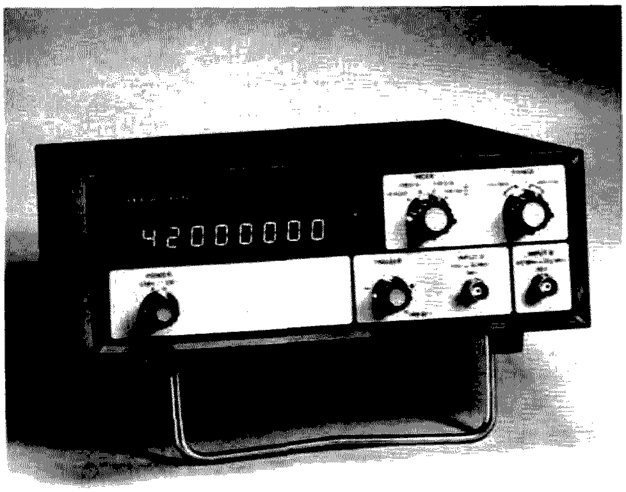


The Heathkit® 512-MHz portable frequency counter.

Tail-Chopper squelch-tail eliminator from Circuit Electronics.

The ZL/DF Special

—your next T-hunt could be a hare-raising experience

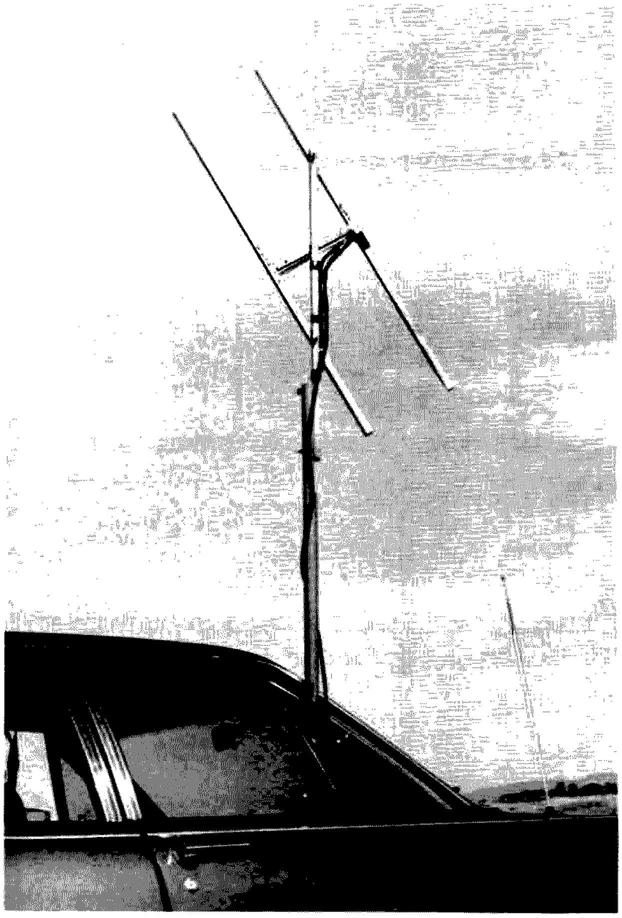
Jane Rice AD6Z
3130 Morningside Drive
Oceanside CA 92054

When our local radio club formed a two-meter T-hunt group, my OM and I decided, after tagging along a few pleasant Sunday afternoons, to put together some sort of simple antenna and join in on the fun of rabbit hunting. We noted that the most successful hunters in the group took up pursuit with four-element quads or yagis. However, we also noted that a four-element quad or yagi has a boom length of about six feet and that the various home-brew devices used to attach this impressive but awkward length to a vehicle looked a bit tricky to construct.

Willing to put out a moderate amount of effort, we agreed that any antenna we built would require no complicated car mounting, that it would be light and small, that it could be flung together cheaply and easily in a few spare hours, and that it would aim us generally in the direction of a hidden transmitter.

Since we had no experience building direction-finding equipment, we didn't realize that our specifications weren't easy to fill until we'd assembled several trial configurations. With most, we used up a lot of gasoline and the rabbits got away.

We tried loops, but had no luck getting a sensor to choose between the two major lobes in the loop's response pattern. Then we tried phased quarter-waves that stubbornly exhibited a radiation pattern reminiscent of a lace doily. Finally,



The completed antenna is mounted through the wind-wing of a car.

Mathematical premises used in this article

A. λ in free space = 984 ÷ MHz (for feet) or 11808 ÷ MHz (inches).
B. $\lambda/2$ in free space = 492 ÷ MHz (for feet) or 5904 ÷ MHz (inches).
C. K-factor of 300-Ohm twinlead at two-meter frequencies = .965.
D. Velocity factor of 300-Ohm twinlead = .82.
E. Length of $\lambda/2$ folded dipole made from 300-Ohm TV lead-in at 146.5 MHz is 5904 × .965 ÷ MHz = 38-7/8".
F. Velocity factor of RG-59/AU coax = .66.
G. Electrical $\lambda/4$ of RG-59/AU at 146.5 MHz is: (11808 ÷ 4 × .66) ÷ 146.5 MHz = 13-1/4".

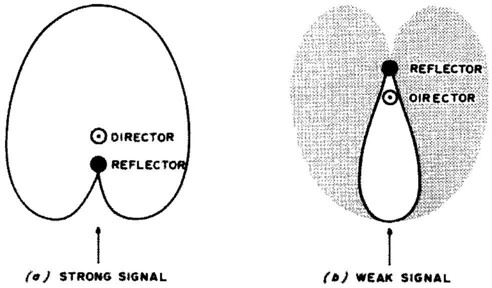


Fig. 1. Response pattern of ZL special. In (a), the director and reflector are positioned so that the null indicates the direction of a fairly strong transmitted signal. In (b), the antenna has been rotated 180 degrees to get a peak bearing on a very weak signal. Gray areas represent that part of the normal response pattern that is lost when receiving weak signals.

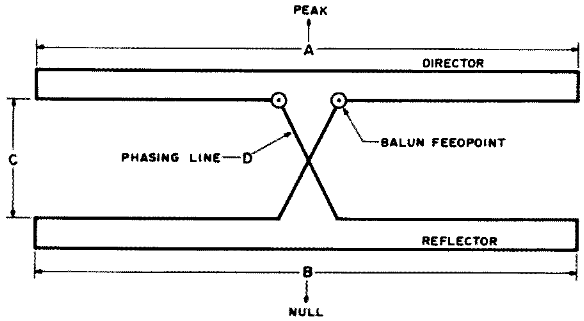


Fig. 2. The ZL Special is composed of two phased driven folded dipoles made from 300-Ohm twinlead. The driven director is 4.4% shorter than a half-wave element and the reflector 1.7% longer. Formulas for dimensions in inches: A = 5446 ÷ MHz; B = 5794 ÷ MHz; C = 1266 ÷ MHz; D = 1266 ÷ MHz. Dimensions for 146.5 MHz are: A = 37-1/8"; B = 39-1/2"; C = 8-5/8"; D = 8-5/8".

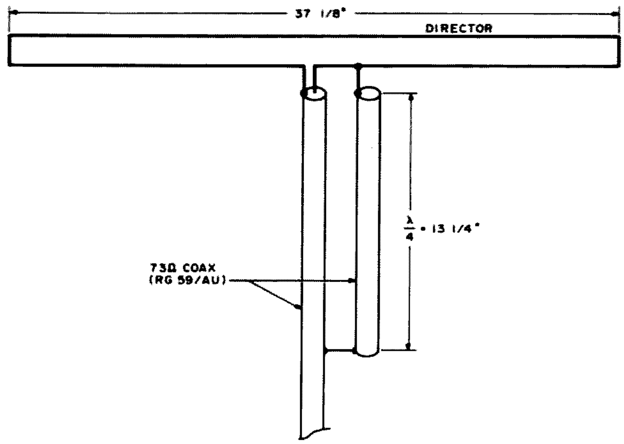


Fig. 3. Dimensions given for the 1-to-1 balun are for 146.5 MHz using coax with a velocity factor of .66. For other frequencies, balun length in inches is calculated from 2952 × .66 ÷ MHz.

when we were on the verge of reconsidering quads and yagis with a less critical eye, one of the more knowledgeable old-timers in the area recounted his successful T-hunting experiences using a two-meter ZL Special and suggested we try one of those.

In an old edition of *The ARRL Antenna Book* and in further reading (see references), we found plans for low-band horizontal ZL Specials. Scaling one down to two meters and upending it to a vertical position seemed to present no problems, so we built it. Happily, it worked, more than fulfilling our original optimistic requirements. The completed antenna shown in the photograph weighs one pound, has a turning radius of thirteen inches, and is easily disassembled.

Car mounting is accomplished by setting a wooden closet pole through the wind-wing and into a five and one-half ounce juice can that is screwed to the car floor. Cost of materials is under ten dollars and construction time under two hours.

As for aiming us in the right direction, we can claim without modesty that we have ferreted out our fair share of hares.

Response Pattern

The modified ZL Special presented here consists of two driven folded dipoles phased to produce a cardioid (heart-shaped) pattern. As seen in Fig. 1(a), this unidirectional pattern exhibits a very sharp null in received signal strength when the driven reflector is exactly between a transmitted signal and the driven director. This null gives a more precise indication of signal direction than the broader peak readings, so following the null makes best use of the antenna while DFing.

An exception occurs when the transmitted signal is extremely weak. In such cases, the sharp null pattern will be lost at the receiver, and it becomes necessary to rotate the antenna 180 degrees to follow peak readings. As the distance between hunter and rabbit narrows, the peak readings become broad and the antenna is again turned to utilize the null. The null will continue to indicate direction even when working extremely close to the hidden signal source.

Directivity and Gain

In addition to its compact size, the ZL Special has another unusual characteristic that makes it ideal for T-hunting: It combines excellent directivity with low gain. Front-to-back ratio is in the neighborhood of 22 dB while forward gain is only about 3 dB.

The low gain is an asset because, contrary to what is often assumed, it is more difficult to locate the source of a strong signal than that of a weak signal. A strong signal, when close enough, will saturate the receiver's front end and pin the signal strength meter regardless of the antenna's bearing, completely wiping out all DF capability.

One disadvantage of using quads or yagis for DFing is that each element that is added to sharpen directivity incidentally increases gain. Signal attenuators, an essential item with any T-hunt antenna, compensate for much of the problem; but given equal situations, a low-gain antenna such as the ZL Special will maintain its directivity closer to a signal source than a high-gain antenna.

Polarization

When first trying out the antenna, we assembled it so that polarization was vertical. Results were fairly good, but proximity to the car body caused some pattern distortion. This problem was greatly reduced by tilting the antenna framework 30 degrees from vertical. As a bonus, the array also seemed less apt to re-

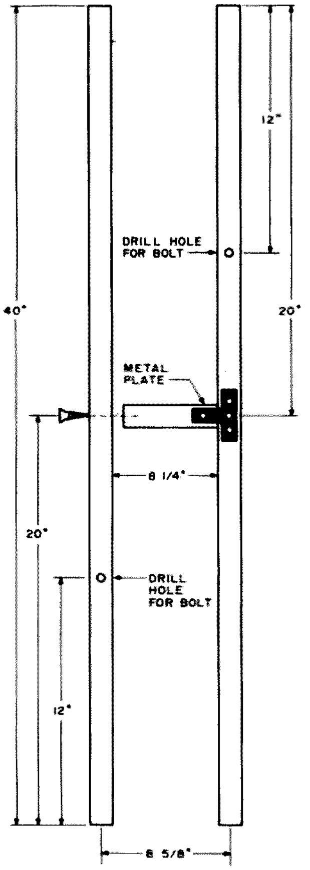


Fig. 4. The ZL Special is tacked to this framework made from ¾-inch-square wood. Dimensions given are for an antenna cut for 146.5 MHz.

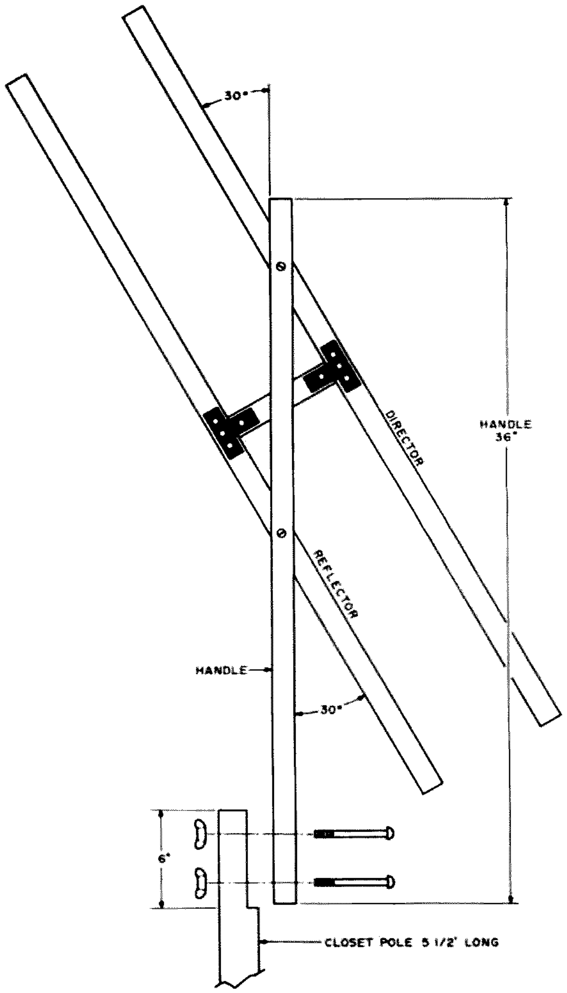


Fig. 5. The positioning of the "H"-shaped framework on its handle determines the tilt of the antenna. The handle is then bolted to a 1¼" wooden closet pole.

spond to signal reflections from nearby signposts, power poles, etc.

Spacing and Phasing

For the best front-to-back ratio, spacing between the two driven elements should be close to .123 wavelengths. Designs should never employ less than .1 wavelengths because pattern distortion and characteristic impedance changes will result.

In our antenna, .112 (one-ninth) wavelengths was used because it happened to be the spacing needed to accommodate the phasing line section. In calculating spacing (as well as element lengths), a K-factor of .965 is assumed for the twinlead at two-meter frequencies. The standard wavelength formula (984 × .965 ÷ MHz), with results divided by nine, is suitable. In Fig. 2, the formula given for spacing, although simplified, is identical except that the one-ninth wavelength will be in inches rather than feet.

The phasing line in the ZL Special acts as part of the transmission line. Its purpose is to provide, as closely as possible, the 135 electrical degree phase difference between director and reflector that is required for the cardioid pattern.

Assuming a velocity factor of .82 for the 300-Ohm twinlead, an electrical halfwave at 146.5 MHz is 492 × .82 ÷ MHz, or 2.75 feet. Then the 180 degrees in the half wavelength divided by 2.75 feet equals 65.36 electrical degrees per foot. Therefore, a piece of 300-Ohm twinlead that is .72 feet long will yield (by .72 × 65.36) 47 electrical degrees. This figure, when combined with a 180-degree twist in the phasing section (shown in Fig. 2), comes close to ideal phasing. Actually, 360° − (180° + 47°) = 133 degrees. The formula for phasing line length given in Fig. 2 was derived in the manner just described and will provide 133 electrical degrees at any chosen two-meter frequency.

The fact that the phase shift is two degrees less than ideal and that the element spacing is .011 wavelengths less than optimum is justified from a constructional standpoint. Note in Fig. 2 that the phasing line and spacing have the same dimension, making construction easy. If the ideal figures were carried to construction, the phasing line would turn out to be shorter than the space between elements, and the elements would have to be bowed in to make ends meet.

Construction

For antenna elements and phasing line, the use of lightweight 300-Ohm twinlead is recommended as it is easier to work with than a heavily insulated type. Formulas for dimensions and their application to 146.5 MHz are given in Fig. 2. Especially note the twist in the phasing section. A quarter-wave 1-to-1 balun, made from the same coax as the transmission line, is added at the director feedpoint to prevent unwanted currents from flowing on the coax transmission line. Details are in Fig. 3. The balun will not affect the impedance at the antenna feedpoint, generally reported to be about 70 Ohms. 73-Ohm coaxial cable (RG-59/AU) will provide a suitable match to both the antenna and a 50-Ohm receiver. When used for transmitting, the antenna exhibits an swr of 1.5 to 1 at design frequency and, compared to a dipole, is relatively broad-banded.

After the antenna is completed and the transmission line and balun soldered in place, the assembly is attached to its wooden support by driving tacks through the center of the twinlead. Electrical tape will suffice to hold the feedline and balun to the wooden handle. Care must be taken to maintain even spacing between the transmission line and balun, and spacers (about ½") may be necessary.

Construction details of the support framework and dimensions for a 146.5-MHz antenna are shown in Figs.4 and 5. The framework is a wooden "H" made from ¾-inch stock. The crossbar on the "H" is first screwed in place and then the joints are reinforced by adding narrow metal T-plates. The handle, of the same stock, is bolted to the framework at points that determine the 30-degree tilt. Make sure that the reflector, not the director, is bolted closest to the bottom of the handle. Finally, the handle is bolted to a 1¼"-diameter wooden closet pole that has one end rabbited to provide a flat surface.

After the juice can has been screwed to the car flooring and the antenna is in place, mark the pole at eye level to indicate the antenna's heading. A marker that can be felt as well as seen is convenient. We used a small rubber screw-in foot, like those found on the bases of radio gear, to indicate the direction of the null.

Since the highest point of the antenna will be about six feet above the roof of the car, keep a sharp eye out for trees with low branches and you will greatly extend the life-span of your ZL Special! Good hunting! ■

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1. American Radio Relay League, *The ARRL Antenna Book*, ARRL, Newington CT, Twelfth Edition, 1970, pages 214-215.
2. American Radio Relay League, *The Radio Amateur's Handbook*, ARRL, Newington CT, 48th Edition, 1971, chapters 13-14.
3. Jordan, Gary Blake WA6TKT, "Understanding the ZL Special," *Ham Radio Magazine*, Greenville NH, May, 1976, pages 38-40.
4. Kraus, John D., *Antennas*, McGraw-Hill, New York, 1950, chapter 11-4.

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A 49-MHz Repeater

—fun project

Any experimenter who has ever pondered the potential of the new license-free 49-MHz band can't help but see freedoms from regulations to experiment here that are denied in ham radio. For instance, a transmitter operating here isn't required to identify by callsigns, nor is it limited to any particular emission. While most hams might not consider this a handicap, an experimenter who requires a radio transmission of short range, as in the case of telemetry, can avoid a lot of inconvenience and cost by using 49 MHz instead of a regular ham band.

I was playing around with several inexpensive 49-MHz transceivers (the two-for-$20 variety) when the idea of a truly license- and restriction-free repeater came to mind. Now, these transceivers run about 20-40 milliwatts of power and have a range of about one-quarter to half a mile, depending on terrain. They have regenerative receivers which don't help the range much, but any VHF ham will agree that 40 mW with a proper antenna and a good receiver will cover distances considerably greater than this. All one has to do is look at the hundreds-of-square-mile ranges of certain repeaters in this country that don't use much more power to see the possibilities.

I didn't expect, or want, distances like this, but being an experimenter at heart, I took up the challenge of 49 MHz to see just what could be possible on this band.

Building the License-Free Repeater

The repeater transmitter was simple. One of the transceivers was sacrificed and altered to stay in transmit-only mode and modified to accept audio from a receiver instead of using its built-in mic. The original frequency of 49.86 MHz was changed by replacing the transmit crystal with one 30 kHz towards the band edge. A quarter-wave antenna was fashioned out of copper wire and the whole assembly enclosed within a six-foot piece of large-diameter PVC pipe. A waterproof connector allows power and audio to be fed to the transmitter through the pipe over a multiconductor cable. Rf chokes and capacitors at this connector bypass and keep down stray rf that could end up down at the receiver. This transmitter/antenna can now be mounted at a reasonable height. The antenna attached to the transmitter is an apparent legal requirement on 49 MHz, but it works to an advantage here.

The receiver used for the repeater was located indoors and connected to a vertical half-wave dipole separated from the transmitter by one hundred feet. It consisted of an old surplus URR-22 receiver with an Ameco CN 50 converter. The repeater transmitter offset from 49.86 caused no desensitizing. That's all there is to it. Notice that since there is no requirement for identification, there is no CW identifier. Also, since there is no requirement against a continuous carrier, the transmitter is left on continuously. The receiver has an added squelch so that the carrier remains quiet except when rebroadcasting a received signal. How simple could it be? No COR, no ID, no time-out timers!

The transceivers all come set to operate on 49.86, so the repeater receiver is tuned to this frequency. Since the transceivers have regenerative receivers, a change of 30 kHz doesn't require much, if any, tweaking to bring them on the new repeater channel.

How Well Does It Work?

With the antennas thirty feet up, communications have been consistent to one-half mile between units and over a mile on numerous occasions. A half-square-mile coverage is about the expected range, which isn't bad when considering that this is supposed to be low-power, license-free radio.

An added bonus to this system is that the continuous repeater carrier quiets the rush noise from the inexpensive regenerative receivers and acts like a squelch. Also, as long as the receiver is quieting, the operator is sure he is within range of the repeater.

I haven't polished the system up any more than described. A better solid-state repeater receiver, more attention to the transmit/receive frequency offset, better transceivers, and so on would no doubt improve the system. It should be obvious that such a repeater could lend itself well to events covering small geographical areas like hamfests, county fairs, or Boy Scout jamborees. No one needs a license to operate, the equipment couldn't cost less, and 49 MHz is free (for now, anyway) of any interference.

If not a repeater, I hope that this article will spark other interesting ideas for using 49 MHz, an experimenter's delight. ■

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802 Hulton Road
Verona PA 15147

TR-7400 Behind Bars

—something new in S-meters

One day while evaluating various LED bargraph displays at the workplace, my thoughts momentarily turned to ham radio.

"Hey," I thought. "This bar graph would make a terrific S-meter on my two-meter rig!"

But could it, and the circuitry, be made to fit? I was sure it could, as I have had the meter out of the TR-7400 to replace the lamp bulb. The only questions remaining were: (1) What is the drive level of the existing meter, and (2) could the drive level be used to drive the display without need of an extra amplifier?

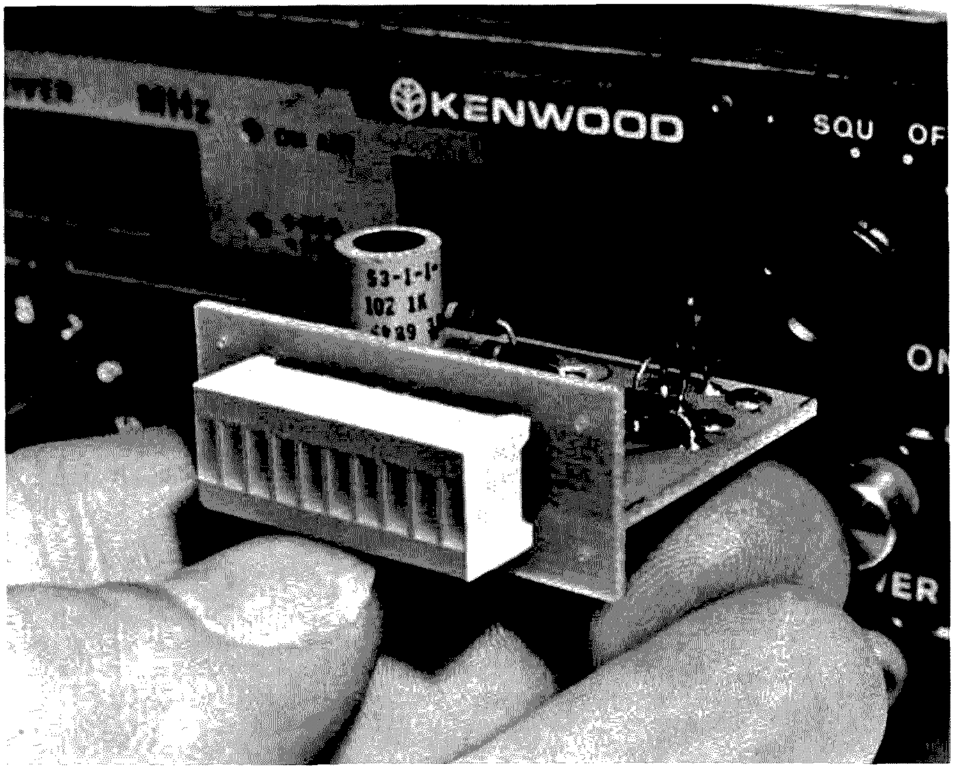

Photo A. Completed unit ready for installation. Note the two-board construction.

Upon arriving home that evening, a little tinkering with the rig was in order to determine the needed circuitry and circuit-board configuration for the conversion. I have always been one of those who has to build everything on a printed circuit board.

I found that the resistance of the meter was around 600 Ohms and that a dc input of 0.3 V was developed across it at a full-scale reading. I also discovered that this voltage increased to nearly 6 volts if the meter was taken out of the circuit. A quick look at the TR-7400 schematic revealed that a simple diode rectifier and capacitor circuit was used to drive the meter.

The circuit appears twice in the Kenwood, as the meter also reads relative output power in the transmit

mode. Each circuit has an adjustment pot inside the rig for trimming the meter. This feature could come in handy later.

Some further experimentation indicated that with a higher resistance load (greater than 600 Ohms), I could get the 1.2 volts needed to drive the bar-graph IC to full scale. I now knew that all the major questions concerning the conversion were answered. I then quickly started design of a PC board. The PC board quickly evolved into a pair of boards.

Sometime in the wee hours, the boards were made, tested, and installed solidly within the TR-7400. The new indicator functioned perfectly and looked as if it had been designed in from the start. The moving bars added quite a touch to the old rig.

The response time of the bar graph is much quicker than that of the old mechanical meter due to the lack of mechanical damping.

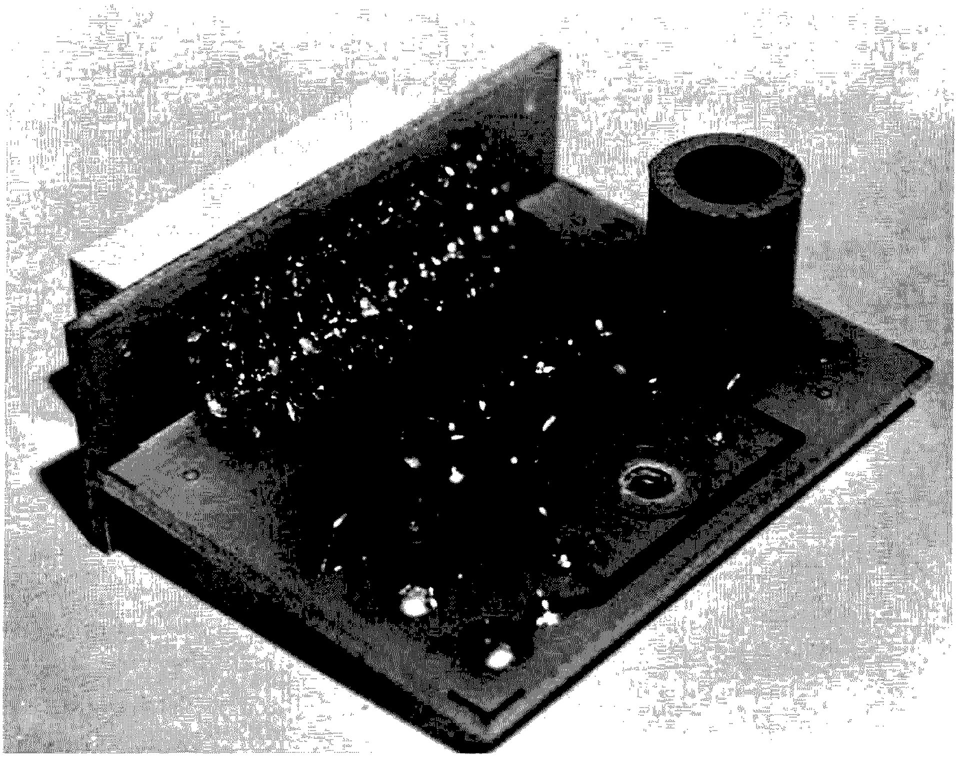

Photo B. The two boards joined using the rows of large pads. The IC is mounted underneath the board.

Circuitry

The heart of the circuit is the National Semiconductor LM3914 dot/bar display driver. This is an amazing IC in an 18-pin DIP. The LM3914 senses an analog voltage and drives ten LEDs, providing a linear graph-type display. All drive for the LEDs is self-contained within the IC, thus eliminating the need for external limiting resistors. LED drive control is provided, however, by selecting only one resistor value. Supply voltage may range from 3 to 15 volts without affecting display brightness. Some caution must be exercised at higher voltages, however, as dissipation in the IC may exceed the safe level. I used the regulated 5-volt source within the Kenwood to drive the display.

The schematic (Fig. 1) shows the circuit to be straightforward. The variable resistor and R1 allow some scaling of the input voltage for calibration. The values may be changed to suit other installations. Remember that 1.2 volts is needed at pin 5 of the LM3914 to drive it full scale. Resistor R3 deter-

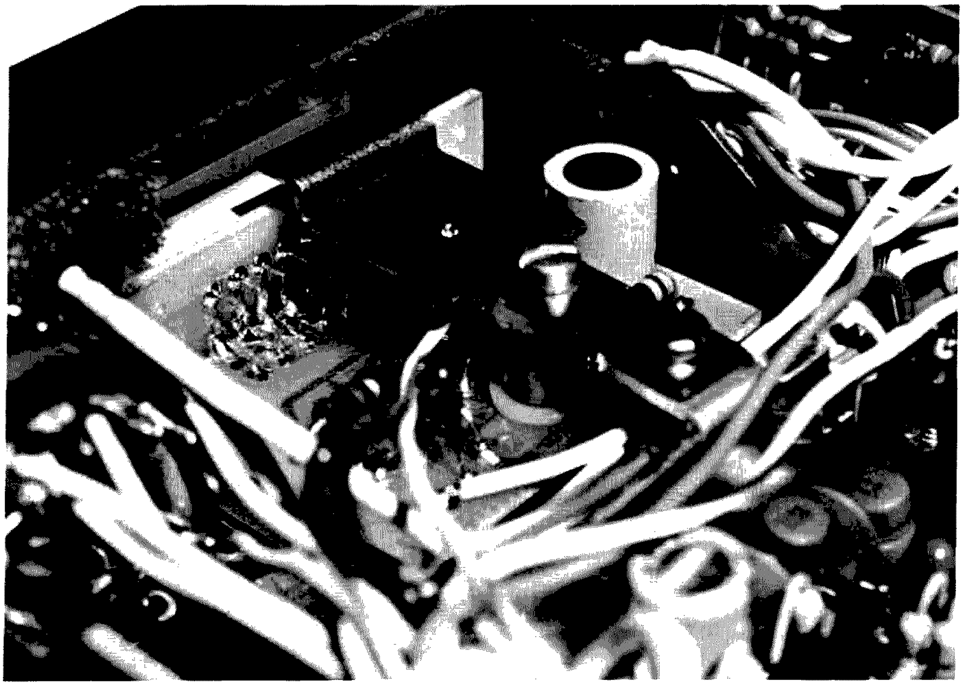

Photo C. Completed circuit installed within the 7400. About 4/10" is needed between the board and bracket.

mines the display brightness; ten times the current flowing in R3 will flow through an LED. The voltage at pins 6 and 7 is equal to 1.2 volts. LED current is 1.2 V/1k = 1.2 mA × 10 or 12 mA. R3 may be made larger if less current is desired. The jumper from pin 9 of the LM3914 to ground puts the display into the bar-graph mode.

Construction

As the circuit is uncomplicated, layout is not critical. I used the pair of small circuit boards shown in Photo A. The boards make a nice clean installation and ease the job of centering the display. In my unit, I mounted the IC on the nonfoil side of the board.

The resistors and trimmer are mounted on the foil side. This makes adjustments readily accessible. Also, the Kenwood has very little room beneath the meter opening.

Photo B shows how the two boards are mated and soldered in place using the flat foil pads on the boards. Be sure the boards are perpendicular and straight when soldering in place. An alternative mounting would be to use ribbon cable as an interconnect between the two boards. This would allow some freedom as to the location of the larger board.

Installation in the TR-7400

Before mounting the display into the rig, you should verify how far the old meter deflects for some reference input signal. Something that causes almost a full-scale reading is best. This will be used to adjust the new meter to compare with the old one. Remove the old meter, bracket, and connections to the meter. The hole in the center of the new meter will be used for mounting. A 4/10''-long spacer is needed between the board and the mounting bracket. One with a threaded #4 hole is ideal. The old meter bracket will need a hole drilled in it so the PC board can be attached using the spacer and screw. Take care in measuring the location of the mounting hole. You want the bar-graph readout to come right up to the front glass in the rig.

Adjustment

After satisfying yourself that the unit is mounted and aligned correctly, connect the black wires from the old meter to the minus pad on the circuit board. Connect the wire that was on the high side of the meter to the signal input on the board. A new wire must be run for the +5-volts connection. Connect a wire from the PC + input to the pin located on the left side of the rig behind the volume control marked "5 V". This is the internal regulated 5 volts. Trim off the old lamp wire so that it does not short out. Recheck all your work.

Turn on the rig and adjust the trimmer with your reference signal being received to obtain the same reading as you had on the old meter. Replace the cover, and that's it. Just one thought on the display. It is possible to insert ten small LEDs in place of the more expensive bar display. The appearance won't be as nice, but it's great for those on a budget.

Note: A kit of all components will be furnished for $13.75 ppd. The kit includes: MV 57164 display, LM3914, trimmer, resistors and capacitors, set of printed boards (drilled), and spacer. A set of boards can be ordered for $3.75 ppd.

Order from: MTEC WB3ATP, Box 17133, Pittsburgh PA 15235. (Pennsylvania residents add 6% sales tax.)■

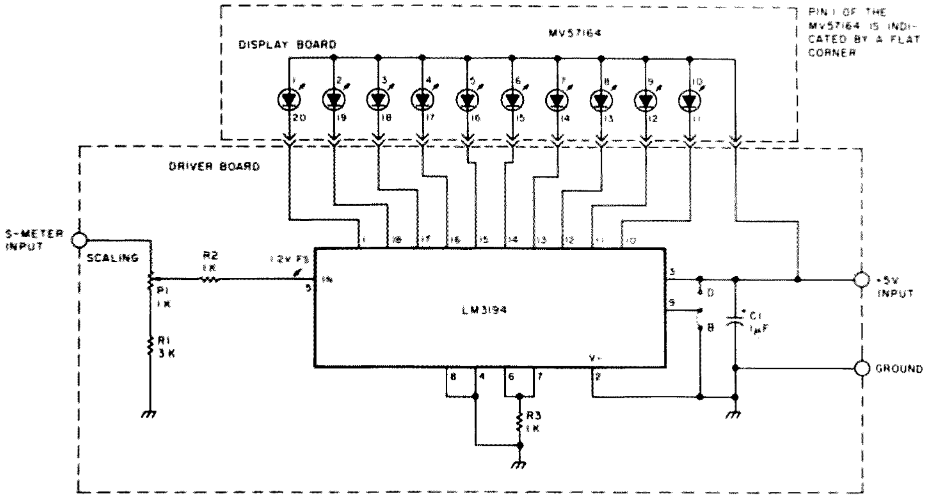

Fig. 1. Schematic of bar-graph S-meter.

The Last PL Generator

—this synthesized unit is the last one you'll ever need

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Many repeaters utilize a PL™ (private line) system to permit only limited access. If a person belongs to many repeaters, the cost of frequency-determining elements for a conventional PL tone gen-

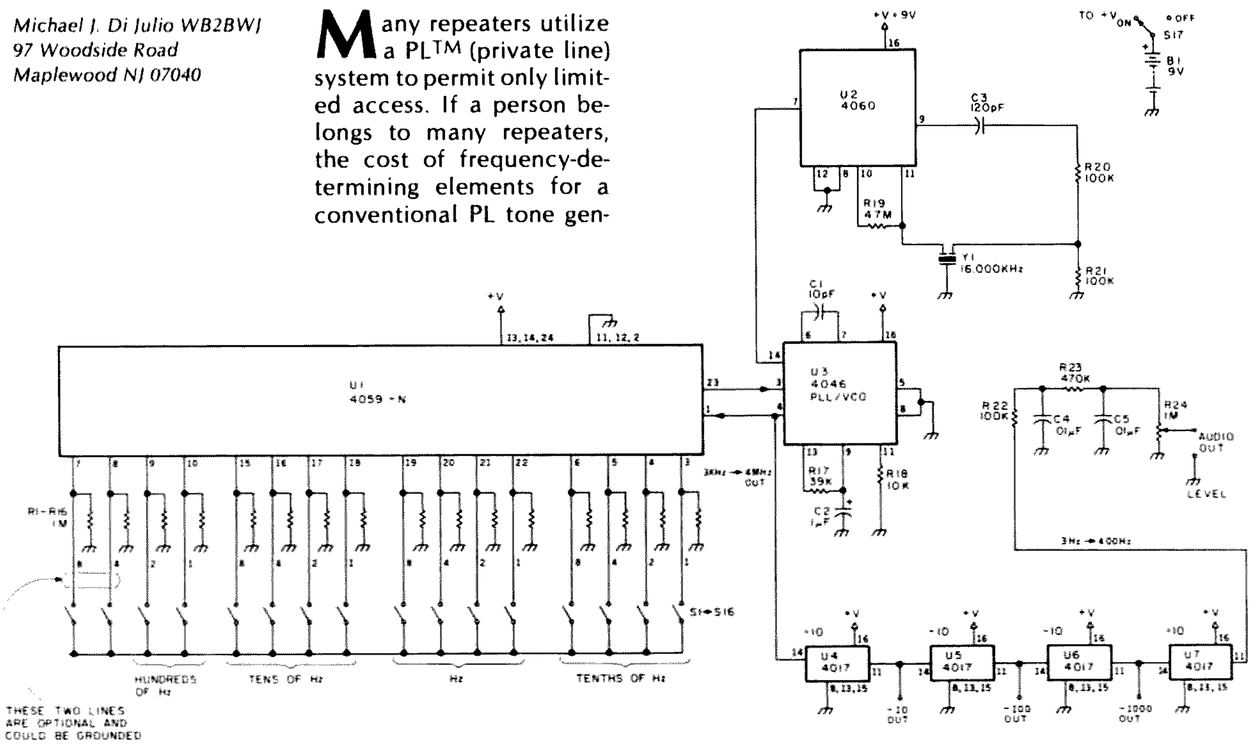

Fig. 1. Synthesized tone generator schematic.

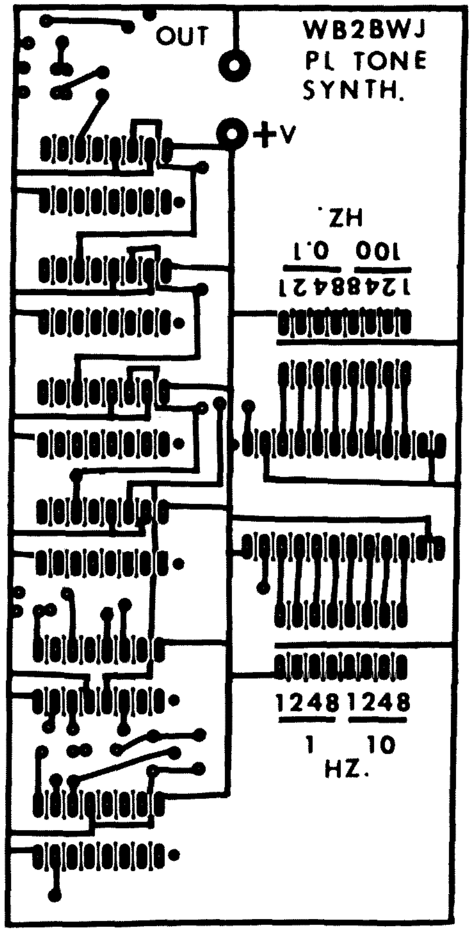

Fig. 2. PC board layout.

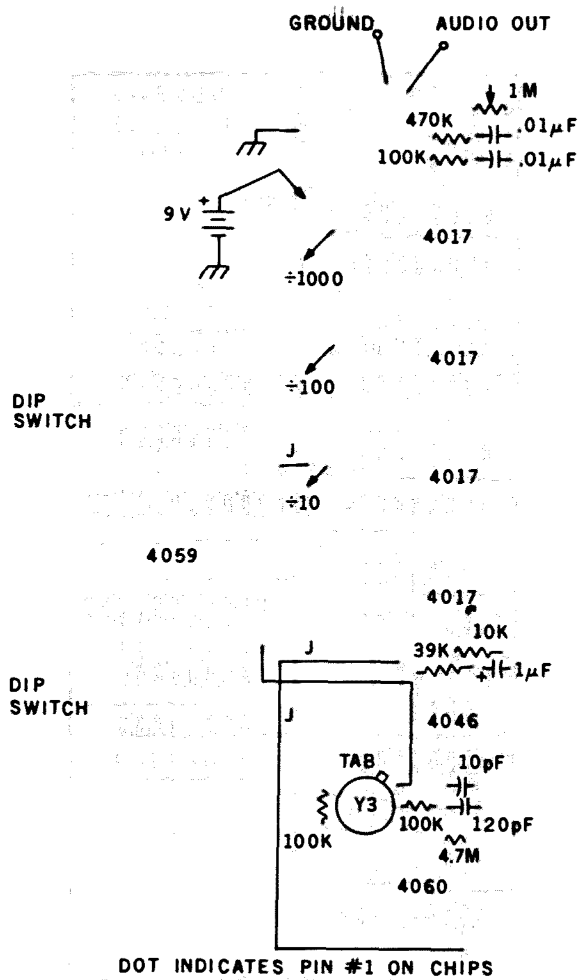

Fig. 3. Parts location.

erator can quickly get out of hand. Additionally, some clubs change their access tone periodically, and it would be convenient to have a synthesized tone generator that could be programmed using thumbwheel or DIP switches.

My design reflects the need for an inexpensive device that is easily programmed and that can generate stable tones in the frequency range of about 60 to 200 Hz. Table 1 is a listing of the common PL tone frequencies and their designators. As it happened, when I had finished my design I had a more versatile instrument that generated signals from about 4 MHz down to 0.3 Hz.

Refer to the schematic in Fig. 1. The device works as follows: The 4046 has an internal vco working in the range of about 600 kHz to 2 MHz. The 4060 is used as the reference source, starting with a 16-kHz crystal and dividing by 16 to generate a 1000-Hz reference which is fed to one input of the phase comparator of the 4046. The vco output of the 4046 goes to the input of the 4059 divide-by-n, and the output of the divider goes to the other input of the phase comparator. A phase-locked loop is thus formed, and the vco output is equal to (n)×1000 Hz, where n is the number programmed into the 4059. As the 4059 is set up, any number from 3 to 9999 can be set on the four thumbwheels or DIP switches. Therefore, the vco could potentially vary from 3000 Hz to 9.999 MHz. At 9 volts, most 4046 chips can work up to about 4 MHz. At higher voltages, frequencies up to about 6 MHz can be realized. If the device is to be used solely as a PL tone generator, S1 and S2 could be eliminated and pins 7 and 8 of the 4059 grounded, as the divide-by-n number will never go over 2000. I have included S1 and S2 in the event that

Designation	Frequency (Hz)	Designation	Frequency (Hz)
L1 or XZ	67.0	2B	118.8
WZ	69.3	3Z	123.0
LZ or XA	71.9	3A	127.3
WA	74.4	3B	131.8
L3 or XB	77.0	4Z	136.5
WB	79.7	4A	141.3
L4	82.5	4B	146.2
YA	85.4	5Z	151.4
L4A or YB	88.5	5A	156.7
ZZ	91.5	5B	162.2
L5 or ZB	94.8	6Z	167.9
1Z	100.0	6A	173.8
1A	103.5	6B	179.9
1B	107.2	7Z	186.2
2Z	110.9	7A	192.8
2A	114.8	M1	203.8

Table 1. Subaudible tones and designations.

the user wishes to go higher than 2.999 MHz in frequency.

The output of the vco is then divided by 10,000, using four 4017 divide-by-10 chips. The pulse output is then fed through a low-pass filter consisting of R22, R23, C4, and C5; the audio level to the radio's microphone input is adjusted with R24. It is important to note that the output of the low-pass filter is not constant with frequency, and so the adjustment of R24 may have to be changed if a radical change in frequency is made in order to maintain a certain deviation. Pads have been provided on the PC board so that the vco output divided by 10, 100, and 1000 is available.

If the device is configured as a pulse generator, a switch could be provided to make these outputs available. For example, with the switches set to 1000, 1 MHz, 100 kHz, 10 kHz, 1000 Hz, and 100.0 Hz are all available with four decades of precision.

The construction of the generator is straightforward and involves only a few discrete components. Figs. 2 and 3 provide PC board layout and parts location. Provision is made on the board for the two 16-pin DIP switches. Numbers have been etched on the board beneath the switches to indicate which BCD digit a particular switch selects. A 1-megohm resistor is required from each of the 4059 program inputs to ground (R1-R16). These resistors can be soldered underneath the board from the switch contacts to the ground buses provided. If the thumbwheel switches are used, eliminate the DIP switches and simply connect the appropriate wires to the holes where the DIP switches would reside.

In conclusion, this project represents an inexpensive state-of-the-art design of a very useful device. In addition to the previously mentioned uses as a PL tone generator and a pulse generator, it can be used as a programmable reference or as the tone generator for a multi-tone FSK modem. ■

Parts List

R1-R16	1 megohm
R17	39k
R18	10k
R19	4.7 megohm
R20-R22	100k
R23	470k
R24	1-megohm subminiature PC-mount potentiometer
Note: R1-R23 are 1/4-W or 1/8-W resistors, 10% tolerance	
C1	10-pF ceramic disc
C2	1-uF tantalum
C3	120-pF ceramic disc
C4,5	0.01-uF ceramic disc
U1	4059
U2	4060
U3	4046
U4-U7	4017
Y1	Statek 16.000-kHz crystal, type SX-1V (available from author for $6.00 postpaid).
S1-S16	Two 16-pin DIP switches or 16 toggle switches or four BCD thumbwheel switches
S17	SPST switch
B1	9-V transistor radio battery

PC boards are available from the author, tinned and drilled on G-10 epoxy, for $15.00 postpaid.

An End to Repeater Time-Outs

—with the IC-211

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When the Hong Kong Amateur Radio Transmitting Society installed our first professional 2-meter repeater recently, the transmission timer was set to two minutes. I decided that I didn't want the ignominy of timing out the repeater, so, after a little thought, I evolved a circuit which fits snugly inside the IC-211 microphone and gives me a 10-to-15-second warning before time-out occurs.

Very little modification needs to be done in the IC-211. All that is required is a 12-volt source attached to pin 3 of the microphone socket. This is obtained from J5 of the power unit.

Some modifications are necessary in the microphone plug. There are three wires and a screen braid. The screen must now be wired to provide the only ground wire for the microphone. The now spare wire is used to carry the 12-volt supply to the time-out unit.

The values of R2 and C1 may need slight adjustment to compensate for variations in voltage and capacitance. It should only be necessary to select R2 to give a time-out alert 10-15 seconds before the repeater switches off.

The green LED is mounted on the top of the hand microphone and it is very noticeable when it starts to flash its warning. ■

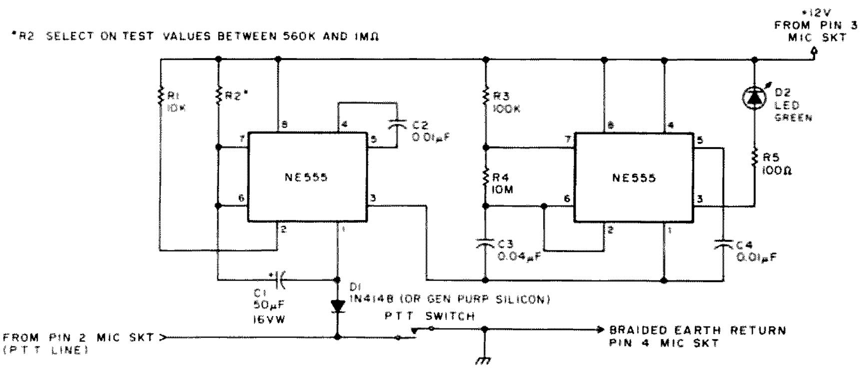

Fig. 1. Time-out circuit flashes LED after one minute, forty-five seconds.

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The History of Ham Radio
—part XII

Reprinted from QCC News, a publication of the Chicago Area Chapter of the QCWA.

The assignment to radio amateurs of the short waves below 100 meters brought about a general awakening to the value of this spectrum. In 1924, the broadcasting industry exerted great effort toward the adaptation of short wavelengths to give their programs added coverage to distant listeners by interconnecting stations across the country.

Secretary of Commerce, Herbert Hoover.

The Hoover Conference

The Hoover conference was scheduled to meet in the fall of 1924. Invitations were directed to all radio groups interested in the hearings, in which existing technical radio problems were to be explored. The assembly was to make recommendations to the Department of Commerce for important revisions of then-existing wavelength assignments, allocations, limitation of power, division of time, and such problems which relate to general reduction of station interference. Of major importance, however, was the subject of shortwave usage by broadcasters and commercial stations. The amateurs, supported by the Department, with their constant experimenting with the higher frequencies, had been providing the industry with interest in these higher-frequency ranges, demonstrating their effective capabilities. The radio law of 1912 had given the amateurs, through assignment, the use of all waves below 200 meters.

The Hoover conference was called on to revise and to somehow "make amends" to a region in the spectrum which proved to be not only large but of great future value.

The conference sessions continued from October 6 to 10, 1924. Although radio broadcasting held the center of the stage as far as the broadcasters and listeners were concerned, the radio amateur had by all odds top interest in the outcome of the deliberations. The situation, with about 600 broadcasting stations on the air, with foreign stations all over the world striving to be heard, with a wavelength revolution having set in, and with practically no worldwide rules and regulations to give direction, loomed chaotic in the radio broadcast world.

All the higher frequencies below 200 meters, formerly regarded as unsuitable for commercial purposes, were now eagerly sought as of major importance for DX transmissions. The Hoover conference was set to scrutinize these shortwave regions.

The use of spark transmission, although not ruled out completely by existing laws, nevertheless received its doomsday with the announcement at the conference that all spark should be discontinued by amateurs as well as the commercials. Spark discharges of whatever type and kind caused much of the interference encountered and should be avoided.

The conference gave the broadcasters five wavebands in the short-wavelength region for use primarily for relay broadcasting. All actions taken at the conference were recommendations to the Department, pending further outcome from future legislation.

1924 Hoover Conference Frequency Allocation

Meters	Kilocycles	Allocation
200—545	550—1,500	Broadcast
150—200	1,500—2,000	Amateur (160 meters)
137—150	2,000—2,200	Point to point
120—137	2,200—2,500	Aircraft
109.2—120	2,500—2,750	Mobile
103.3—109.2	2,750—2,900	Relay broadcasting
85.6—103.3	2,900—3,500	Public service
75—85.6	3,500—4,000	Amateur (80 meters)/Army mobile
66.7—75	4,000—4,500	Public service/mobile
60—66.7	4,500—5,000	Relay broadcasting
54.5—60	5,000—5,500	Public service
51.7—54.5	5,500—5,800	Relay broadcasting
42.8—51.7	5,800—7,000	Public service
37.5—42.8	7,000—8,000	Amateur (40 meters)/Army mobile
33.3—37.5	8,000—9,000	Public service/Mobile
30—33.3	9,000—10,000	Relay broadcasting
27.8—30	10,000—10,800	Public service
25.8—27.8	10,800—11,600	Relay broadcasting
21.2—25.8	11,600—14,000	Public service
18.7—21.2	14,000—16,000	Amateur (20 meters)
16.7—18.7	16,000—18,000	Public service/Mobile
5.3—16.7	18,000—56,000	Beam transmission
4.7—5.3	56,000—64,000	Amateur (5 meters)
0—4.7	64,000—	Beam transmission

The conference concluded by listing wavelengths in effect for one year. All wavelengths from zero (0) to 3158 meters were allocated. The radio amateurs retained the previously-assigned wavebands as confirmed, with minor changes, as shown in the box.

The government departments were authorized to work in the wavebands below 150 meters "with due regard to the authorized use given to other legitimate services."

To be noted was the method of allocating wavebands. Namely, the dovetailing of assigned ranges in such a manner that the frequencies in one band were octaves of those in the preceeding band. This manner of band distribution for all services receiving assignments would, therefore, cause disturbances only to the respective assignees operating from one band to the other. Note the distribution, for instance, for the radio amateurs, all being in harmonic relation:

1.5 MHz to 2.0 MHz
3.5 MHz to 4.0 MHz
7.0 MHz to 8.0 MHz
14.0 MHz to 16.0 MHz
56.0 MHz to 64.0 MHz

Theory of Frequency Propagation: Still a Mystery?

There existed an unanswered question in the minds of most. Why are 100-meter waves able to carry across oceans at night with little power? This problem baffled the scientists and radio experimenters in the field. Dr. A. E. Kennelly of Harvard University suggested that there must be conducting layers in the upper regions making possible the transmission of radio waves. The layers most likely represented ionizing action to accomplish such results at long distances. As Professor Kennelly theorized, the greater volume activity of the higher-frequency waves enabled them to cut a sharper conducting boundary surface in the upper air than was possible for the longer waves of the lower frequency. The longer waves had a greater tendency to follow the surface of the earth, thus restricting their efficiency.

The Hoover/White Bills

The changing conditions surrounding radio, especially in the field of broadcasting, definitely necessitated comprehensive legislation by Congress. Hoover had in mind a bill in the form of emergency legislation. He thought of the White Bills which had been pending as holdovers from the previous Congress. In communication with Congressman White, his proposal was submitted in the following form to satisfy the public interest until final legislative policy could be inacted in Congress:

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that it is hereby declared and re-affirmed that the ether within the limits of the United States, its territories and possessions, is the inalienable possession of the people thereof, and that the authority to regulate its use in interstate and/or foreign commerce is conferred upon the Congress of the United States by the Federal Constitution."

"That Section 1 of the act of Congress approved August 13, 1912, entitled, An Act to Regulate Radio Communication, is hereby amended by adding at the end of said section the following: The wavelength of every radio transmitting station for which a license is now required by law, its power, emitted wave, the character of its apparatus, and the time of transmission, shall be fixed by the Secretary of Commerce as in his judgment and discretion he shall deem expedient, and may be changed or modified from time to time in his discretion."

The pending White Bill was temporarily sidetracked. The National Association of Broadcasters could hardly disagree with Mr. Hoover's suggestion, so long as he was Secretary, and so long as unfair decisions could be appealed with the consent of the present Secretary.

The amateurs responded by stating that, although the bill needed amending by limiting the life term or by placing discretionary powers into the hands of some appointed radio commission to provide appeals from unfair decisions, no further suggestions would be forthcoming.

A Memorable ARRL Undertaking

The evidence of the popularity and the splendid results obtained with shortwaves in the hands of amateurs was clearly exemplified through the experiences conducted jointly with the United States Navy and the ARRL in the summer of 1925.

A shortwave station, call letters NRRL, was placed aboard the USS Seattle, flagship of the Navy fleet operating in the Pacific waters. ARRL traffic manager F. H. Schnell assembled the transmitter and receiver along customary amateur radio lines, typically breadboard but compact. Schnell was put in complete charge of the floating station, which was stashed in a small cubbyhole on the compass shack of the ship. There was no other vacant space on board. Schnell strung a single #12 wire vertical antenna up in the rigging of the ship. The Hartley circuit used operated in the 20, 40, and 80 meter bands. For a period of six months, Schnell, as sole operator, made almost daily contacts everywhere. He convinced the Navy personnel that long-range transmissions with low power could consistently outperform on short wavelengths, and had definite value over any of the long wave installations aboard ship.■

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Half a Loaf

— charger for 6-volt batteries

Gates 6-volt, sealed rechargeable batteries are available through hardware stores and other suppliers. One of these batteries has a 5 Ampere-hour (Ah) capacity. These can furnish standby power for small transceivers and could be used on Field Days or for other remote applications. The sealed batteries do not have the explosive gas problems associated with ordinary lead-acid car batteries and, hence, can be used safely indoors. I use two 6-volt, 5-Ah batteries in series to power a small transceiver.

Consider the battery charger circuit shown in Fig. 1. Two outputs are provided to charge two 6-volt, 5-Ah batteries at a time. One of these outputs can be left disconnected if only one battery needs to be charged. The two 12-volt transformers step down the line voltage to the proper battery charging voltage. Note the alternate primary connection for 220-volt operation. Diodes D1 and D2 change the ac to dc for battery charging. Resistors R1 and R2 limit current for proper fast-charging. Lamp L1 serves a dual function: It limits the current when trickle-charging and provides a visual indication that trickle-charging is occurring. The timer terminals short out the lamp for fast-charging.

Parts layout is not critical, except that R1 and R2 should have adequate room to dissipate their heat when fast-charging is used.

The batteries may be left on trickle-charge indefinitely. The timer setting should be reduced to about 4 hours when charging only one battery. Note that when the timer is timed out, the batteries are automatically placed on trickle-charge. A single battery also can be left on trickle-charge indefinitely. ■

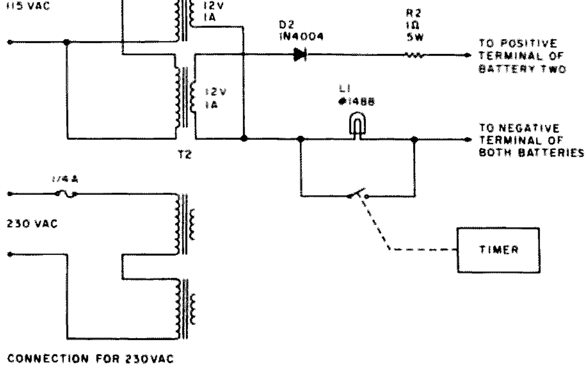

Fig. 1.

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The Great Aluminum Cover-Up

—how to paint the stuff

Editors' Note. Various potentially dangerous chemicals are used in cleaning and preparing aluminum for painting. Along with the author's suggestions, remember to provide proper ventilation of your work area and that many chemicals can damage skin and eyes. Also, acetone and lacquer thinner are highly flammable. 1-1-1 trichloroethylene may be more difficult to obtain in hobbyist quantities but is one of the non-flammable "safety solvents." Above all, if you are not sure of a chemical's risks, assume the worst. Either find out how to use them safely or don't use them!

Let's face it, aluminum is hard to paint. Sometimes we'd rather switch than fight.

Wood cabinets are great if you want the antique look, but it doesn't fit in well with the rest of your modern gear—and the shielding properties are not the best. Steel takes paint easily, but the material is hard to work with. Drilling is okay, but the stuff sure dulls a nibbling tool fast. Also, bending a fair-sized piece is more than my small brake can hack. Sheet steel is not the most readily available material for the home hobbyist, anyway. Aluminum is the ideal material to work with, if only it could be finished easier.

There is, of course, the trend toward plastic covering materials. Although dry transfers will adhere reasonably well to plastics, decals can be a problem. Also, the available textures and colors may not suit your needs.

There is the old standby of etching in a lye bath, but I get tired of all the satin aluminum panels staring me in the face, and sometimes gray stains which are not removable appear during the process. A good etch involves many of the same steps I'm going to cover below, so why not paint? The fact is, it *is* possible to paint aluminum reliably.

I began to understand the secrets of painting aluminum when I started construction of a home-built airplane. Aircraft people worship aluminum for its structural properties, so they had to learn to put on finishes that would not come right off. The primary secret of this process is that *cleanliness is next to godliness*! You will not get paint to stick to aluminum if any grease or oil is left on the surface.

There are two types of cleaning agents useful for cleaning aluminum. One is a solvent cleaner, such as acetone or trichloroethylene. The other is a detergent cleaner. Although the latter is generally a more powerful degreasing agent, it does react with aluminum and it has other problems. The more powerful detergents are quite caustic and combine chemically with aluminum. This is not always bad, but you may not want that action. Also, whereas solvents will evaporate completely from a surface, the detergent may leave a soapy residue. (You may clean off this residue with a solvent.)

As a general rule, keep the aluminum panel or piece reasonably clean as you work with it. Of course, fingerprints are inevitable, but don't plop the piece in a grease smudge when you set it down, and *never* leave a piece of aluminum sitting on a concrete floor because concrete and aluminum react strongly.

When all the drilling, cutting, and filing are done, you are ready for finishing. Clean the part in a mild detergent. Rinse thoroughly with plenty of water. Wait—don't pick up that piece! Even if you think your hands are clean, oil will appear on your skin very rapidly. From this point until the piece is primed, it must not be handled with bare fingers. Although paper towels can be used if you are careful, I recommend wearing plastic or rubber gloves.

The next step is called chemical conversion. The idea is to replace the surface layer of aluminum with some chemical to which the pain will adhere better. Although there are special mixtures sold for this purpose, they are not usually easy to come by. The easiest and cheapest way I have found is to use a product called Aluminum Jelly (although Naval Jelly also will work). This stuff is found in most hardware stores.

Brush the goop on, let it sit for a few minutes, and then rinse it off, using lots of water. You won't notice any change of appearance at this point. Next is a two-step cleaning process. Again use the mild detergent, followed again by a thorough rinse. Now, clean it with a solvent cleaner, such as lacquer thinner or trichloroethylene. Unfortunately, this immediately raises a problem. These solvents will probably dissolve your gloves! For this step you must use your bare hands, handling the aluminum part with a paper towel. Now we are ready to paint.

Aluminum must be primed with a zinc chromate primer. Don't settle for anything else. There are two kinds of zinc chromate primer. One is yellow, the other is green. The green stuff is recommended for aluminum, but unfortunately it is hard to get. The yellow kind is found in most hardware and paint stores, and will work, although it should be your second choice. Try to find the green primer at aircraft supply

stores. It is available in spray cans.

Applying the primer calls for a good spraying technique. The primer dries pretty fast, so you can give the piece a quick, light coat, wait one or two minutes, and then give it a heavy coat. This helps to prevent runs. If after the piece dries you have any runs, "orange peel," or dust in the finish, sand carefully with number 600 sandpaper. If you have to sand, remember to wear gloves, and do a follow-up by cleaning with isopropyl alcohol. This solvent will remove a reasonable amount of crud, while not dissolving the primer.

Now you are ready for painting. If spraying, I recommend that you buy the type sold for painting plastic model airplanes. There is a tremendous selection of colors available, both matte and glossy. More important, however, is the spray head. These spray cans have heads with tiny holes which give an extremely fine spray, producing a very smooth finish. After spraying, allow at least twenty-four hours for drying, especially if you are dealing with more than one color.

Next, letter the panels with dry transfers or decals. Whichever you use, they should be protected by a clear finish. So, again from the model paint counter, use either a clear matte or clear gloss spray. Be careful when spraying a clear finish, because it is very easy to put it on too thick. Use very thin coats, especially on the matte. The matte will dry in a few hours. The gloss should be put on until it first begins to look shiny, and then it should not be handled for twenty-four hours.

There, that wasn't hard, was it? It was? Yes, but aren't the results worth it? ■

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Waltham MA 02154

Home-Brew X-Band Wavemeter

—indispensable test gear for microwave mavens

The need to know the operating frequency of an amateur signal in the X-band assignment can be met with an adjustable cavity wavemeter and a detector. The cavity can be adjusted so that it accepts a small amount of power from the transmitter, and the detector, which is coupled loosely to the cavity, "sees" this energy and converts it to a small current that will operate a microammeter, which serves as a resonance indicator.

The wavemeter must have some sort of dial which can be calibrated in frequency. The accuracy of this calibration will depend upon many factors, such as the temperature stability of the cavity, the resettability of the adjusting system, and the exactness of the calibration reference. There are others, but these are the three which will concern us while constructing a suitable unit. The other problems will become evident as we move along.

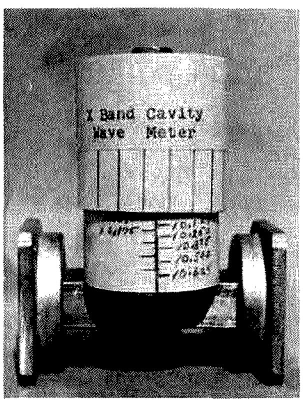

Photo A. Cavity wavemeter for X-band.

A cavity wavemeter is a parallel resonant circuit (see Fig. 1). You have used these devices as traps in the output of your transmitters on the lower frequencies and in many other circuits of your equipment. The operation of a microwave unit isn't different from those. The Q of the circuit in which it is used and the Q of the wavemeter itself make the difference for a calibrated frequency reference. A microwave cavity such as the device we are about to construct can have a working Q of nearly 3000. The working Q will depend upon the loading of the cavity and several other factors.

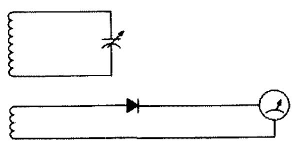

Fig. 1. Parallel resonant equivalent circuit of wavemeter.

An important limitation to recognize is that the device we are making will put you within the band limits, but it is not an absolute frequency meter.

A cavity wavemeter circuit diagram might look like the circuit shown in Fig. 2. A difference in the circuit when using waveguide for the transmission line will be, for example, that the coupling loop in Fig. 1 is a one-turn link to the tank coil. In the microwave configuration we will use, this is simply a small hole in the E-plane wall of the waveguide. The diameter of the hole determines how much coupling there is to the tank circuit, which, in our case, is the cavity. The diameter of the hole controls coupling and many other factors. It must be placed carefully so that the match to the transmission line will not be upset.

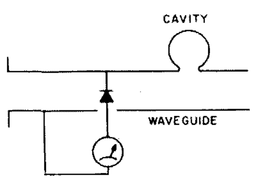

Fig. 2. Cavity wavemeter circuit diagram.

Now, let us examine the construction of a cavity wavemeter for X-band. (See Fig. 3.) The cavity we will construct is, in microwave parlance, a right circular cylinder cavity operating in the TE_{011} mode. It is mounted on the E-plane of an X-band waveguide, off center so that the center of the cavity will sit directly centered over a hole in the waveguide. This hole is called an iris hole. The remainder of the cavity bottom, which hangs over the waveguide, is covered with a brass half-circle soldered in place. This is shown in

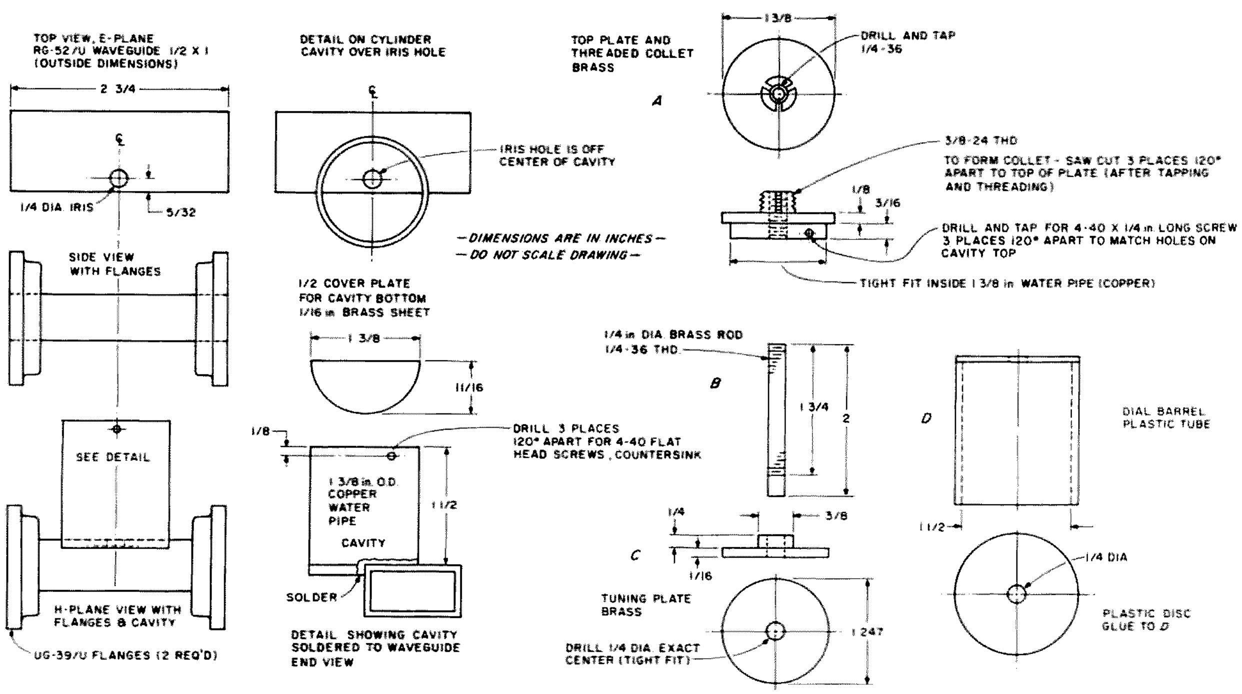

Fig. 3. Construction details for cavity wavemeter.

the photos and drawings accompanying this article.

Tuning of the cavity is accomplished by varying its length. This is done by moving a circular plate longitudinally within the cavity cylinder. A lead screw fastened to the circular plate serves as the device to move it into the cavity. The lead screw must have very fine threads, and the bushing which guides it also must have threads that fit well. A set of three cuts equally spaced around the diameter of the bushing will serve as a collet-threaded bushing when fitted with a small compression nut and lock. This particular part of the construction should be given great care since it directly affects the resettability of the wavemeter. In a commercial unit, a micrometer barrel often is used to control the circular plate motion, giving a high order of accuracy.

In the design shown, a barrel similar to a micrometer was used. It is larger, however, allowing the calibration to be inscribed more easily—and for me to read without my glasses.

The disk is constructed from a piece of flat brass at least 1/16" thick. Dimensions of the disk shown in the drawings should be followed carefully. As you will note, the dimensions allow only .03-inch spacing between the wall and the disk edge. This means that the drive mechanism must also be placed in the center of the drive holder. In each case, it is best to have your friendly machinist fabricate these pieces on a lathe. This means that the top cover, the disk, and disk holder all must be centered exactly or the disk will rub on the cavity walls.

The disk must have some absorbing material added to the back of it. This is necessary because the back of the cavity—that is behind the disk—otherwise can support resonances which wll be coupled weakly from the waveguide and will produce unwanted responses which can mislead the user. The absorbers may be constructed from a disk made of a piece of attenuator card. If you have access to powdered iron material, paper can be shaped around the periphery of the disk to make a form. Mix the powdered iron particles with some coil dope and pour in enough to make a level surface about 1/16" thick. Be sure that the surface is held level while the mix is hardening. (Powdered iron can be obtained from cup core manufacturers or, if you are really ambitious, you can make your own simply by crushing a cup core with a steel roller. Make sure that the particles are very small.) After the mix has hardened, be sure to remove all of the paper and glue from the edge of the disk.

Next, construct the waveguide section by mounting the two flanges, one on either end of the guide. This is done by cutting the waveguide ends square and then removing all burrs from them with a smooth file. Each end will have a flange soldered in place. This is done simply by sliding the flanges on each end of the guide, after first applying a small amount of soldering paste (flux) to each end. Now heat the entire assembly until the flux runs and turns the copper waveguide a deeper color. Apply just enough solder so that it will run around the joint. When this operation is completed, lap the ends of the flanges against a piece of very fine emery paper. Now inspect the joint to be sure that there are no gaps in the solder around the face of the joint.

Next, measure the distance between the rear butts of the flange, and in the center of this distance, using a square, draw a line across the E-plane of the waveguide.

On one side of the guide lying on this line, place a centerpunch mark at the distance from the outside wall shown in the mechanical assembly drawing, Fig. 3. Now drill the hole also described in this detail. Deburr this hole inside and out of the guide so that it is smooth. This is the iris

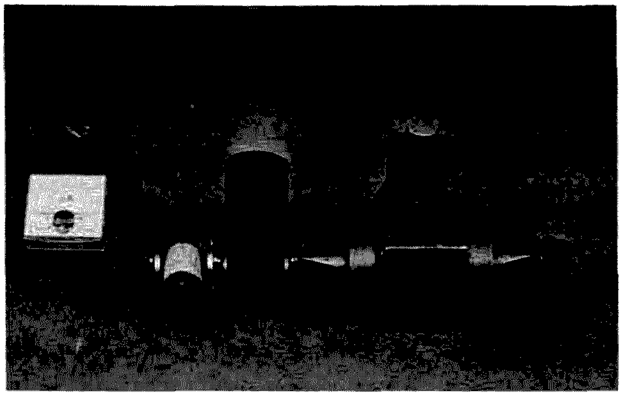

Fig. 4. Test setup for calibration, as described in the text.

coupling hole, and it should be perfectly round with no burrs or raised pieces sticking down into the waveguide. The deburring job is easy on the top of the guide and can be done with another drill bit held by hand and turned to lift off the burr. The inside of the waveguide may be done with a very small bladed knife such as an X-acto® scalpel. This can also be done from the top of the waveguide by inserting the point into the hole against the burr.

Clean a piece of copper pipe (shown in the assembly drawing) as the cavity cylinder. It should be free from all burrs on each end and polished clean with Dutch Cleanser or a similar pot-scouring compound, particularly on the inside of the cylinder. On one end of the cylinder, using a machinist's square and try, set the center so that a pair of marks can be scribed across the open face of the cylinder and on the end of its side walls.

Using flux here, too, solder the half-circle of brass in place so that it lies on the two scribe marks just made to the bottom edges of the cylinder. Now the bottom of the cavity will be half closed. Use acid-base soldering flux for this operation.

The cavity may now be mounted to the waveguide section by aligning the scribe marks on the cavity outside walls with the scribe line made on the face of the waveguide. The half circle of brass will butt against one side wall of the waveguide providing a solder surface. Using a C-clamp and a small, flat piece of wood, clamp the cavity in place, placing the wood under the clamp so that it does not mar the top of the cavity. Adjust the cavity so that it aligns with the marks on its walls and the waveguide. Make sure that the half-circle butts tightly against the side wall of the waveguide. Now apply soldering paste to the bottom of the cavity and to the waveguide surfaces that make contact with the cavity parts. Heat and solder, using just enough solder so that it will "run" when the assembly is hot enough. Let the assembly cool thoroughly before removing the clamp.

When the soldering is completed, the waveguide section should have the cavity mounted off-center on the guide with the iris hole off-center with the diameter of the cavity (see Fig. 3 details). The cavity should be in line with the scribe marks previously described as the alignment lines. If this is not the case, but the alignment marks are only a very few thousands of an inch off, do not rework to improve the alignment; this small deviation will not degrade the operation of the wavemeter too badly. Inspect the inside of the cavity where it mates with the waveguide and be sure that solder has completed the "run" around the entire cavity surface that is in contact with the waveguide.

When all soldering is complete on the waveguide and cavity body, wash off all soldering paste with very hot water. Any traces of the paste or acid will degrade the future performance of the instrument when it causes corrosion.

The most important parts of the assembly are attempted next. These parts are shown in the mechanical drawings as parts A through D and should be assembled in this order. (Before assembly, if you desire to silver-plate all parts of the cavity and waveguide, some improvement of the cavity Q will result and the performance of the wavemeter will be better. Silver-plating *can* be dispensed with, however, since the unit will perform very well without it.)

Now the tuning disk and lead screw can be assembled into the bearing and collet assembly. To do this, place a lock nut of the compression type (as found on most screwdriver-adjust locking pots) on the collet—see A in Fig. 3. The locking nut is a device which has inside tapered threads, 3/8-24, and is about 1/4-inch thick. It will compress the collet against the lead screw threads causing it to move tightly in the collet bearing. Put the nut on so that it is loose.

Now, from the opposite side of the bearing plate (A), insert the threaded end of the brass 1/4-inch rod and screw it up through the collet until about an inch of it is exposed. This item is labeled B in Fig. 3. Now install piece C, the tuning disk, on the end of the brass-threaded rod. Gently heat this piece and solder it to the threaded rod, taking care not to get solder in the fine threads. When the piece is cooled, wash off all solder paste. Now, on the back of the tuning plate, add the powdered iron as described earlier.

When the three pieces have been assembled, insert the tuning plate into the cavity and align the top plate so that the three

Photo B. Wavemeter parts and bottom view of the cavity, showing how it is offset from the waveguide.

screw holes in the cavity wall top mate with the three threaded holes for the three 4-40 flat-head screws, which can be found on the side of the top plate (A). Press the top plate down firmly into the cavity and install the screws to hold the plate firm.

Now screw in the tuning plate by adjusting the threaded rod; see that it moves in and out of the cavity easily, and adjust the collet lock nut so that the rod moves firmly but not hard. Now put a dab of Super Glue® on the lock nut, taking care not to get it in the cracks of the collet and on the lead screw threads. This will lock the collet lock nut in place.

Now the last piece, D, can be assembled. Simply glue the plastic disk to the top of the 1-1/2-inch diameter tube. This tube can be made from any available plastic or metal material. It fastens to the extended end of the threaded brass rod with two 1/2-36 nuts. Place one nut on the end of the rod and engage enough threads to allow about 1/4" to protrude through the assembled dial barrel (D). Then place another nut with the same threads on the rod and tighten until it is firm and the tube will not rotate. Now you have a micrometer barrel dial and a completed assembly. When rotated, it actuates the threaded lead screw and serves as a dial. It should move freely without touching the outside walls of the cavity. Cover the outside of this tube with a piece of paper. Also cover the cavity outside wall with white paper so that calibration marks can be added.

To calibrate the wavemeter you will need a signal source which can be tuned over at least the amateur assignment. Calibration points beyond the band on either end are a valuable asset and should be included. The source can be your uncalibrated X-band transmitter, a signal generator, or simply a klystron and power supply. A calibrated wavemeter and an attenuator ending in a crystal detector mounted in a waveguide adapter make up the waveguide components required for calibration. A meter to register the crystal current will serve as the reaction indicator. Fig. 4 shows how to connect these devices for calibration.

Let's assume you are using a klystron and power supply to do the job. Be sure that the klystron is oscillating in a mode that will not stop or "squeg" during the operation. Once it is oscillating, adjust the attenuator to provide a three-quarter scale reading on the current meter. Set the klystron so that it is in the range of 9.8 GHz to 12 GHz by adjusting its frequency control. Now adjust the calibrated wavemeter (which we will call the reference wavemeter from now on) until you see a pronounced dip in the output-current indicating meter. By adjusting the frequency control on the klystron and the reference wavemeter, you should be able to set up the starting calibration frequency of 9.8 GHz. When you have this frequency and you are sure of it, detune the reference wavemeter. Now tune the device you have just constructed until you get a similar reaction on the output-current meter. The dial barrel will be quite near the top of the wavemeter cavity. Now simply make a pencil or pen mark on the calibration dial paper, using the moving barrel edge as a guide for your pencil.

Continue the calibration process, setting the frequency changes in 50-MHz steps, for a start. Put the coarse calibrations on one side of the calibration line and fine steps on the other side. If you decide to make the calibration steps at a finer set of divisions after you have done a coarse calibration, do not remove the coarse steps; they can be your check points to check out how well the device resets.

The drawings showing the mechanical construction of the wavemeter are supplemented by photographs so that you can verify how the assembly goes together. It is not difficult, and most amateurs who have had experience with hand tools should be able to complete the unit satisfactorily. It is hoped that the meter will be helpful to those amateurs who want to know that they are within the X-band confines.

To use the wavemeter in your rig, simply place it in the waveguide circuit, which is the output toward the antenna, then tune it until you get a reaction in your power-output indicator, read off your frequency, and then detune the wavemeter. You may leave it in the line since it will cause very little loss to your output.

Materials for this device were obtained from Lectronic Research Labs, Inc., Atlantic and Ferry Ave., Camden, New Jersey. All of the materials for waveguide components are listed in their catalog. There are numerous other sources of material for this band and others, but this catalog should be in the hands of all microwave enthusiasts.

All letters with questions regarding this and other articles I have written will be answered if the writer includes an SASE. All telephone calls also will be answered, but please remember what your time zone is so that I don't get your call in the early hours of the morning. ■

Sam Creason K6EW
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Fullerton CA 92635

The Real-World Connection

—add up to four I/O ports to your TRS-80

When I recently acquired a TRS-80, the first device that I wanted to interface to it was my music synthesizer (*73 Magazine*, November, 1978). It requires three output ports. Unfortunately, there is no inexpensive, commercially-available way to provide I/O for the TRS-80, but a home-brew device is easy to build and not at all expensive. A version with one input port and one output port costs about $22 (not including the unregulated power supply). Each additional port, up to a total of four of each kind, costs about $2.50.

Fig. 1 is the schematic of such a one-input/one-output device (easily expanded as described later).

The TRS-80 points to an I/O device by means of address lines A0-A7. The six more significant of these lines drive the select and enable inputs of a 74LS138 one-of-eight decoder. The Y0 output of the 138 is low whenever 1000 00XX appears on A7-A0. This output drives the enable inputs of

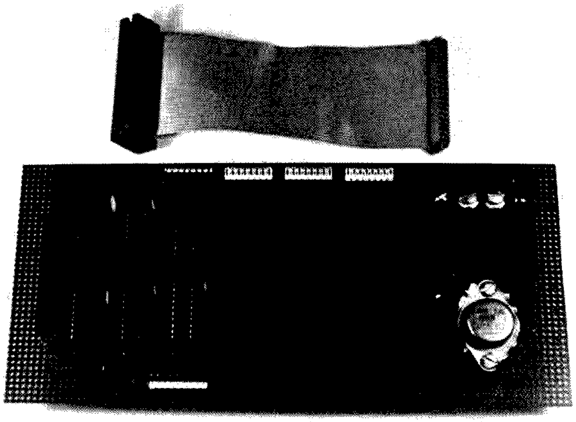

Photo A. Interconnect cable and top view of a wire-wrapped I/O board. The 2 × 20 header at the left accepts one end of the interconnect cable. The other end of the cable attaches to the connector at the rear of the TRS-80 keyboard unit. The 2 × 8 (output) and 2 × 9 (input) headers provide connections to the I/O ports. ICs (starting at upper left, clockwise) are a 74LS138, 74LS155, 74LS374 (output), 74LS374 (input), 74LS368, and 74LS368. Empty sockets are for additional (subsequently added) output 74LS374s. Terminal strip provides connections to unregulated power supply. LM309K regulator and tantalum capacitor are at lower right.

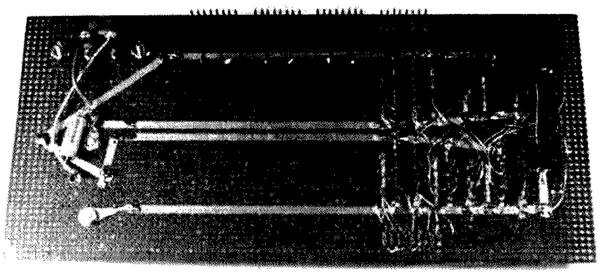

Photo B. Bottom view of the I/O board. The 2 × 20 header is at the right. The electrolytic and ceramic capacitors for the regulator circuit are at the left. Power buses are 1/8″-wide adhesive copper strips made by Circuit-Stik™. Small white spots are paint used to mark correct positions for the sockets and headers. Terminating resistors (input port) were added after the photograph was taken.

a 74LS155 dual two-line-to-four-line decoder, while address lines A0 and A1 drive the select inputs, and the $\overline{IN}$ and $\overline{OUT}$ lines each drive one of the data inputs of the 155. The $\overline{IN}$ line must be inverted since the 1C data input of the 155 is itself inverting. The net result at the outputs of the 155 is a set of four $\overline{IN}$ strobes and a set of four $\overline{OUT}$ strobes, each of which is completely decoded and which correspond to device numbers 80, 81, 82, and 83 (hexadecimal).

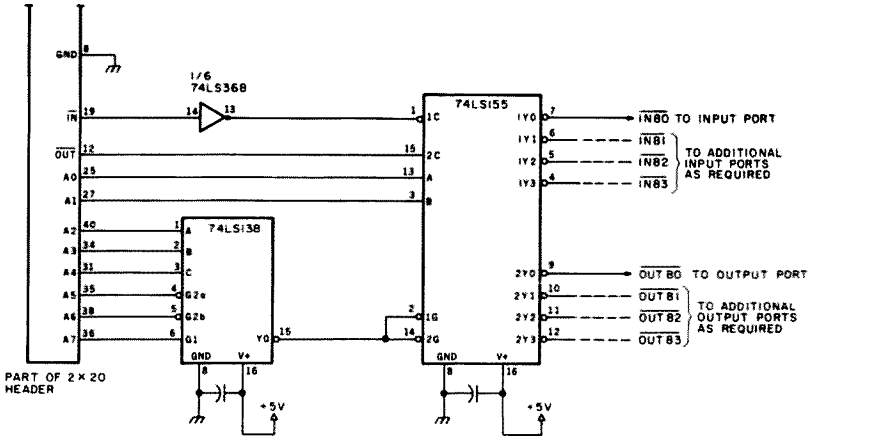

Fig. 1. Schematic of strobe generator circuit. Unmarked capacitors are 0.1-uF, 25-volt disc ceramic.

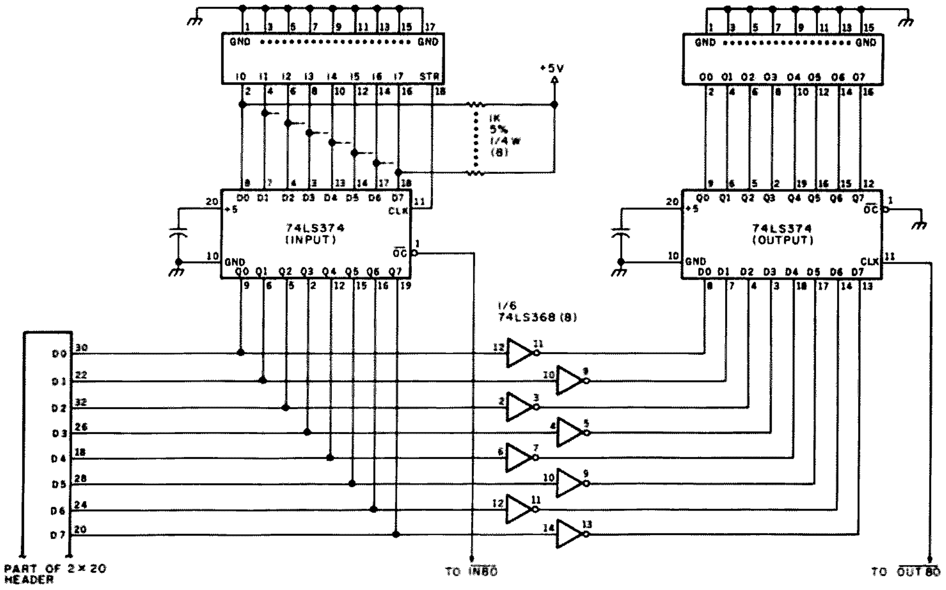

Fig. 2. Schematic of port function circuit. Unmarked capacitors are 0.1-uF, 25-volt disc ceramic. Tie enable inputs (pins 1 and 15), unused data inputs (pins 2, 4, and 6), and ground pin (8) of the 74LS368s to ground. Tie +5-volt pin (16) of each 74LS368 to +5 volts and bypass to ground via a 0.1-uF, 25-volt disc ceramic capacitor.

The 74LS374 is a good choice for the port functions proper. It is a positive-edge-triggered (CLK input) octal D flip-flop with tristate outputs that are enabled via the $\overline{OC}$ input. When the 374 is used as an output port, the data lines from the TRS-80 drive its D inputs (via buffers), one of the $\overline{OUT}$ lines from the 155 drives its CLK input, and its $\overline{OC}$ input is tied to ground. Note that data from the 74LS368 buffers is inverted. Using 74LS367 buffers avoids this since they are non-inverting, but at the expense of an extra IC to provide the inverter for the $\overline{IN}$ line.

Adding another output port simply involves connecting another 374 to the buffer outputs and using one of the remaining $\overline{OUT}$ strobes to drive its CLK input.

When the 374 is used as an input port, its outputs drive the data lines to the TRS-80 and one of the $\overline{IN}$ strobes from the 155 drives the $\overline{OC}$ input of the 374. The clock and data inputs of the 374 provide the port function. Substituting a 74LS373 for the 374 provides a tracking (rather than clocked) input. The outputs of the 373 track its inputs as long as its CLK input is held low.

Adding another input port simply involves connecting another 374 (or 373) to the data lines and using one of the remaining IN strobes to drive its $\overline{OC}$ input.

Photo A shows the connector cable and the top of a wire-wrapped I/O board which provides one input port and four output ports. The connector cable shown is made of junk-box parts. An AP Products 924005-6R socket/jumper (Jameco Electronics) and an AMP 88103-1 card edge connector (several sources) provide an easily-obtained alternative. The card edge connector mates with the PC fingers on the TRS-80 keyboard unit, while the socket/jumper connects to the 2 × 20 header on the

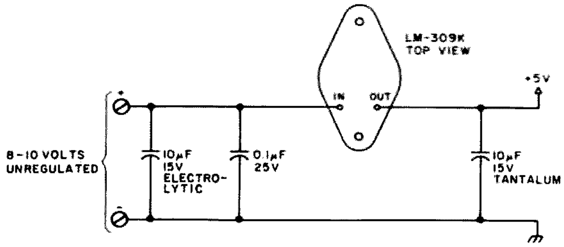

Fig. 3. Schematic of power-supply regulator. The 10-uF capacitors are tantalum and electrolytic; the 0.1-uF capacitor is disc ceramic.

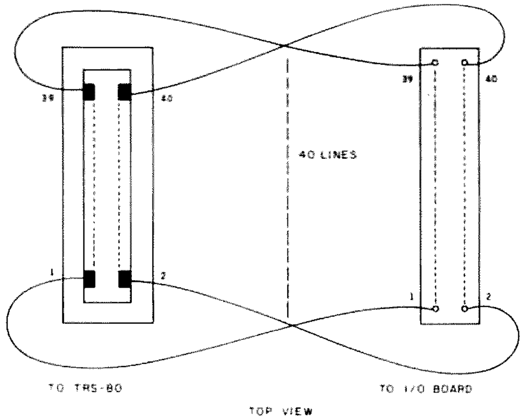

Fig. 4. Schematic of interface connector. Viewed from the rear of the TRS-80, pin 1 is the upper-left finger and pin 40 is the lower-right finger on the PC board.

I/O board. The connection to each port is via a 2 × 8 (output) or 2 × 9 (input) header.

Photo B is a shot of the bottom of the I/O board taken during construction. It shows the copper-foil bus strips which carry power to the ICs, but not the 1k terminating resistors which were added later.

Building the board required only three evenings, including one just to set up the epoxy which holds the sockets and headers to the perfboard. In operation, the board has been glitch-free. For the time and money involved, it can't be beaten. ■

73 Magazine Staff

Practical Af and Rf Speech Processing

—using modern ICs

The value of speech processing at either the af or rf levels for SSB transmitters has certainly been discussed and presented in many forms. However, some readily available and inexpensive ICs well suited to speech processing applications are still overlooked by many amateurs. These are the English line of Plessey ICs which are distributed also in the U.S.

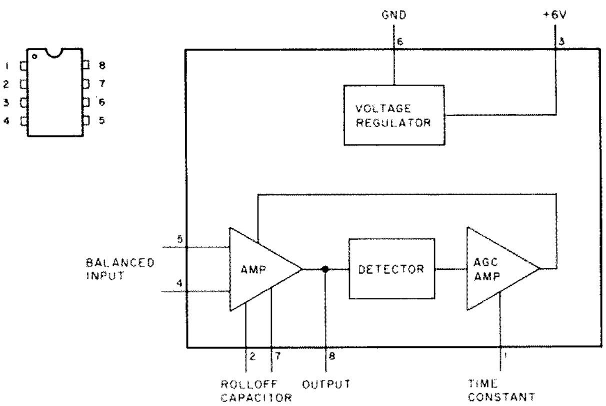

Fig. 1. Internal stages in the Plessey SL1626C af compressor.

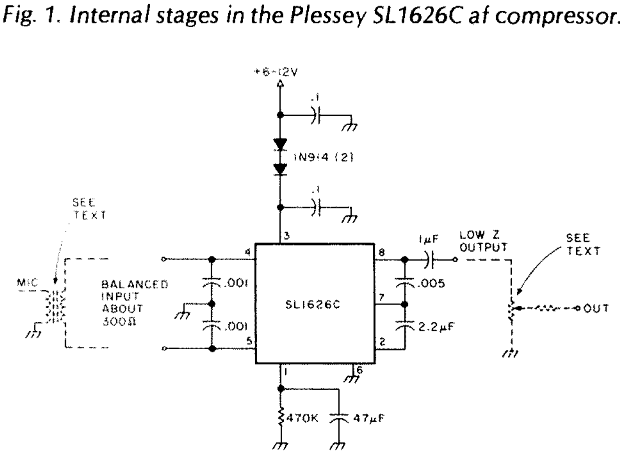

Fig. 2. Complete circuit of the af compressor with optional input transformer and output-level control. If the circuit is powered by a 9-volt transistor radio battery, the battery should be bypassed with a 100-uF, 15-volt capacitor.

Perhaps the most interesting IC yet developed for use in an af speech compressor is the Plessey SL1626C. A block diagram of the small, eight-pin IC is shown in Fig. 1. The input stage is a balanced one with a low-impedance input of about 300 Ohms. Part of the output (low impedance at about 50 Ohms) drives a detector stage which, in turn, drives an agc stage which regulates the gain of the input amplifier. A very wide control range of 60 dB can be achieved (100-uV to 100-mV input) over which the output will remain essentially constant. By the use of a small transistor-type matching transformer at the input, almost any low- or high-impedance microphone can be used with the IC. Supply voltages between 6 and 12 volts can be used with the unit, drawing about 14 mA at 6 V.

A few simple external components are all that are needed to implement a practical circuit. The low-frequency rolloff response of the compressor is set by a capacitor connected between pins 2 and 7. A 3-dB point at about 100 Hz is achieved by using a 2.2-uF capacitor, for example, although the value can be adjusted as desired for higher frequency rolloffs by reducing the size of the capacitor. The high-frequency rolloff response depends on the value of a capacitor connected between pins 7 and 8. A .005-uF capacitor provides a 3-dB point at 3 kHz, but one can vary this capacitor value also to achieve the best speech response with a given microphone.

The agc time constant is set by a parallel resistor/capacitor combination connected from pin 1 to ground. The attack time is set by the capacitor at 0.4 milliseconds/microfarad. The decay time constant is set by the time constant of the combined resistor/capacitor combination. The resistor and capacitor values can be varied to suit individual preferences, but the manufacturer recommends that the resistor value be between 500k and 1.5 megohms and that the capacitor be not less than 22 uF.

A practical circuit using the SL1626C is shown in Fig. 2. In addition to the resistor/capacitors mentioned previously, several other capacitors are used for rf bypassing. A balanced input is shown, although a

single-ended input can be used at the sacrifice of some of the control range. In general, it is better to use a small input transformer of the transistor-interstage type. These transformers are inexpensive, and a 500/50k-Ohm type will suffice for most high-impedance microphones, while a 500/10k-Ohm type can be used with medium-impedance microphones.

There are no adjustments to make and the circuit will work very well in most applications with the component values shown. The one exception might be in a mobile application where the large dynamic range of the circuit might cause excessive background noise pickup during speech pauses. This problem can be cured by also placing a resistor between pins 7 and 8 to reduce the dynamic range. Resistor values of about 500 to 1,000 Ohms should be used, reducing the dynamic range to 35-40 dB. A 1k potentiometer may be connected on the output if it is desired to have a variable-output control. A series resistor may also be placed in the output line, if necessary, to reduce loading on the stage that the compressor works into. For instance, if the output of the compressor goes to a high-impedance microphone input on a transceiver, a series resistor of 50k to 100k may be necessary.

A parts layout for the SL1626 circuit is shown in Fig. 3. While there is nothing critical about the wiring of the circuit, a good, compact layout with good grounding will contribute greatly to avoiding any rf feedback problems from this high-gain circuit. Single- or double-sided PC board construction or use of the isolated-pad technique are particularly recommended. There are so few interconnections involved that isolated-pad construction is just as fast as etching a board, and this technique leaves almost all of the copper on the board for a good ground plane.

For those not familiar with the technique, it just involves the use of a special drill that simultaneously drills a hole in the PC board for a component lead while removing a small ring of copper around the hole for a small radius so that one can interconnect component leads without shorting to the remaining copper. The same effect can be achieved using regular drills—a small one for the component lead hole and a larger one to cut the copper away around the hole. A small modeling knife is handy in removing the copper so that there are wiring channels, where necessary, between component holes. I have used this technique for dozens of small projects with good success. It has all the electrical advantages of an etched board with almost the ease of construction associated with plain perforated board stock.

The af speech-compressor circuit just described is easy to implement and does provide some added audio "punch" with almost all transceivers. Probably, on the basis of the investment necessary in terms of money and constructional complexity, it provides the best return in terms of increasing a transceiver's effectiveness. However, numerous tests have shown that clipping at the rf level is still more effective. Completely outboard devices can be constructed to obtain the benefits of rf clipping where an SSB signal is generated, clipped, filtered, and then demodulated to provide an audio signal to a transceiver. The most economical way to provide the benefits of rf clipping, however, is to break the SSB generation chain in a transceiver, as shown in Fig. 4, and insert a few additional stages for clipping, amplification, and filtering. Some of the Plessey ICs make this particularly easy to do.

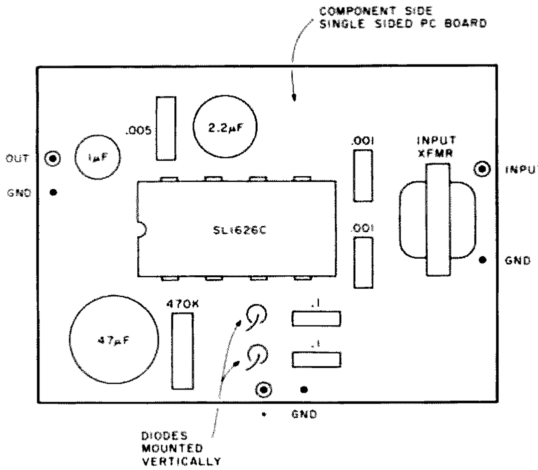

Fig. 3. A typical parts layout for the af compressor. The layout is exaggerated, of course, but any similar layout where the input/output is kept well separated will suffice.

The Plessey SL610C is an integrated rf amplifier having a modest voltage gain and a bandwidth up to 140 MHz. The supply voltage can be 6-9 volts, and the current drawn is about 15 mA. Internal HF decoupling is provided and the external circuitry needed is very simple. In fact, if agc is not applied to a stage using the SL610C, there is no need for any external circuitry other than an input/output coupling capacitor or a tuned circuit, if desired.

The Plessey SL613C is a broadband limiting amplifier consisting of a two-transistor amplifier stage, the output of which drives an emitter-follower output stage. Negative feedback is incorporated and careful design of the bias and feedback circuitry ensures that the amplifier limits or clips symmetrically. The limiting action starts with about a 120-mV input. The amplifier, like the SL610C, has internal HF decoupling so that the external circuitry needed is simplified. The circuit can operate on 6-9 volts and draws about 15 mA.

The two ICs just described can be used to form a simple but very effective rf signal processor (clipper) as shown in Fig. 5. This circuit, of course, is meant to be used in the scheme shown in Fig. 4. It can be

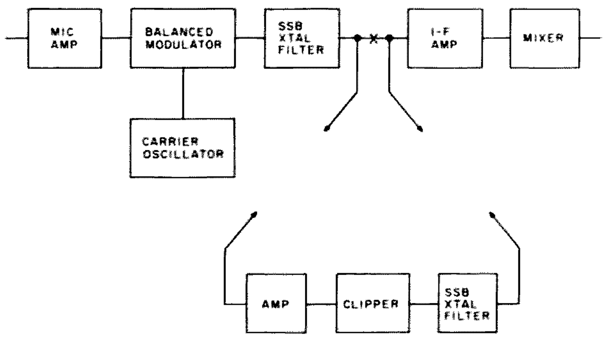

Fig. 4. Rf clipping can be added to most SSB transceivers by breaking the i-f chain after the SSB filter and adding the stages shown.

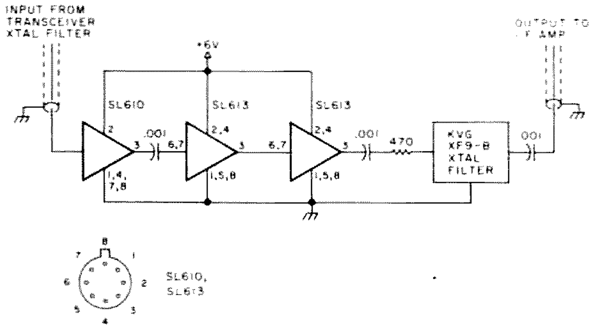

Fig. 5. Extremely simple but high-performance rf-clipper circuit shown with a 9-MHz crystal filter.

adapted to practically any transceiver i-f, although the circuit as shown uses a sideband filter for a typical 9-MHz i-f where the upper-sideband crystal frequency would be 8998.5 kHz, and the lower sideband crystal frequency would be 9001.5 kHz.

The KVG crystal filter shown is a West Germany product distributed by Spectrum International, Box 87, Topsfield MA 01983. It can be used with many 9-MHz i-f transceivers although, if possible, the best thing to do is to purchase a duplicate of the sideband filter used in any given transceiver.

The circuit, as can be seen, is extremely simple. The input signal is amplified by the SL610C stage and fed to two cascaded SL613Cs. The latter two stages clip the signal but, because of their inherent symmetrical clipping, preserve the zero-crossing points. The harmonics and higher-order intermodulation products are removed by the following crystal filter.

The mean-to-peak ratio of an unprocessed SSB signal can be increased by up to 12 dB. Although it is exactly this increase that makes rf speech processing so effective, you have to be sure that the output stage and power supply in a transceiver can take the extra average power dissipation. There is no way to be absolutely sure of this beforehand although, if the SSB and CW power-input ratings of a transceiver are drastically different (the CW input being lower), you should proceed with caution. This is not true of most newer transceivers, but mainly of some older types using sweep-tube finals.

The circuitry of Fig. 5 can be assembled on a small PC board. Again, the isolated-pad type of construction is recommended since there are so few interconnections and components involved. Short lengths of coaxial cable are used to connect the input/output into the transceiver circuitry, and a small DPDT relay can be incorporated to provide the ability to switch the clipper in or out of the transceiver circuitry. If you are wondering why there are no bypass capacitors, etc., remember that HF decoupling networks are *internal* to each IC.

The Plessey units are distributed nationwide; I have purchased units from Ancroma Corp., PO Box 2208, Culver City CA 90230. However, if you cannot locate a source of supply, write directly to Plessey, 1641 Kaiser Ave., Irvine CA 92714, for the name of the nearest distributor. ■

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LOR: A Light-Operated Relay

—handy circuit has many uses

The problem: how to turn on a cassette recorder whenever a certain 2-meter channel was active, without digging into the crowded circuitry of a Yaesu 227?

A channel busy light provided the answer: a light-operated relay (LOR).

The circuit is simple. A 2N5778 phototransistor, amplified by an NPN transistor (I used a BC-108) controls an NE555 IC timer. The timer drives the reed relay and prevents the recorder from stopping between transmissions, so the first word or so is not missed or slurred.

The circuit was ready to try out after only a few minutes at the breadboard. I cut, drilled, and bent 90 degrees a thin aluminum bracket to hold the phototransistor in front of the channel light. The microphone plug nut held the bracket to the panel. A piece of ¼-inch black plastic tube shielded the phototransistor from stray light.

I then got the idea of using the relay to key a second transmitter on another channel to make a repeater. An audio output transformer matched the four Ohms from the Yaesu's audio out jack to the microphone input of the second unit. The timer could now be adjusted to control the length of the squelch tail.

Several of these LORs have been built, all with good results. Layout is not critical: Printed circuit board, breadboard, chassis, or "dead-bug" construction all work well. Dead-bug is when the IC or transistor is fixed to the board with its legs pointing up. The .001-uF capacitors suppress any false triggering due to stray rf. The only caution is to use a good quality timer capacitor for C1. Most electrolytic capacitors differ a lot from the value on the label. Try several.

Do not forget the diode on pin 3 of the NE555; otherwise, the relay may latch.

Adjust the time by R1 to suit your needs. The sensitivity must be adjusted to a minimum working position to prevent false triggering by stray light.■

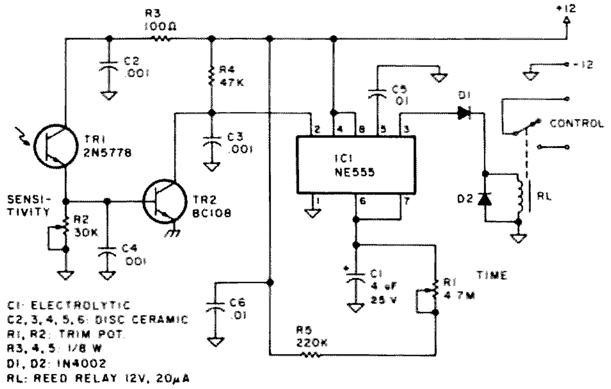

Fig. 1.

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The Calibrator Gater

—so you can find yourself

Ever had trouble picking your calibrator signal out of the heterodynes and QRM on the HF bands? Does your calibrator poop out on 15 and 10? How about giving it a little personality to make it stand out? This circuit does just that. It switches your calibrator signal on and off rapidly, giving it a distinctive sound that is easy to find in even the thickest of crud. It is simple, cheap (about $3 with all-new parts), easy to install on just about any receiver or transceiver, and leaves no irreversible modifications. About the only thing it ain't is original; Ten-Tec has had a similar feature on its Triton models for some time. However, if you don't own a Triton, why not give this circuit a shot?

The circuit, in keeping with personal tradition, is simple. It consists of a CMOS quad gate connected as a low-frequency oscillator which drives a CMOS quad bilateral switch. This switch is connected between the calibrator output and the antenna input to the receiver and serves to pulse the calibrator signal rapidly, making it sound different from most other racket present on the band. Since CMOS circuits work satisfactorily over a 3-to-15-V dc range of supply voltages, locating a suitable power tap-off point in the rig shouldn't be much of a problem. On tube-type rigs, the half-wave rectifier and filter capacitor shown will allow the circuit to be operated from an ac tube filament or pilot-light wire. Most transistor and hybrid rigs already have a suitable dc supply built in. That's why the rectifier is shown separate (but still included in the $3 price tag). Use it if you need it.

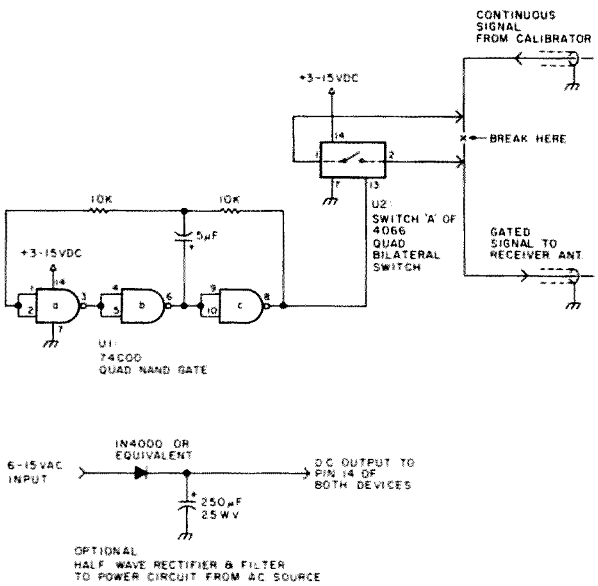

Fig. 1. The Calibrator Gater.

Construction is non-critical. Both CMOS devices are static-protected, so unless you barbecue them with a 150-Watt radiator-shop special, the circuit should work no matter how much you torture it. Use a short piece of wire between the circuit and the calibrator and again between the circuit and the receiver antenna input, or else use miniature coax to prevent any instability or stray coupling caused by the modification.

On my HW-101, the device was built on a 1" by 1½" piece of perfboard and allowed to hang by its wires under the bandpass circuit board. Connections consisted of merely unsoldering the center conductor of the coax (antenna input) leaving the bandpass board right after CR201 (calibrator output) and connecting one wire of the CMOS switch to the coax and the other wire to the spot where the coax had been on the board. Ac power was taken from pin 4 of tube V19 and was rectified by the circuit shown. Incidentally, it doesn't matter which wire of the CMOS switch goes to the calibrator or antenna input; it works just fine either way.

Most calibrators don't run continuously, only when they are needed. Thus, unless you have an oddball, no power switch is needed for the circuit. Current consumption is negligible, even for the QRP fan. With the calibrator turned off, the switching action of the device is unnoticeable under normal conditions. However, at full rf and af gain with no antenna connected, a distinct clicking sound is detectable. If this should become noticeable

with an antenna connected, a switch for the circuit will have to be added (not included in the $3 price tag, since anyone with a receiver or location *that* quiet doesn't deserve to pay less than $3).

According to the *CMOS Databook*,[1] the 4066 quad bilateral switch is capable of passing signals up to 40 MHz with little attenuation, so that takes care of all calibrator harmonics for the HF bands. Due to the conservative nature of many CMOS specifications, it is very possible that the circuit would work at six meters, or even two meters with a simple preamp after the switch, although that's just speculation.

So I conclude this article with a couple of thoughts for the experimenter. First, if the frequency at which the calibrator is gated doesn't suit you, here's the formula to change it:[2] Frequency (in Hz) desired = 0.599/(R × C), R being in Ohms and C being in farads (multiply microfarads by 1,000,000 to get farads). Note that R is either resistor, as long as both are equal.

Also, since only one of the four bilateral switches is used in this project, why not leave some provision for using the other three? They're dandy for switching in audio or CW filters, speech processors, extra phone-patch or microphone inputs, various metering modifications, or for just about any low-level audio or rf application where the signal voltage doesn't exceed the voltage on pin 7 of the 4066. ■

References

1. *CMOS Databook*, National Semiconductor (Radio Shack printing), page 2-150.
2. *CMOS Databook*, application note by Mike Watts, National Semiconductor, page 5-22.

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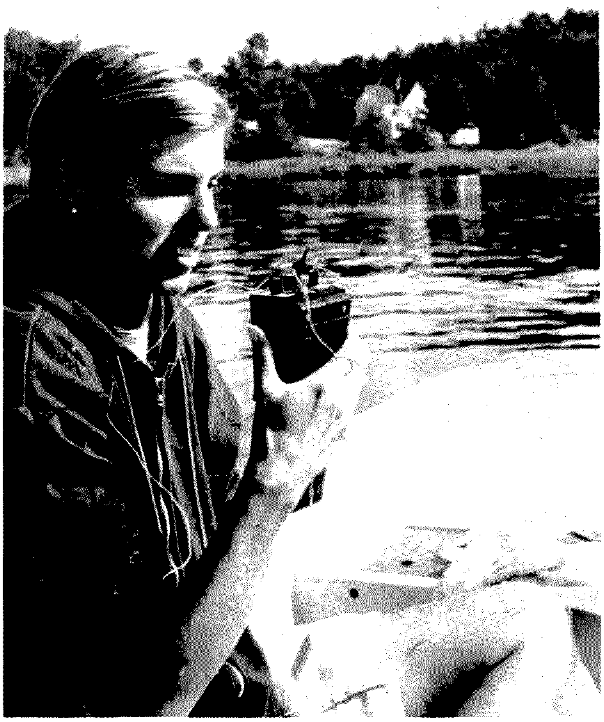
The Flexi-Plane Antenna

—this "scrawny ducky" will boost your HT's signal



On the lower Kennebec River near Bath, Maine, the XYL of N1PL talks through the Streaked Mountain repeater (.28/.88), some 70 miles away from the floating QTH.

Do you have a 2-meter handie-talkie? Where and when do you use it? If you're like me, you probably find yourself with unit in hand in a variety of circumstances. You may be chatting across a hamfest on .52, trying to make a distant repeater from a mountainous site you have arduously attained, or coordinating a civil-defense drill. What do you use for an antenna?

The Rubber Duck

For general toting and flea-market work, the flexible rubber ducky makes a fine antenna. It is shorter than a quarter wave and will not break off if you should accidentally sit down with the little rig in your back pocket. But with flexibility comes a drawback: The wobbly ducky just doesn't put out the juice. A friend told me that the rubber ducky was down 6 dB—but he didn't say down from what.

My own measurements, using a home-brew field-strength meter calibrated at 146 MHz (by comparing readings to those at several power levels from my Sigma RF-2000 power meter), suggest that the signal from the rubber ducky is down more than 3 dB compared to the signal from a ground plane. Field-strength measurements were taken at 20 meters (65.5 feet), or roughly 10 wavelengths.

That 3 dB difference (or more—measurements were conservative) means losing *half* of your transmitting signal strength, and also *half* of the strength of the signals you receive. Not so good. Do you want to stick to that rubber ducky?

What Alternative?

Surely, you won't want the ducky for mountaintopping. You might as well use a small beam there, since you're already going to the trouble of hauling your body up. However, I find that much of my handie-

talkie use is of the mid-range variety. I am often 20 to 60 miles from a repeater and, depending on repeater coverage, access is marginal with the rubber ducky.

What I did was build an antenna which combined the advantage of the rubber ducky (flexibility) with the relative gain of the ground plane. The Flexi-Plane is actually more flexible than the duck—and a good sight cheaper!

I made mine for the cost of a connector. I also used some copper wire that I had in the shack. (Don't use aluminum, because it's brittle and won't solder.)

How To Build It

Like any ground plane, the Flexi-Plane consists of a quarter-wave radiator and an artificial ground plane of quarter-wave radials. I made the radiator of #18 copper bus wire cut to a length of 0.49 meters (19.3 inches). For the radials, I used two lengths of #22 solid copper hookup wire about one meter (39 inches) long.

I put the end of the center radiator through a short piece of insulation stripped from a bit of zip cord. Then I pushed the wire and insulation down into the center of the BNC connector, soldered the wire to the small pointed tip, and, to hold things in place, poured some plastic rubber into the top of the connector.

Next, I stripped some insulation from the center of the hookup wire radials, wrapped each wire around the connector, and soldered them in two places. Thus I had four radials, each about 0.49 meters long. Of course, a connector other than a BNC might require a slightly different procedure.

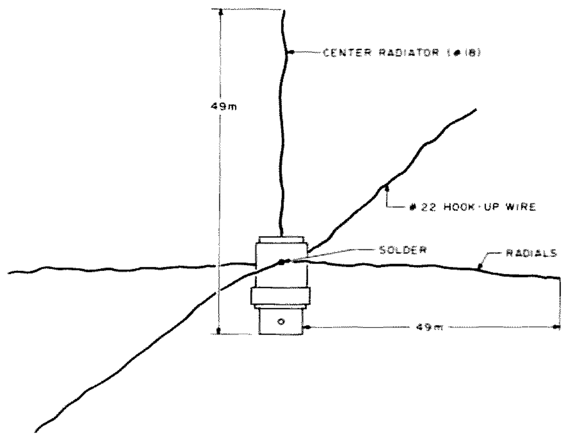


Fig. 1. The Flexi-Plane with BNC connector.

Not Pretty, But Beautiful!

The resulting antenna isn't handsome. But it is highly flexible. You can roll it into a ball or roll it around the rig. (When you unroll it, the elements don't have to be arrow-straight, so don't worry!) In three years, my Flexi-Plane has been all over the country and has spent many hours in my boat in Maine with no deterioration.

Best of all, it combines what all hams strive for in an antenna, the ability to produce a strong signal, with what my brother, Koof W3KF, finds especially beautiful in a home-brewed item—cheapness! ■

*Reader Service—see page 130

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CB to 10. . .and Beyond

—getting excited at 432

Shortly before the January VHF contest, a commercial 432-MHz transverter was purchased as a last minute attempt to add another potential source of points to the station. However, the station's only HF transceiver was already providing the necessary 28-MHz drive for a pair of 6- and 2-meter transverters. In order to provide for independent operation and monitoring on 432, another 10-meter transceiver would be required (preferably solid state in keeping with the rest of the station).

After purchasing one tower, several transverters, a truck load of aluminum for antennas, and miscellaneous other items, to bring home another "radio" would have meant instant divorce court and possible damage to the operator! Enter—one solid-state, 23-channel, SSB, neglected CB rig, vintage 1973.

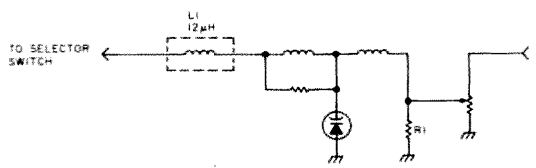

Fig. 1. SBE-12CB clarifier circuit. L1 is added to extend range to 15 kHz. R1 is 1-4k Ohms and controls linearity. All other components are existing.

The unit available for conversion was the SBE Sidebander II (model SBE-12CB). Conversion is simple and inexpensive and requires only a VTVM and wattmeter (with a 10-Watt slug) as test equipment. The actual conversion consisted of:

1. Replacement of four crystals in the synthesizer.
2. Addition of one inductor in the clarifier circuit to provide for continuous coverage.
3. Retuning the rig for 28-MHz operation.

The SBE-12CB uses three oscillators and a total of eleven crystals to synthesize its 23 channelized frequencies. A fixed 7.8-MHz oscillator is controlled by a single 7.8025 crystal. This oscillator remains unchanged. The other two oscillators, 7 MHz and 11 MHz, are controlled by four and six crystals respectively. The channel selector switch selects one (out of 4) crystals from the 7-MHz oscillators and one (out of 6) crystals from the 11-MHz oscillator.

For LSB and AM conversion, the selected outputs of the 11-MHz and 7-MHz oscillators are added tc produce a signal around 1ʕ MHz. Adding the fixed out put of the 7.8-MHz oscil lator produces the requireı frequency. For USB conveı sion, this same 19-MH signal is added to the seı

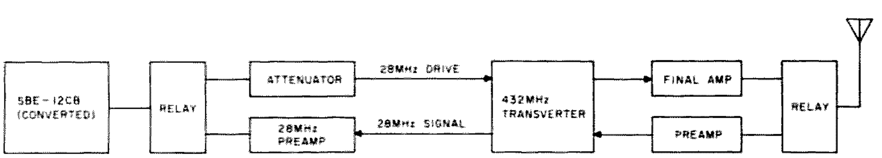

Fig. 2. CB to 432.

Channel	Center Freq. Before Conversion	11-MHz osc. Xtal Freq. (Unchanged)	7-MHz osc. Xtal Freq.[1,2] (Before Conversion)	Center Freq. After Conversion[1] 10 Meters, CW	Center Freq. After Conversion[2] 10 Meters, Phone
1	26.965	X6 = 11.700	X2 = 7.4625	28.0050	28.5050
2	.975		X3 = 7.4725	.0175	.5175
3	.985		X4 = 7.4825	.0300	.5300
4	27.005		X5 = 7.5025	.0425	.5425
5	27.015	X7 = 11.750	X2	.0550	.5500
6	.025		X3	.0675	.5675
7	.035		X4	.0800	.5800
8	.055		X5	.0925	.5925
9	.065	X8 = 11.800	X2	.1050	.6050
10	.075		X3	.1175	.6175
11	.085		X4	.1300	.6300
12	.105		X5	.1425	.6425
13	.115	X9 = 11.850	X2	.1550	.6550
14	.125		X3	.1675	.6675
15	.135		X4	.1800	.6800
16	.155		X5	.1925	.6925
17	.165	X10 = 11.900	X2	.2050	.7050
18	.175		X3	.2175	.7175
19	.185		X4	.2300	.7300
20	.205		X5	.2425	.7425
21	.215	X11 = 11.950	X2	.2550	.7550
22	.225		X3	.2675	.7675
23	.255		X5	.2925	.7925

Notes:

1. 7.8-MHz osc. xtal freq. = 7.8025 MHz (CB and 10 meters)
   11 MHz osc. xtal freq. (CB and 10 meters) = 11.700 MHz = X6; 11.750 MHz = X7; 11.800 MHz = X8; 11.850 MHz = X9; 11.900 MHz = X10; 11.950 MHz = X11
2. 7-MHz osc. xtal freq. =

	CB	10 meters, CW	10 meters, phone	
	7.4625 MHz	8.5025	9.0025	= X2
	7.4725 MHz	8.5150	9.0150	= X3
	7.4825 MHz	8.5275	9.0275	= X4
	7.5025 MHz	8.5400	9.0400	= X5

Table 1. SBE-12CB synthesizer mixing scheme.

ond harmonic from the fixed 7.8-MHz oscillator (15 VHz) to produce a signal in :he 34-MHz area. Subtracting the output of the 7.8-MHz oscillator from this urn yields the required JSB frequency. Table 1 ummarizes the synthesizr.

The first column of Table indicates the frequencies vailable from this rig for B operation. All that is reuired to shift these frequencies into the 10-meter and is either to replace the x 11-MHz crystals or the ur 7-MHz crystals. Since ur is cheaper than six, the MHz oscillator was atcked. The new crystal lues are determined by king the new center freiency, subtracting the exing center frequency, and ding this difference to value of the existing MHz crystals.

Example: The new de-ed channel 1 frequency is 005 MHz and the old freency is 26.965; the difence is 1.040 MHz. The current 7-MHz crys- is 7.4625 MHz; add the ference (1.0400), and the v crystal required is 025 MHz = X2.

ince there is a greater jump between channels 3 and 4 for CB operation, the last 7-MHz crystal (X5) is .02 MHz greater than X4. X4, X3, and X2 are each 0.01 MHz apart. In order to provide for continuous coverage and more linear coverage, the new crystals were placed .0125 MHz apart in frequency. This reduces the final frequency coverage only slightly (2.5 kHz) and allows for continuous tuning, which was deemed a reasonable sacrifice.

Table 1 indicates the new crystals required for operation at 28 to 28.3 MHz, and also those required to operate in the phone portion of the 10-meter band (28.5-28.8 MHz). The actual coverage in each case is about 300 kHz.

The varactor clarifier of the SBE-12CB tunes ± 700 Hz from the selected center frequency. In order to provide for continuous coverage, a spread of about 15 kHz is required. Fig.1 shows the existing clarifier circuit in the unit plus the additional 12-uH molded choke (L1) which was added to extend the range to the required 15 kHz. Adding the choke caused the tuning range of the clarifier to vary in a nonlinear fashion, and it was found that R1 could be changed to rectify this situation. The new value of R1 is determined best by experiment and seems to fall in the range of 1 to 4k, depending upon the spread finally selected.

This completes the conversion. Retuning this rig is simple if you have the SBE service manual or Sams *Photofacts*® #CB-50 (described 1973).

The rest of the setup for 432 is simple enough. An attenuator was built to hold down the 12-Watt output of the CB rig on sideband to that required by the transverter. No preamp was deemed necessary for the SBE-12CB, but a 432-MHz one was utilized (see Fig. 2).

There is nothing unique about the 432-MHz utilization of this rig, but the conversion is an interesting project which can yield a low-cost, 10-meter mobile rig. ■

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Three-Way Power Supply

—ideal for CMOS, TTL, op-amp projects

For as long as I can remember I have wanted an inexpensive, self-contained positive and negative variable-voltage power supply for experimenting with transistors, digital, and linear integrated circuits. When National Semiconductor introduced their LM317 and LM337 adjustable regulators, I felt that this was the answer to my prayers. The LM317 and LM337 are the commercial-grade versions of the LM117 and LM137, which are positive and negative adjustable 3-terminal voltage regulators respectively, capable of supplying an excess of 1.5 Amps over a 1.2- to 37-volt output range. These two devices are easy to use, requiring only two external resistors to set the output voltage. They both also feature internal current limiting, thermal shutdown, and safe-area compensation, making them virtually blow-out proof against overloads.

This article describes the construction of a self-contained variable positive and negative regulated voltage power supply with an additional 5-volt supply for TTL integrated circuits, giving the final specs shown in Table 1.

The Circuit

As shown in Fig. 1, the power supply uses three integrated circuit voltage regulators: LM309, LM317, and LM337. The necessary positive and negative supply voltages are derived from the grounded center-tapped 25.2-volt transformer secondary and a full-wave rectifier bridge. After rectification, the positive voltage is filtered by C_1 while the negative voltage is filtered by C_4. For the positive supply, the output voltage is set by the 270 Ω resistor R_1 and the 5k Ω potentiometer. To improve ripple rejection, a 10-μF aluminum electrolytic capacitor C_2 is added across the 5k Ω pot. C_3 is added to improve the regulator's transient response. Diode D_5 protects the LM317 in case the output is shorted to ground. In a similar manner, the nega-

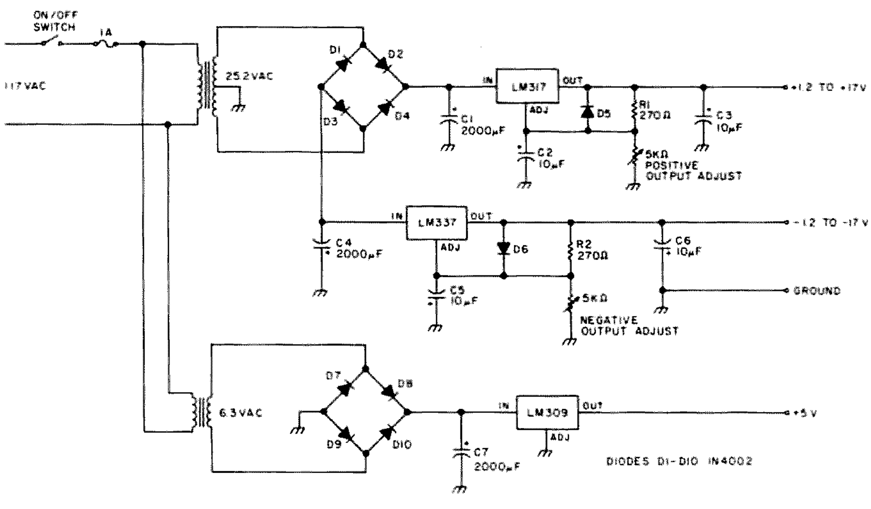

Fig. 1. Tri-voltage power supply schematic.

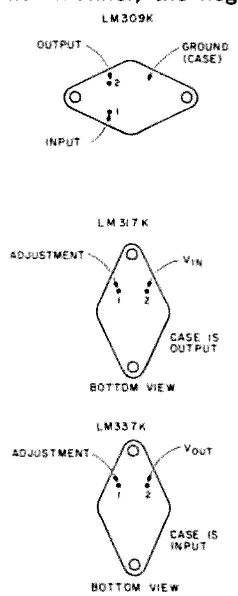

Fig. 2. Pin connectior for the LM309, LM31 and LM337 voltage reg lators (TO-3 packages).

tive supply is designed, except that the polarities of the capacitors and diode are reversed.

The 5-volt TTL supply section is of standard design, as described in many of the amateur radio and experimenter magazines.

Construction

Considering the number of components and the simplicity of the circuit, all connections were made with point-to-point wiring, keeping all leads as short as possible. Shown in Fig. 2 are the pin connections for the three IC regulators (TO-3 packages). Both the LM317 and LM337 must be insulated from the chassis. This is done by using insulating washers along with the required mica washer, such as the Radio Shack kit #276-1371. All controls and output jacks were mounted in an orderly manner on the front panel of an 8 x 5.5 x 3.75" metal cabinet (Radio Shack #270-269 or similar). As an additional feature, I included a pair of 0-15 volt dc edge-type panel meters that I had on hand. However, since meters of this type normally cost about $25 each, a lower-cost substitute is the 0-15 volt meter made by Radio Shack, #22-054, which sells for approximately $8. ■

	Positive Supply	Negative Supply	TTL Supply
Output Voltage	+1.27 to +17 V	−1.27 to −17 V	+5 V
Output Current	1 Amp	1 Amp	1 Amp
Load Regulation	0.1%	0.3%	50 mV
Ripple Rejection	80 dB	77 dB	80 dB

Table 1.

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Home-Brew in the Real World

—victim tells all

Why is it that all the design projects in the ham magazines have titles like, "Build Your Own Station for Under a Dollar and a Half!" or, "At last! A Linear for Ten Bucks!" It seems as though every time I turn around, some designer has cooked up a homebrew project for me which will: a) give me everything I ever wanted, and b) won't cost me more than I would spend on a pound of solder.

My suspicion is that these guys do their pricing at their jobs. I have a picture, of, let's say, an engineer for some big electronics or digital company on his lunch hour, designing things for his ham shack at home. He breadboards them at work, grabs capacitors and chips out of handy bins, and doodles until he's happy with his final product.

The next thing we know, there's an article in *73/CQ/QST/HRH* entitled "DX the World for 75 Cents!" It is not my thesis that these folks are evil men who are trying to trick me into bankruptcy, but is the real world really full of people with $5,000 junk boxes? I wish I had a dollar for every article I've seen which is headed: "Here's a Weekend Junk-box Project That Will Give You Your DXCC in Ten Minutes!"

My junk box consists of some solder and a handful of parts that I couldn't find places for in my last Heathkit.® Worse than that, even, is that if the local Radio Shack doesn't have the part that is called for in the article, I have to mail away to Arizona or someplace that takes my credit card number and promises to bill me for postage.

Take the last home-brew project that I built from a magazine. It was a fifty-dollar frequency counter—that is, on the *page* it was a fifty-dollar frequency counter. But when the author called for *one* 100k resistor, I couldn't convince Radio Shack to sell me fewer than five at a clip. The only parts that I had on hand were the jumper wires. My phone calls alone, to Arizona to check on the errant parts, cost me almost fifty bucks!

Actually, my fifty-dollar frequency counter cost me —including the case ($2.19) and the presstype ($6.95) and the chips and all the good things inside the box —something like $80.00.

However, I wouldn't have it any other way. In truth, I am now the possessor of the world's best frequency counter. It is the best because I built it. I read the schematic, I figured out the mistakes in the drawings, I wired it up, and I saw its display light up. I enjoyed the smell of the rosin core the way a gigolo enjoys Chanel No. 5. I experienced the pride of showing off a homemade piece of equipment.

And I now have a lot of leftover resistors and capacitors and IC sockets because I was forced to buy more than one of each by the packagers. I think my junk box is getting bigger as a result. Who knows? In ten or twenty years I'll be able to build a RTTY system from the parts that didn't go into all my previous projects!

I guess if my XYL knew in advance that my fifty-dollar counter was going to cost eighty dollars, she would have pulled my credit cards.

It all works out for the best! ■

John Gilbert VE3CXL
714 Highland Ave.
Ottawa, Ontario
Canada K2A 2K7

DXing the Past
—a visit to Signal Hill

For several years, my wife and I have been engaged in genealogical research into the origins of my wife's grandparents who moved from Newfoundland to Toronto around 1890. Our research could proceed no further without an actual visit to Trinity and St. John's, Newfoundland. The trip was of great interest to me from an amateur radio point of view. I had wanted to operate mobile from Signal Hill in St. John's since 1976, when I had walked up to the top of the hill to visit the Cabot Tower. Early in 1978, we had been in contact, on twenty meters, with both Newt VO1CW and Dick VO1EI about our interests and found that they had some knowledge of the families and places which were of interest to us. Gradually, the itinerary of a vacation pieced itself together, combining visits to Newt, Dick, Signal Hill, four or five small Newfoundland towns, and a few military museums. The last was to allow my son to pursue his interest in military uniforms.

In August, 1978, with the Kenwood TS-520 installed in the family wagon, operational on 10 and 15 meters, we drove via W1-, W2-, and VE1-land to North Sydney, Nova Scotia, and thence by ferry to Newfoundland. Band conditions were not particularly good, and we netted only 4 or 5 solid contacts per day until we were close to St. John's. Then a 5/9 QSO with G3MGW showed what ten can be like when it puts its mind to it, and later in the day we were working back home to Ottawa in a QSO with VE3KHT. Fifteen opened up as we drove into St. John's, with several contacts into G-land and one into OK-land. Then, having settled into our apartment hotel, we were off to Signal Hill.

As radio history buffs will know, it was here, in 1901, that Guglielmo Marconi carried out an experiment to demonstrate that signals could be transmitted by electromagnetic waves. On December 12th of that year, Marconi received three faint dots, transmitted from Poldhu in Cornwall, England: a distance of 1700 miles, and the first transatlantic DX.

Signal Hill is now a National Historic Park, and Cabot Tower, constructed in 1898 in commemoration of John Cabot's landing in Newfoundland 400 years before, is an old visual signal station. It now houses many exhibits, including details of the Marconi experiment. The parking lot next to the tower is an excellent mobile site—with a 360 degree clear view. The only drawback is its attraction for other hams and CB enthusiasts with resulting cross-modulation problems. Conditions were spotty to say the least, and although we made a number of contacts, DX and North America, in several trips to the Hill, there were only two real openings.

The first opening occurred late one evening. We had gone to the Hill at 2130 to take in the incredible view of the city of St. John's at night. We had been greeted with the typical hiss of a dead ten-meter band, and fifteen was just folding for the day. Just as we were about to leave, I gave one last sweep of the dial and, as usual at home, swept past the Ottawa ten-meter beacon, VE3TEN. But just a minute . . . what was VE3TEN doing with an S9 signal in VO1-land, hundreds of miles away? As always, ten had produced the unexpected—an opening to the west. A CQ netted a small pileup of W1s, W2s, and, finally, VE3KIE/3 and VE3TP from back home in Ottawa.

The second big opening, appropriately enough, was on our last day in St. John's. The family stayed in the apartment watching TV while I took one last trip to the Hill. Once again, at 2130 the fifteen-meter band was folding and ten sounded about as lively as a radio club meeting when the club president asks for volunteers. No sign of VE3TEN this time, but tuning over the CW portion of the ten-meter band, I came across a signal—perfect Morse at 30 words per minute. It turned out to be W1AW. Quickly swinging over to the phone band, I was just in time to hear WB1DMP signing off after a local QSO. A quick call to him, and he asked me to join him on the 10-10 Minute Man Chapter Net which was just starting. As a result, I worked those who checked into the net plus a few more W1s before the band faded as quickly as it had opened.

Our mission accomplished, the rest of the trip was devoted to genealogy, plus most enjoyable visits to VO1CW (being visited by his son, HS1ALT) and VO1EI. We had a couple of days of excellent mobile conditions on the way back home, and I was able to complete a long-standing personal goal—I now have operated from all Canadian call areas.

Arriving home, we were greeted by a QSL from WA1YRB, my last QSO from Signal Hill, saying what a thrill it had been for him to work a station operating from the site of the original Marconi experiment. It was a thrill for us too—a real DXpedition to the past. ■

REVIEW

from page 28

are only a few hundred cycles away from the DX, what then?

Have no fear, the Varifliter will come to the rescue—but first you will have to hook it up. Just open the box that Kantronics has shipped it in, dump out a few thousand soft plastic packing "worms," retrieve the warranty card and instruction booklet, and somewhere down under all that is the Varifilter. It is packaged in a two-tone beige and brown cabinet measuring about 6 inches square and only 2½ inches high.

An ac line cord is neatly coiled up and waiting for you to plug it into a source of 115-volt alternating current. If, by any chance, you don't have (or prefer not to use) ac, Kantronics has made provisions for 12-volt dc input on the back panel by means of a 2.5-mm diameter "phone" plug. When you lift the Varifilter out of its nest, you immediately notice how light it is, and how good it will look on the operating desk or maybe even on the receiver itself, as in my shack. Now, let's see, where's that instruction book? Oh, here it is. It suggests that you connect the receiver's speaker output to an RCA-type phono jack on the rear panel and plug your external speaker into a 3.5-mm jack, also on the rear panel.

The book tells you that the input voltage protection circuitry in the Varifilter will protect its innards from damage due to momentary voltage spikes and excessive and negative voltages. It's comforting to know that it won't go BZZZZTTT and curl up its toes when you hook it up. If you prefer to use headphones instead of an external speaker, just plug them into the headphone jack (standard ¼-inch style) also located on the back panel.

Now it's time to look at the front of the unit and see what knobs and switches there are to be learned (and cussed at when you select the wrong one). What's this? Simplicity itself—only three round knobs, two rectangular push-buttons, and a couple of LEDs. The left-most knob says Volume, the middle one, Bandwidth, and the right-most knob, Frequency. The left-hand switch is power off (out)/ power on (in).

Ahhh... let's push that Power switch—the little left-hand LED rewards us with a ruby glow. So far, so good. We rotate the volume control to the right and immediately hear some CW signals coming through the Varifilter. Hmmm... wonder how they sound in the "straight through" mode? So, we push the on-off switch to off, and hear signals typical of our receiver: *lots* of signals.

Hoping that the Varifilter does, in fact, filter, I push it to *on* once more. By tweaking the frequency knob a bit, the right-hand LED begins to blink in time with an incoming signal centered in the passband. Just about right, maybe 900 Hz, or a bit less: comfortable copy. Now, I reach over to the Bandwidth knob and rotate it ever so slightly. The received signal immediately and drastically "sharpens" in the speaker. By golly, this little critter does work!

For the next hour or so I play around with the Frequency and Bandwidth controls, narrowing and widening the "window" through which we listen to the incoming signals. I find that the Frequency control is very critical when using the filter in its narrow bandwidth position, and care must be exercised to keep that little LED blinking in rhythm with the CW.

By carefully adjusting receiver tuning and the Varifilter, it's possible to achieve a remarkably comfortable and solid-copy signal through all kinds of QRM. Just to satisfy an urge to see what the receiver will do by itself, I switch the Varifilter off, and promptly lose the station I was getting Q5. Whoops... back "on" again, and there it is, still solid.

Time to see what the Peak mode switch does, so I pop it out and am rewarded with a very much enhanced signal strength —much louder than my receiver brings it to me under the same conditions. I do notice that the adjacent "hash" is also enhanced, but with a slight readjustment of the Bandwidth, the hash is gone. Wow! this is really making copy easy! And so it goes, day after day under poor band conditions, evening QRM, static, etc., etc., and I'm beginning to find out just how helpful this little Varifilter can be. After a while, I am scarcely aware it is in the circuit. Tuning across the band, I can dig out signals that I didn't know were copyable, signals that wouldn't have been readable without the Varifilter.

Ordinarily, I'm not a sideband operator and don't often use my rig in that mode. But, what the heck, the Varifilter is supposed to do its thing with SSB, too (and for that matter, ASCII, RTTY, etc.). Once again, I put the little box through its paces and found it equally adept at removing the typical sideband crud that obscures the wanted signals. Not surprisingly, the Varifilter works with little fuss, muss, and bother. It just sits there and blinks contentedly while churning out solid copy.

For those who are interested in such things, the technical facts are straightforward. The bandwidth is continuously variable from about 30 Hz to over 1000 Hz and, once set, remains constant regardless of frequency. The frequency is variable from less than 150 Hz to over 1000 Hz, thus accommodating almost any audio preference. Capable of 2 Watts audio output power, the Varifilter can drive the shack speaker or headphones to unbearable levels. Because of the variable nature of the filter, one can tune it on, above, or below the desired signal and vary the width of the audio bandpass to suit nearly any taste.

Modular design has been incorporated for serviceability and, should service ever be required, components can be removed and shipped to Kantronics for repair or replacement. Incidentally, if you wish to use the Varifilter on dc, you don't have to disconnect the ac line cord. If your shack is provided with 230 volts ac, don't despair. A tiny switch inside the Varifilter, reachable by screwdriver without removing the cover, allows you to set it for that voltage.

The instruction book is large, easy to read, clearly illustrated, and a joy to behold because it contains a nice schematic diagram and a parts list which shows the value and number of every part used. If you wish to service your Varifilter (after warranty is over), you shouldn't have any trouble, because Kantronics' instruction manual is about all you could wish for.

All in all, the Kantronics Varifilter is a most satisfacory device for the average ham and for the contester and DXer as well, making difficult copy quite easy and turning nearly impossible copy into Q5 reception. At only $139.95, the Varifilter is economically feasible and will make a worthwhile addition to any shack. I didn't try it on RTTY (or ASCII for that matter), but have no reason to suppose that it wouldn't PERFORM equally well on those modes. Try it, I think you'll like it! For further information, contact *Kantronics, 1202 E. 23rd Street, Lawrence KS 66044; (913)-842-7745.*

Jim Gray W1XU
73 Staff

MFJ SHORTWAVE CONVERTER

Like many other hams, I have always enjoyed listening to the shortwave broadcast bands. The BBC, Voice of America, Deutsche Welle, Radio Moscow (in very small doses!), and countless others provide commercial-free programming of a very high quality. A lot of hams would like to spend more time listening, but they just can't seem to find the time. When it comes down to a choice between operating the ham station and listening to shortwave broadcasts, the ham station always wins!

A few years ago, I briefly considered getting a radio with shortwave capabilities for my car. What could be better than to catch up on a some shortwave listening while driving to work? I quickly dismissed the idea when I found out how much such a car radio costs. Only a few very expensive European models offer shortwave coverage, and I wasn't about to buy a radio that was worth more than the rest of the car!

Recently, MFJ began advertising two shortwave converters for the car. The MFJ 304 covers 19, 25, 31, and 49 meters in four bands, and the MFJ-308 covers all the above and adds 13, 16, 41, and 60 meters. This seemed too good to be true. I imagined that the sensitivity would be low and the selectivity would be poor,

but at $79.95 for the eight-band model, the little box was sorely tempting, and I banged off an order to MFJ Enterprises.

When the package came a couple of weeks later, I dropped everything, grabbed my toolbox and ran out to the car. Groping around under the dashboard in the middle of a New Hampshire winter isn't exactly a laugh a minute but, fortunately, installation only took about 15 minutes.

I unplugged the car's antenna lead from the radio, plugged it into the converter, and plugged the output of the converter into the antenna jack on the radio. The converter operates on 12 V dc, which is easy to get in my car; I just tap into the filtered line I have for two-meter equipment. That's all there is to it!

I am a compulsive manual reader, so I checked the manual before I went any further. I needn't have bothered; operation couldn't be simpler. The converter is normally in the off state. When you push in one of the band switches on the front panel, the converter is activated. Tuning is then accomplished normally with the tuning knob on your car's am radio. When you want to listen to stations on the local broadcast band, you merely push the off switch and the converter is switched out of the circuit completely.

With no further ceremony, I punched the bandswitch for a band known for its daytime activity, and started tuning around. I was absolutely astounded. The thing was amazing! Any fears I had about sensitivity were banished. As I tuned up and down the band I heard exceptionally strong signals everywhere, and the selectivity was excellent. I was so excited that I didn't know what to do with myself, and several other *73* staffers who came out to see what the commotion was all about were equally impressed. In the next twenty-four hours I found all sorts of excuses to go for a drive, and each time I was rewarded with the reception of several interesting programs from every corner of the globe. MFJ has a winner.

Problems? Yes, I had a couple of minor problems. The mounting brackets included with the converter are a bit on the small side and I'd rather see MFJ furnish the more typical U-shaped bracket. Admittedly, such a bracket would add to the cost of the unit, and since you aren't likely to be moving the converter around very often, the slight inconvenience of the present system is acceptable.

MFJ's shortwave converter.

The only other problem doesn't have anything to do with the converter itself, but can involve your car instead. If your car's ignition system isn't up to snuff, it can produce a tremendous amount of amplitude-modulated hash. If your present radio can hold its own against this ruckus, the converter will do fine, too, as long as you don't try to listen to extremely weak stations, which tend to get lost in ignition noise. If your car's ignition noise is well under control and your am radio has good sensitivity, you'll be able to DX to your heart's content.

Serious problems are conspicuous in their total absence. This unit performs so well that I am surprised that there aren't more such converters on the market. The entertainment and educational value of this little box from MFJ is fantastic. If you have any interest in shortwave listening, MFJ has an incredible value for you!

The MFJ World Explorer II is available from *MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762.* Reader Service number 484.

Paul Grupp KA1LR
***73* Staff**

BENJAMIN MICHAEL INDUSTRIES 24-HOUR CLOCK

What can one say about a clock, you ask? Plenty, if it's this quartz-crystal controlled twenty-four-hour clock from BMI.

How many times have you agonized over the conversion of local time to UTC? Well, maybe you're smarter than I am, but I always have a problem going from Eastern Standard or Eastern Daylight to UTC. I'll admit it is a bit simpler before noon, but in the *afternoon*, Ugh!

Enter Benjamin Michael Industries with their little liquid-crystal-display clock. It sits quietly on the table top, receiver, shelf, transmitter, windowsill, or wherever your imagination might suggest. BMI provides small mounting lugs on each side of the plastic case so that the clock can be mounted in a panel. It can be attached to any number of other things by means of those lugs—it's versatile, too!

A front-panel toggle switch and two push-buttons allow you to set the time as follows: flip the toggle to Set and cycle the hours and minutes with the Hours and Minutes push-buttons until the proper numbers come up in the window. As soon as WWV or CHU give their time-set tones, just flip the toggle back to the left and you're on time. Seconds are ticked off unobtrusively yet visibly by the blinking of the colon that separates hours and minutes. It is pleasant to finish a QSO and just look at the time expressed in hours amd minutes UTC—makes a log-keeping a snap!

The liquid-crystal display is set within a surrounding bezel which is mounted on an alodined or anodized (black) aluminum front panel. The 1.5-volt pen cell mounts in a clip on the bottom of the case. Inside is a glass-epoxy printed-circuit board which appears to be gold-plated for corrosion resistance. The back of the case incorporating the mounting "ears" is easily removed by two small screws set into the sides of the case, near the rear edges.

There is a slot at the bottom rear of the assembled unit which appears to be wide and long enough (¼" W × 2" long) to accommodate something like a ruler or yardstick. There is a tiny hole for a screw in the center of the back, suggesting that this little clock could be mounted at one end of a long, thin stick, like a yardstick. I'm not sure why anyone would want to do that, but it does seem possible, *if* you want to. Maybe it's for a pendulum; do you suppose...?

I have watched the little clock perform like a champ for two whole weeks, and know what? It hasn't lost or gained a millibleem, measured against WWV, in all that time.

For $24.95, how can you hate it? You can't! Get one, because you need it to keep from going bananas trying to figure out UTC. More information can be obtained by contacting *Benjamin Michael Industries, PO Box 173, Prospect Heights IL 60070.* Reader Service number 482.

Jim Gray W1XU
***73* Staff**

MASTER HANDBOOK OF ELECTRONIC TABLES & FORMULAS
by Martin Clifford

In the introduction to this book, the author notes that there are a number of ways to solve problems in electronics. The first is to use formulas and to plug in or substitute numerical values. As the author states, "This technique calls for some arithmetic dexterity and, quite often, a good working knowledge of algebraic and trigonometric functions, and sometimes a bit of calculus. Aside from the work involved, the use of a formula has the disadvantage in that it supplies a single solution."

The second method of solving problems in electronics involves the use of nomographs which also can give a number of alternative solutions.

A third method is provided in this book by presenting electronics data in tabular form with minimal use of arithmetic. The answers to electronics problems are given immediately in the tables if the elements of the

problems are known.

The tables are based on standard formulas used in electronics and provide answers of a much higher order of accuracy than is commonly needed for the solution of electronics problems. The tables also provide a number of alternate solutions much as do nomographs, allowing the user a choice of practical component values that may be required in circuits.

Of interest to the amateur are tables giving solutions for resistance and conductance involving such things as equivalent resistance of two resistors in parallel, resistance vs. conductance, resistivities of conductors, and design values for three types of attenuator networks, T-pad, H-pad, and π-pad. There are tables on voltage and current, capacitance, inductance, impedance, permeability, power decibels, and sensitivity.

If, for example, you require a simple attenuator pad to supply an insertion loss of 40 dB, you can go to the table on Design Values for Attenuator Networks and, for a T-pad, locate 40 dB in the left-hand column of the table. Then, to the right of this value, read the values for R1 and R2, where R1 represents two resistors each having a value of 588.1 Ohms. R2 is shown as having a value of 12 Ohms. The same method can be used to locate desired resistance values for the H-pads and π-pads.

There is a chapter on antennas which I found of little use for the amateur. The standard publications for amateurs are much better sources of antenna information and it is my feeling that some other aspect of electronics could have been substituted for this short chapter on antennas.

For the amateur interested in computers, there is a chapter on digital logic and number conversion tables and a chapter on symbols, codes, and alphabets which includes the American Standard Code for Information Interchange (ASCII).

For the constructor, there are chapters on transistors covering alpha vs. beta and methods of testing transistors, wire, color codes, time constants, and both RC and RL constants.

As the author indicates in his introduction, there is a limit to the number of electronics tables that can be prepared. When a problem requires more than two component parts of the formula, it is better to use the formulas or nomographs than to try to set up tables.

As stated, this book's purpose is to save time and work, and on this basis I found this book useful and worth its $14.95 price. It is available from *Tab Books, Inc., Blue Ridge Summit PA 17214.*

Edwin R. Lappi WD4LOO
Carrboro NC

HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time away from other duties to decipher cryptic notes scrawled illegibly on dog-eared post cards and odd-sized scraps of paper. Please type or print (neatly!), double spaced, your request on an 8½" × 11" sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a "1" look like a "1," not an "l," which could be an "el" or an "eye," and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.

I have a Koyo Model JL-451 CCTV camera and need a photocopy of the owner's manual. Also, does anyone have a modification for improving the product detector in an HQ-110A VHF made by Hammarlund?

Finally I need an SSTV alignment tape. I will copy and return.

Ira Linderman WB2RXR
89 Dovecote Ln.
Commack NY 11725

Help! I need some assistance down here in South America.

First, I need help in getting the paperwork completed for my local amateur license. I am told that it would be much faster if I had another ham who knows the ropes to help. I have listened to the local repeater till I am somewhat blue, but no one ever gives out their phone number and of course I do not dare give a call, since the laws here are very strict about that.

Second, I am looking for a simple circuit which will help us in a Bible competition—a question and answer type of program. The requirements would be as follows:

One button per each team member. Three teams, 4-6 members per team. When a team member's button is pushed, it would lock out all other buttons, while lighting a light on the button block and an LED or digital readout for the team and team member on the console. A reset button on the console would also be needed.

Finally, I am looking for an IC that would work with a TT decoder project I am working on for my bench and for possible use with a portable repeater when I return to the United States in three and a half years. For the first prototype, I plan to use 567s since they are somewhat available here (even though very overpriced).

I am looking for a chip that would give me a numeric readout rather than one of a row of LEDs to signify the decoded digit. Being somewhat of a beginner, I am not sure which chip or IC would be a good choice.

At present, the 567 output is fed to a 7402 or one of three 7402s which in turn gives a high output depending on the digit decoded, i.e., 1-0, *, #. Thus, the feed or output to the needed IC would be any one of 12.

I would appreciate any help which readers could give on these matters. Thank you very much and may God bless you.

Major Fred Musgrave WB3HCW
Special Projects Director
Ejercito de Salvacion
Sucursal 3, Casilla 194
1403 Buenos Aires
Argentina

I need a Collins 32S1 transmitter in any condition—either repairable or for parts.

H. F. Schnur
115 Intercept Ave.
North Charleston SC 29405

I badly need a copy of a manual for a General Radio 1021-A signal generator. I will pay any reasonable fee.

George Shira WD4BUM
Rt. 7, Box 101-I
Anderson SC 29624

I need a Hallicrafters SR400 or SR400A crystal lattice filter, part no. 049-000851. Can anyone help?

Marv Westerdahl KAØILK
1600 Frontier Ln.
Olathe KS 66062

I would like information on a radio I picked up at a junk sale. It is a 6-meter radiophone (DeWald by U.S.L.). I would like to find out as much as I can about the radio or sell it to someone who could use it. By the way, it has an 8450-kHz crystal.

Fred Nordstrom KA4IZK
Rt. 2, Box 26
Calvin KY 40813

I am involved in a high school science project and need any parts, complete units, etc., of the AN/USM 32 oscilloscope. I will pay all postage.

R. G. Hall W6BSH
1381 Taper Ct.
San Jose CA 95122

The Louisiana Slow Net is looking for any amateurs interested in traffic handling. The LSN meets Monday through Friday at 0130 UTC on 3.703 MHz. Interested parties should send an SASE.

Stephen V. Genusa WD5EAE
2106 Park Avenue
Monroe LA 71201

I have just acquired an old Vibroplex no. 176056 key. It is in nearly mint condition. Can anyone tell me how I can learn the year of its manufacture?

D. L. Bassler WD4KAX
330 Country Club Dr.
Tequesta FL 33458

I need a power transformer for a Heathkit® HX-10 SSB transmitter. Primary: 117 V ac; secondaries: 5 V @ 2 A, 5 V @ 2 A, 6.3 V @ 9 A, 222 V c-t, 814 V c-t, and 1880 V c-t. It is Heath part number 54-114.

Jud White WA2PMH
50 N. Greenwood Ave.
Hopewell NJ 08525

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received two months prior to the month in which the event takes place. They should be sent directly to Editorial Offices, 73 Magazine, Pine Street, Peterborough NH 03458, Attn: Social Events.

OLD BRIDGE NJ
MAR 1

The Old Bridge Radio Association will hold its first annual auction of ham radio, electronic, and computer equipment on March 1, 1981, at the Cheesequake Firehouse, intersection of Rtes. 35 and 9, Old Bridge NJ. The exhibition will begin Sunday morning at 11:00 am, and the sale will begin at noon. Refreshments will be available. Talk-in on .72/.12 and .52. For more information, call Fred Goldberg at (201)-257-8753.

DAVENPORT IA
MAR 1

The Davenport Radio Amateur Club will hold its tenth annual hamfest on March 1, 1981, from 8:00 am to 4:00 pm at the Davenport Masonic Temple, Highway 61 (Brady Street) and 7th Street, Davenport IA. Tickets are $2.00 in advance, $3.00 at the door. Tables are $4.00 each with a $2.00 additional charge for an electrical hookup (limited number). Features will include over $2,000 worth of major prizes. Hotel discounts and refreshments will be available. There will be a pre-hamfest Saturday night banquet with Paul Graver, midwest ARRL SCM, as guest speaker. Banquet tickets are $8.00 and reservations must be paid by February 18, 1981. Talk-in on 146.28/.88, W0BXR. For advance tickets, dinner, and table reservations, write Dave Johannsen WB0FBP, 2131 Myrtle, Davenport IA 52804.

GRAND JUNCTION CO
MAR 7

The Grand Mesa Repeater Society will hold the second annual indoor Western Slope Swapfest on March 7, 1981, at the Lincoln Park Barn, 12th and Gunnison, Grand Junction CO. Doors will be open from 10:00 am through 4:00 pm and admission is free. Swapfest tables are $4.00 in advance. Attractions will include commercial exhibitors, a flea market, an auction, and prizes. Raffle tickets for the grand prize of a Tempo S-1 are $2.00 each. Talk-in on 146.22/.82. For further information, send an SASE to Larry Brooks WB0ECV, 3185 Bunting Avenue, Grand Junction CO 81501, or call (303)-434-5603.

STERLING IL
MAR 8

The Sterling-Rock Falls Amateur Radio Society will hold its 21st annual hamfest on Sunday, March 8, 1981, at the Sterling High School field house, 1608 4th Avenue, Sterling IL. Advance tickets are $2.00 and tickets at the door are $2.50. A large indoor flea market will be restricted to radio and electronic items only. Tables are available for $5.00 for commercial and $3.00 for others. Plenty of free parking will be available, including an area to accommodate campers and mobile trailers. Many prizes will be given away, including a first prize of a minicomputer. Doors open at 7:30 am. Featured will be a movie, "The World of Amateur Radio," to be shown throughout the day, bargains, good food, and plenty of close-by activities for XYLs and kids. Talk-in on .52 and WR9AER .25/.85. For advance tickets and tables, write Sue Peters KA9GNR, 511 8th Avenue, Sterling IL 61081. Make checks payable to Sterling-Rock Falls Amateur Radio Society and enclose an SASE.

MIDLAND TX
MAR 14-15

The Midland Amateur Radio club will hold its annual swapfest on Saturday, March 14, 1981, from 1:00 pm until 7:00 pm, and on Sunday, March 15, 1981, starting at 8:00 am, at the Midland County Exhibit Building east of Midland TX on Highway 80. There will be door prizes. Preregistration is $4.50 or $5.00 at the door. Talk-in on 146.16/146.76. For more information or to pre-register, write the Midland Amateur Radio Club, Box 4401, Midland TX 79704.

TRENTON NJ
MAR 15

The Delaware Valley Radio Association, W2ZQ, will hold its 9th annual flea market on Sunday, March 15, 1981, from 8:00 am to 4:00 pm at the New Jersey National Guard 112th Field Artillery Armory, Eggerts Crossing Road, in Lawrence Township, NJ. Advance registration is $2.00, $2.50 at the gate. There will be indoor and outdoor flea market areas. Sellers are asked to provide their own tables. Prizes and refreshments will be available. Talk-in on 146.07/.67 and 146.52. For additional information or tickets, write DVRA, PO Box 7024, West Trenton NJ 08628. Please include an SASE.

WINCHESTER IN
MAR 15

The Randolph Amateur Radio Association will hold its 2nd annual hamfest on Sunday, March 15, 1981, from 8:00 am to 5:00 pm, at the National Guard Armory, Winchester IN. Admission is $2.00 in advance or $3.00 at the door. Table space is $2.50 and table space with table (limited supply) is $5.00. Space reservations must be made in advance. Features include prizes, programs, new equipment displays, a flea market, and refreshments—all indoors with security. Talk-in on 147.90/.30, 223.30/224.90, and 146.52. For advance reservations and information, contact Jake Life W9VJX, Box 162, Winchester IN 47394, or phone (317)-584-9361.

CANTON OH
MAR 21

The Canton Amateur Radio Club will hold its annual auction on March 21, 1981, at the Nimishillen Grange Hall, Easton Street NE, Canton OH. The doors will open at 4:00 pm and the auction will start at 7:30 pm. An Icom IC-2A and an antenna tuner will be given away as door prizes. The two-meter check-in prize will be an Avanti antenna. Check-in on 146.19/.79. For advanced tickets and/or further information, send an SASE to R.A. Stellarini WB8VUN, 1003 Shadyside Avenue SW, Canton OH 44710, or phone (216)-453-5896 after 5:00 pm.

MARSHALL MI
MAR 21

The Southern Michigan Amateur Radio Society and the Calhoun County Repeater Association will sponsor the 20th annual "Michigan Crossroads" Hamfest on Saturday, March 21, 1981, at the Marshall High School, Marshall MI. Doors will open at 7:00 am for exhibitors and at 8:00 am for buyers and lookers. Free parking, unloading help, and food service will be available. There will be a special craft section for the ladies, and door prizes and talk-in prizes will be awarded. Table space is $.50 per foot and will be reserved until 9:00 am. Talk-in on .07/.67 and .52. For more information, write SMARS, PO Box 934, Battle Creek MI 49016, or call Earl Goodrich at (616)-781-3554.

SO. SIOUX CITY NE
MAR 21

The 3900 Club and the Sooland Repeater Association will sponsor Hamboree 5 on Saturday, March 21, 1981, at the Marina Inn, So. Sioux City NE. Doors will open at 9:00 am. Advance registration, including the banquet, is $10, tickets at the door are $12, and the Hamboree only (no dinner) is $2. Present will be Midwest Director Paul Graver W0FIR and *QST*'s Stuart Leland W1JEC, who will present two programs. Features include CW contests, a special Novice meeting, many programs throughout the day, commercial exhibitors, a flea market, old-time radio and amateur exhibits, and prize drawings. At 6:00 pm, there will be a banquet featuring Toastmaster John Daniels WA0GQK. There will be special programs for the ladies. Reservations for a 3 x 8 foot table are $2 and can be made by contacting Al Smith W0PEX, 3529 Douglas Street, Sioux City IA 51104. For advance tickets and motel reservations, write Jerry Smith W0DUN, Box 14, Akron IA 51001. For more information, contact Dick Pitner W0FZO or Glen Holder K0TFT.

CHARLOTTE NC
MAR 21-22

The Mecklenburg Amateur Radio Society, Inc., will sponsor The Charlotte Hamfest and ARRL North Carolina state convention on March 21-22, 1981, at the Civic Center, Charlotte NC. Close by are hotels, restaurants, and secure parking. Aisle booths are $60.00 and end

booths (in pairs) are $160.00. This includes a name sign, two tables, dividers, and electricity. For more information or booth reservations, write The 1981 Charlotte Hamfest, Mecklenburg Amateur Radio Society, Inc., 2425 Park Road, Room 023, Charlotte NC 28203, Attention: Bob Darke W4MHF. On Friday, March 20, 1981, the annual Charlotte Hamfest "Attitude Adjustment" party will be held in the Civic Center Hospitality Room.

IRVINGTON NJ
MAR 22

The Irvington Radio Amateur Club will hold its hamfest on Sunday, March 22, 1981, from 9:00 am to 4:00 pm at the P.A.L. Building, 285 Union Avenue, Irvington NJ. Take the Golden State Parkway to exit 143 north or 143A south. There will be refreshments available. Admission is $1.00 and tables are $3.00. Talk-in on .34/.94 and .52. For further information, call Pete WB2FAS (201)-763-8220, or write IRAC, P.A.L. Building, 285 Union Avenue, Irvington NJ 07111.

MAUMEE OH
MAR 22

The Toledo Mobile Radio Association, Inc., will hold its 26th annual auction and hamfest on Sunday, March 22, 1981, at the Lucas County Recreation Center, Key Street, Maumee OH. Hours are from 8:00 am to 5:00 pm. The free auction starts at 10:00 am. There will be ample free parking all day and overnight. Tickets are $2.00 in advance and $3.00 at the door. Flea market tables are available; displays are limited to electronics and ham gear. There will be commercial exhibits, refreshments, door prizes, and a big raffle—all inside. Prizes include a Kenwood TS-130 with power supply, two Icom IC-2AT HTs, a Bird Wattmeter, and many more. There will be an additional ladies' program. Bring your YL, XYL, or OM and make a day of it. Talk-in on 146.52/.52. Area repeaters are 146.01/.61, 146.19/.79, 146.34/.94, 147.87/.27, and 147.975/.375. For additional information, write J. Honisko N8BGH, 1733 Parkway Drive N., Maumee OH 43537.

COLUMBUS GA
MAR 28-29

The Columbus Amateur Radio Club will hold its hamfest on March 28-29, 1981, at the Columbus Municipal Auditorium. Admission is free. A ticket donation is $1.00, and inside swap tables are $5.00 per day. There will be a free outside flea market. This is an ARRL hamfest and will include an ARES forum. Talk-in on .28/.88. For table reservations, contact K4RHU, 2701 Peabody Avenue, Columbus GA 31904, or phone (404)-322-7001. For more information or tickets, contact N4ATI, 263 Logan Avenue, Ft. Benning GA 31905, or phone (404)-687-3272.

PHILADELPHIA PA
MAR 29

Penn Wireless Association, Inc., will hold its Tradefest '81 on Sunday, March 29, 1981, at the National Guard Armory, Southhampton road and Roosevelt Boulevard (Rte. 1), ½ mile south of exit 28 on the Pennsylvania Turnpike, Philadelphia PA. General admission is $3.00 and a 6' x 8' seller's space is $5.00 with an additional $3.00 for a power connection (limited number). Each sales space will entitle the seller to one free admission. Doors will open at 7:00 am for setup and at 8:00 am for general admission. Features will include prizes, refreshments, displays, rest areas, and surprises. Talk-in on 146.115/.715 and .52. For more information, contact Kenneth Marinoff K3FKW, PO Box 734, Langhorne PA 19047.

MADISON OH
MAR 29

The Lake County Amateur Radio Association will hold its 3rd annual Lake County Hamfest on Sunday, March 29, 1981, at the Madison High School, Madison OH. Admission is $2.50 in advance (send an SASE before March 14, 1981) and $3.50 at the gate. Display space, including table(s) if desired, is 85¢ per linear foot. Table rent with reservation will hold a space until 10:00 am. Highlights will include commercial exhibits for ham and computerist, an inside flea market, a computer raffle with a prize of an Ohio Scientific C1P Series 2 personal computer with monitor, cassette, and 8K RAM. Also, door prize drawings will be held hourly, with first prize being a Ten-Tec Delta 580 with 280PS. Plenty of overnight accommodations are available within a 15-minute drive. Talk-in on 147.81/.21. Check-in on 146.52/.52. For further details, write Lake County Hamfest Committee, 5555 Anaconda Road, Mentor OH 44060, or call (215)-953-9784.

BRAINTREE MA
MAR 29

To celebrate its 50th anniversary in amateur radio, the South Shore Amateur Radio Club will hold an indoor flea market on Sunday, March 29, 1981, at the Viking Club, 410 Quincy Avenue, Braintree MA, from 11:00 am to 4:00 pm. The entrance fee of $1.00 includes one chance for the door prizes. Additional chances may be purchased at 3 for $1.00. There will be eight-foot tables available for $7.50 each (which includes one free admission). Vendors will be able to set up at 10:00 am. Plenty of free parking will be available. For advance table reservations, send a check, payable to the South Shore Amateur Radio Club, to Ed Doherty W1MPT, 236 Wildwood Avenue, Braintree MA 02184

ROCHESTER MN
APR 4

The Rochester Amateur Radio Club and the Rochester Repeater Society will sponsor the Rochester Area Hamfest on Saturday, April 4, 1981, at a new location, John Adams Junior High, 1525 NW 31 Street, Rochester MN. Doors will open at 8:30 am. There will be a large indoor flea market for radio and electronics items, prize raffles, refreshments, and plenty of free parking. Talk-in on 146.22/.82 (WRØAFT). For further information, contact RARC, WBØYEE, 2253 Nordic Ct. NW, Rochester MN 55901.

UPPER SADDLE RIVER NJ
APR 4

The Chestnut Ridge Radio Club will hold a ham radio and computer flea market on April 4, 1981, from 9:00 am to 3:00 pm at the Education Building, Saddle River Reformed Church, East Saddle River Road at Weiss Road, Upper Saddle River NJ. Tables will be available for $10; tailgating, $5. There is no admission fee. Food and drink will be available. For further information, contact Jack Meagher W2EHD, (201)-768-8360, or Neil Abitabilo WA2EZN, (201)-767-3575.

GOTEBORG SWEDEN
APR 4-5

The Goteborg Transmitting Amateurs invite all interested hams to an international ham meeting in the Swedish Trade Fair Centre, Goteborg, Sweden, on April 4-5, 1981. Featured will be a thematic stamp exhibition; lectures on VHF, UHF, and SHF; and meetings for YLs, award-hunters, and DXers. Other programs to be announced are fox-hunting, a mobile-radio contest, and a CW speed contest. A hamfest will be held on Saturday night.

PADUCAH KY
APR 5

The Paducah ARES Club will hold its 2nd annual ham/swapfest on Sunday, April 5, 1981, from 8:00 am to 5:00 pm, at the National Guard Armory, Paducah KY. There will be hourly as well as grand prize drawings. Dealers will be on hand. Talk-in on 147.66/.06 and 146.52. For additional information, contact Larry Reid AI4T, Chairman, 220 Longview Drive, Paducah KY 42001.

FRAMINGHAM MA
APR 12

The Framingham Amateur Radio Association will hold its annual Spring flea market on Sunday, April 12, 1981, at the Framingham Police Station drill shed, Framingham MA. Doors will open at 9:00 am and admission is $1.00. Sellers' tables are $7.00 in advance and $8.00 at the door. Talk-in on .75/.15 and .52. For more information or seller pre-registration, contact Ron Egalka K1YHM, 3 Driscoll Drive, Framingham MA 01701, or phone (617)-877-4520.

AMBOY IL
APR 26

The Rock River Amateur Radio Club will hold its 15th annual hamfest on April 26, 1981, at the Lee County 4H Center in Amboy IL, one mile east of the junction of Rtes. 52 and 30, 10 miles south of Dixon IL. There will be free coffee and donuts starting at 8:00 am. Camping space will be available at a nominal charge. Six-foot display tables are $5.00 each and tickets are $1.50 in advance, $2.00 at the gate. Talk-in on .37/.97 and .52. For full details, contact Charles (Chuck) Randall W9LDU, 1414 Ann Avenue, Dixon IL 61021, or phone (815)-284-6380.

LETTERS

from page 20

and more people interested in hamming not only for a possible career but just a "good life." You pursued a career with ham radio. I, the "good life" as an executive in a large corporation!

J. F. Irwin W6ECB
San Francisco CA

ONE MAN'S OPINION

With regard to Wayne's editorial in the December, 1980, issue, it is reasonable to assert that the use of calculus and lots of mathematical equations is not essential to the pursuit of radio technology by amateurs or technicians, and to be guided by this conviction is tailoring the articles which you publish. It is unreasonable to take the same editorial opportunity to condemn college calculus in general as you seem to have done. The danger in such condemnation is its possible influence on impressionable younger readers who admire you for your many accomplishments and thus tend to attach undue importance to what is really just one man's opinion.

Many of these youngsters are faced with important career decisions and will latch on to any guidance they can find. Some are contemplating enrollment in university courses of science or engineering, courses for which calculus is a requirement despite your low opinion of its merit. These people should be advised that opinions differ widely on the role of mathematics in the sciences, and that yours is representative of just one extreme. Everywhere in the ham community can be found dedicated, intelligent, and successful people who are diametrically opposed to the views you express.

Calculus is the mathematics of motion and change. As such, it plays a vital role in the exposition and understanding of physical principles, indeed, so much so that it has become part of the very language in which many sciences are couched. Thus, the student must know a fair amount of calculus to cope with the science texts that he is required to master, or to comprehend the lectures which are an essential part of his science education. To disdain the calculus is to disdain communication with some of the greatest minds of past and present. Most working scientists employ both mathematical and physical reasoning in their work, emphasizing one or the other, depending on their personal tastes and talents. When the going really gets tough, they are happy to try any tool available.

Please bear in mind that nearly a half century has elapsed since Wayne's own, unfortunate encounter with college math. Many drastic changes have occured both in the way the material is presented and in the extent to which students must acquire proficiency in it if they are to get the most from their subsequent courses in the sciences.

In 1940 only a relatively few Americans went on from high school to colleges and only a small fraction of college students enrolled in calculus. Today the subject is taught in many high schools, and probably a lot of the brighter students who opt for the course are themselves part of the very ham fraternity that you are so eager to serve.

In time, these students will acquire proficiency not only in calculus, but in disciplines such as linear analysis and matrix algebra whose practical importance has been amplified by the emergence of electronic computers, and whose practical need has been amplified by things like the increased attention which engineers are devoting to systems theory.

So please try to be more tolerant. When someone submits an article containing a few equations, don't just dismiss it as a display of ego or pedantry. Perhaps the author was just trying to express himself in the way which seemed clearest to him. Can you be so sure that you are an infallible guide as to how it would be clearest to others? No manner of presentation has a monopoly on clarity or success.

Larry Potts W2FOH
Williamsville NY

SAFETY FIRST

I am very far behind in my reading. However, I would still like to comment on the article in the August, 1980, *73* by WB6MXD for constructing the Gel/Cell charger ("A Different Kind of Charger," p. 115).

I would like to point out that any device powered from the 120 V ac power line or even from a battery capable of delivering large amounts of current should never be built without being appropriately fused.

To be safe, this charger should have a fuse not exceeding ½ Amp in the 120 V ac primary circuit, and to be totally safe should also have a fuse not exceeding 1 Amp in the ac secondary circuit.

Most everyone would be amazed at how fast wire insulation can burst into flames when current flow is not restricted. If a diode shorts in a rectifier bridge, this can easily occur.

Rodger Williams N0BRG
Minneapolis MN

CARROT DANGLING

I'd like to comment on Wayne's idea of a code-free (theory-free?) ham license. We already have one! It's called the Novice License. The code and theory required for Novice are so simple that anyone who can read can get a ticket. Even some bright gradeschoolers are licensed.

Most people who don't know about code or electronics are afraid to learn anything about ham radio. Learning code and theory is work. Work should have a reward. The CW-only Novice license is not enough reward for people who are accustomed to voice communication. It's hard to convince a CBer or teenager to learn code, theory, and laws for a radiotelegraph ham license. This is especially so when he finds out he must learn more code, more theory, and more laws, and then have to travel to a distant city for the exam for a radiotelephone ham license.

Almost everyone has had a prospective ham become discouraged to find out that the Novice ticket you're offering to help with will allow only CW contacts and, worse still, that the equipment for the four bands *is* expensive. For the prospective Novice to invest that much work and money is a big decision. I feel that more would make that decision if phone privileges were included in the reward. Not a lot of privileges, but just enough for a carrot.

For example, a new phone subband at 28.4 to 28.5 with a 250-Watt limit. Novices could meet with all other classes of hams on this band, get encouragement, ask questions, and gain experience. I'll bet that more interesting CW contacts would come from Novices who are exposed to a little phone fun. I'll also bet more Novices would be licensed because of phone privileges.

So, how about an easy-code (easy-theory?) license with a carrot to entice the newcomer?

Larry W. Garens WD8CIY/5
Brady TX

QRZ HAWAII

The McKinley High School Amateur Radio Station (KH6NF) is trying to make contact with teenagers and young adults around the world. McKinley High School is the oldest public high school in the state of Hawaii, being 115 years old this school year. We are located in Honolulu, just minutes away from the famous Diamond Head crater and Waikiki Beach. Our student population is just over 2000 students and would rival the United Nations with our diversity of culture and national heritage.

The club station has been in operation since 1966, but this year we are making a special effort to contact other club stations and younger members of the amateur radio society. We are inviting everyone to join us on the bands and make this year an outstanding one for the youth in amateur radio.

Our hours of operation will be from 1730Z to 1815Z and 0045Z to 0130Z Monday through Friday, and 2000Z to 2130Z Monday, Wednesday, and Friday. At present, we operate on 28.530 MHz ± QRM. If 10 meters closes up, we will operate 21.320 MHz or 14.320 MHz. We also operate in the Novice band on 21.195 ± QRM.

If you are unable to contact us because of poor band conditions, please drop a line to set up a schedule and we will do our best to have a QSQ with you.

McKinley High School
Amateur Radio Station
1039 S. King Street
Honolulu HI 96814

SAVE LIVES

Thanks for encouraging repeater owners to install emergency locator transmitter (ELT) monitors. Such monitors definitely assist search and rescue (SAR) forces in two important ways. First, in many areas of the *country no one* monitors 121.5 MHz so repeaters can often be the first to report a distress signal. Second, the moderate height of most repeaters (when compared to a search aircraft or a ground-level search team) provides valuable information in reducing a search area to a manageable size.

Others in the amateur community also can assist in SAR. Homebuilders, designers, and commercial firms can work on creating inexpensive but selective and sensitive 121.5- and 243.0-MHz direction finders and receivers. Commercial firms might also market DFs in kit form to keep costs down. Traffic handlers can offer their services to local SAR teams. Transmitter hunters with equipment for 121.5 or 243.0 are always welcome. All of these areas make good club projects as well. The resulting favorable publicity certainly would help the club and amateur radio in general.

Amateurs interested in this work should get in touch with the SAR organization in their area. If they know someone in their local Mountain Rescue Team or Civil Air Patrol unit, then that's a good place to start. If not, they can write to HQ CAP–USAF, Maxwell AFB, AL 36112, for the address of their state's CAP Wing. I can also provide this information if they wish.

I hope that many more amateurs will find, as I have, that saving lives can be more rewarding than just saving QSLs.

Gary C. Wilson WB2BOO
Major, CAP
Emergency Services Officer
PO Box 16099
McGuire Air Force Base NJ 08641

ELITISTS

Must we be subjected to such unthinking and irresponsible drivel as KB7HM proposes (*73*, December, 1980), namely the elimination of theory *from* the licensing exams? It has already been tried in the CB service, and look at the mess that has resulted! Do we want this on the ham bands as well? Is learning such a painful process?

To examine the question from another angle, what benefits, if any, do we achieve as a result of theory requirements in the exams? "That," as Mr. Shakespeare said, "is the question."

Hams may well look with pride at their many contributions to the science of radio communications and many associated arts. I submit that much of this progress has come about because the technical requirements that KB7HM would eliminate are accepted as demonstration that the individual knows enough of what it is all about so that the freedom to innovate, to experiment, can safely be entrusted to him or her, as the case may be. As an example, while I cannot buy a ten-meter linear, there is no problem with my making and using one. It is this freedom which has made ham radio what it is, in contrast to the electronic anarchy that we find on eleven meters.

If we were to abandon requirements to have at least a glimmer of what makes the wheels go 'round, the future of ham radio might as well be turned over to the equipment manufacturers, who would certainly lick their figurative chops at the prospect of hordes of new (and ignorant) customers to buy their goodies.

If ham radio is not to degenerate into another CB mess, where a fistful of bucks is the only requirement, technical know-how must remain an important factor in licensing, and ham radio will again be capable of providing many technically oriented men and women for industry, or for national emergency, as in the past.

Elitist group? You're damn right! We hams have over the years earned the right to that title! Those who find it too difficult, too painful, or just don't want to be bothered to learn will always find a Bash to pander to their wants. To each his own! But let's not throw the baby out with the bath water!

Henry S. Keen W5TRS
Fox AR

PROFESSIONAL RADIO

Wayne's answer to the letter concerning radio-theory testing requirements for amateur radio licensing (*73*, December, 1980) was "Let's hear it for the code-free, theory-free license." Such an attitude concerns me greatly.

I do agree with him in principal that code or theory really should not be a requirement, for as one will note, it is called "amateur" radio as opposed to "professional" radio. However, without the requirements we would be in serious trouble. Personally, I had a great deal of trouble passing the theory test (flunked it the first time), I am not capable of designing or repairing (unless very simple) my own equipment, I do not use the code that almost cost me my sanity to learn, yet I am a firm believer in those testing requirements.

I feel this way *not* because I think they make you a better radio operator, not because I think you should be able to fix your own gear (I envy those that can), nor because I think everyone should be a finger-talker, but because it is the only way I know of to date to keep amateur radio from becoming an expanded citizen-band radio.

I will be the first to admit that all the time I spent learning code and theory was a waste of time for I retained none of it; then, again, I feel the same way about the language requirement for my PhD—truly a waste of time, the only French I know today is *oui* (and that is because there is a magazine with that name). I feel that even though I did not choose electronics as my field, and at the same time have no desire to use CW, I do have a right to use the radio as does everyone. In addition, however, I feel that along with that right comes responsibility that must be taken seriously if I am to use this privilege.

Ten years ago I was also into CB. At that time I would say "This is KFK-1988 looking for __," and everyone used callsigns and proper radio procedure. There were a few who didn't take it seriously but we ignored them or asked that they use proper procedure. Slowly, their numbers increased until those of us that used our callsigns were in the minority and considered somewhat weird by the average CBer.

I cannot accept today's CB procedures nor do I want to search the deep abyss of my brain to come up with the world's greatest handle (and let's face it: The most important thing to a good CBer is the handle). Consequently, I have a box full of CB gear in my basement that has not felt a volt of electricity for ten years. Personally, I feel that perhaps they too have a right to the airwaves and if they choose to use a handle instead of a callsign, I can choose not to participate. In addition, it provides a place for the serious radio operator and the not-so-serious operator, each able to use the radio for their enjoyment—everyone has a choice.

Presently, the theory and code requirements are the only mechanisms that keep in check (with pretty good results) the professionalism of this amateur hobby. I know of no test that will scrutinize potential radio operators that would guarantee polite, professional, courteous, careful radio operators, and I recognize that the present system also allows a jackass to occasionally slip by the system.

I sympathize with those potentially fine radio operators that cannot pass that tests and therefore cannot give us the pleasure of their company on the bands. I can only say to keep trying, for we'll be waiting. However, if the FCC does away with the testing requirements, you and I both know what will happen and you and I will also be making a choice between selling our equipment or finding that super-unique handle (how about "Hambone"—seems appropriate).

So, until someone comes up with something better, let's not open the floodgates to the unprofessional, careless, unscrupulous, rude individuals who will turn a hobby that presently brings enjoyment into one which will bring frustrations and ulcers to us all. Amateur radio is still a hobby that generates friendships throughout the country, is considered a privilege, and approached professionally and seriously by 99.9% of its license holders—let's not jeopardize

(down-right lose) it by taking off all testing requirements until a better system is designed which will retain the high caliber it is today. What good would a license to operate be (even if very simple to acquire) if you wouldn't want to use it after you did obtain it?

Timothy W. Joseph WB0MIS
Plainfield IL

SHELL GAME

I hope you will print this letter and that your readers will be as burned as I am. It all started when I read David Sumner's (K1ZZ) "It Seems to Us" article in the December, 1980, *QST*. The more I read the more I felt I was participating in a fast-talking carnival shell game. You know, the old "now you see it—now you don't."

I read the K1ZZ article and the small print tucked away on page 51 of the September, 1980, *QST* five or six times before I got the whole picture. Judging from the letters in the Correspondence section of the December issue, complaining about the 25 kHz on the 40-meter band, many people completely missed the point. The rap occurred on the 20-meter band, but I will get to that later.

K1ZZ almost had me in tears of gratitude with the Board's concern for the ham's plight when the MUF drops below 14 MHz. But he explained that the new 10-MHz band gained at WARC would be the solution to that problem. Oh, joy!

Then he tells me that the Board recommended that this band (that was to be my salvation when the MUF dropped) be used only for CW and RTTY. Egad! What will the majority of the operating hams get out of this band? Nothing! The ARRL has ballyhooed us for months about the new band they gained for us at WARC (now you see it), then they turn right around and recommend restricting its use to CW and RTTY only (now you don't). All that talk about the MUF dropping below 14 MHz was just something to distract attention from the real issue, which is, how they are going to go about slicing the frequency pie.

But that's not all the Board did. The old shell game is just warming up. Since the CW and RTTY boys were handed the best band that was gained at WARC something must be done for the phone operators, right? Wrong!

Well, in all honesty, something was done for approximately 6% of the licensed hams, the Extra class operators. The Board recommended opening up the 7.075-7.100-MHz portion of the 40-meter band and the 14.150-14.200-MHz portion of the 20-meter band to the Extra class guys.

K1ZZ's article was strangely silent in regard to the 50 kHz on 20 meters that was handed over to the Extra class operators. Nor did his article mention that it was this 50 kHz that troubled the Board the most in deciding upon what to recommend. Who took care of the Extra class guys? According to my 1979 *Callbook*, the Board members are:

Name	License
Dannals	Extra
Anderson	Extra
Bieberman*	Extra
Butler	Extra
Carpenter	Advanced
Grauer	Extra
Holladay	Extra
Miller	Extra
Nathanson	Extra
Oubre	Extra
Stevens	Extra
Sullivan	Advanced
Thurston	General
Wangler	General
Wicker	Advanced
Zak	Advanced
Powell*	Canadian

*These board members voted against the resolution.

As you can see, 10 of the 17 board members are Extra class licensees, and they voted to take care of themselves. Don't be unduly grateful to Bieberman (W3KT) for his opposing vote. Apparently he opposed the resolution because his recommendation on how to slice the pie failed. Incidentally, his recommendation opposed giving the General and Advanced class operators the paltry 25 kHz on 20 meters that they did get.

The only board member deserving of any respect is Powell (VE3OT). At least he voted in the best interest of the hams he was representing. We all know it would be in his best interest to keep stateside calls out of the band below 14.2 MHz.

OK, it's time to give you the score, the net effect of the Board's recommendation. If you tried to decipher this from *QST* you would need a magnifying glass and a flowchart to know the outcome. Here are the results complete with the winners and losers.

For Generals, Advanced, and Extras, RTTY and CW will be OK on 10.100-10.150 MHz, a gain of 50 kHz.

Extras only: 7.075-7.100 MHz (25 kHz) and 14.150-14.200 MHz (50 kHz).

Advanced ops in the 14.175-14.200-MHz range get 25 kHz.

Generals: 14.225-14.250 MHz (25 kHz).

The only real winners are the Extra class operators. They gained an additional 75 kHz on phone. I can't argue with the fellow who studies and passes the Extra class exam and as a result gets rewarded with extra privileges. But in this case, the Extras did nothing to earn the 75 kHz. For the same effort, the Generals and Advanced class licensees got only 25 kHz. The 25 kHz are an insult to one's pride and intelligence. It's like pitching a steak bone to a dog.

Based upon the license class statistics in my 1979 *Callbook*, the losers (Generals and Advanced) represent about 51 percent of the licensed hams. I wonder how long the ARRL would survive if it retained only its 6% favored membership?

No doubt about it: The CW operators are losers also. They swapped 75 kHz on 20 and 40 meters for 50 kHz on a band where they don't have any equipment or antennas.

Another big loser is the Advanced class DXer. If you don't believe me, just check your log and notice how many of the really rare countries you bagged on the bottom 25 kHz of 20 meters. The crowded conditions will again push the rare DX to the lower end of 20 which will be out of the Advanced class operators' reach.

I suppose what bothers me most is that I feel like I have been had. The Board feels free to dictate and to manipulate its own ARRL members. They expect me to swallow K1ZZ's snow job. They think they can force the CW operators to move, too, and to open up the new 10-MHz band for them. They think they can force hams to upgrade to Extra by penalizing them 50 kHz. They expect people like me to keep their mouths shut. Well, I've got news for them. I'll upgrade when I get damn good and ready to do so—and I will not keep my mouth shut.

Robert G. Ray WB4TCH
Germantown IN

Picky, picky, picky. —Wayne.

REMEMBERING WHEN

In the December, 1980, issue of *73 Magazine*, I was fanning through in preparation to reading it when two names jumped out at me, MacKinlay Kantor and Bandel Linn. I had the good fortune to meet both in Sarasota back in 1954 and 1955 when I worked for Kent McCinley (*The Sarasota News*). Kent asked me to come down and set up a darkroom and photographic staff and Bandel was doing the cartoons for the *News*.

The first time I met him was a bitter cold morning. The City Editor wanted a shot of the official thermometer over on Midnite Key and I had to go by Bandel's and get him out of the sack because the Editor wanted a snowbird drawn sitting on top

of the louvered cabinet that housed the official thermometer. Bandel's first words were "I dunno what the hell a snowbird looks like."

I met MacKinlay Kantor the first time at the post office where I had been sent to get a shot of him mailing the manuscript to the publisher on a Monday morning. It was later the next year that he won the Pulitzer Prize for that manuscript, *Andersonville*. We became good friends and I used to drop in at his place every time I was over at the beach on an assignment.

We talked about Spain a great deal as I had at one time rented a house in a little village and thought I could loaf for a whole year. But after a month and a half, I was going nuts so I had the agent sub-lease it and I came back to the states.

My tenant was Mac Kantor. We used to get a big laugh out of it. He told Johnny, who owned the Beach Club, that I was a hell of a landlord and wouldn't fix the pipes, but where else could he rent a six-room house on the beach. A house that housed Hemingway, Michener, and myself. Where else could he find a house with all that room and two servants all for fifty dollars a month, and keep a dog, Lobo.

One of the most touching obits I have ever heard was the one Mac wrote when Lobo died. Mac loved that dog.

I met a number of interesting people at Mac's home: Ben Stahl, the artist, had a beautiful home on the key and I did a spread for *House Beautiful* on it. He bulldozed a hill and built the house with a basement—unheard of in Florida those days. There was a *john* in the basement! When you closed the door, a panel on the right-hand wall slid up and a bar with a small refrigerator below was at your elbow.

Another person I met at Mac's was a folk singer with a guitar—Burl Ives.

I left Sarasota and moved to Miami where I lived until I had to have my leg amputated (bad circulation) and then moved to Riverview, a small town south of Brandon which is a small town south of Tampa.

Bob McConnell
Riverview FL

RTTY LOOP

from page 18

tional cassette recorder. The unfortunate side is that no compatible tape system is used for these tapes. So, owners of large 6800 systems cannot assemble programs on the large system, dump them to tape and load that tape into the ATR-6800. They are forced either to figure out some direct way of loading or to type in programs by hand, which is very tedious for long programs.

So, let's see what we have. The Microlog ATR-6800 is a versatile computer-based (Motorola 6800) RTTY/Morse system capable of operating on Baudot, ASCII, or Morse. Enhancement programs are available to add convenience functions in the standard modes, or to add additional modes, namely, transmission of SSTV (reception is not supported). Used on Baudot RTTY, probably the most likely application, the unit can provide good solid communication, once familiarity with the unit is obtained. Other modes can be run with ease equal to Baudot, and operation is similar, no matter what the mode.

Problems? Well, putting the functions on the keycaps would help the learning process immensely. Tuning is marginal with the provided indicator; two LEDs for Mark and Space would make tuning less of a chore. The display size is a function of the amount of RAM dedicated to the video display; nonetheless, forty characters on RTTY is a bit more than half of a standard RTTY line, and any attempt at formatting is useless. A hard-copy printer is probably still needed for any type of message or novelty work; this may be one of the new ASCII printers, however, and need not be an old green-key-greaser. The character generator could be changed to a more standard type, and perhaps another software function provided to switch the keyboard into conventional lowercase unshifted, uppercase shifted format in ASCII.

CNTRL-A	Exit from Computer Mode	CNTRL-Z	Zoom/normal toggle
CNTRL-B	Cassette Tape Play/Record	CNTRL-0	Select number of char per line
CNTRL-C	Send clock time	CNTRL-1	Demodulator toggle
CNTRL-D	SYNC (diddle) on/off	CNTRL-2	Hi/low tone toggle
CNTRL-E	Computer terminal mode	CNTRL-3	Normal/inverted toggle
CNTRL-F	Ignore received line feed code	CNTRL-4	AGC toggle
CNTRL-G	Anti-CW toggle	CNTRL-9	Printer char line length
CNTRL-H	Select MARK/SPACE frequencies	CNTRL-SPC	Morse intercharacter spacing
CNTRL-J	Half-Full duplex select	CNTRL-SK	Receive mode
CNTRL-K	Set clock	CNTRL-KN	Receive mode, clear buffer
CNTRL-L	Line Mode, on/off toggle	CNTRL-AR	Word wrap toggle
CNTRL-M	Morse mode	CNTRL-.	Memory size
CNTRL-N	Printer enable/disable toggle	CNTRL-TAB	Display system status
CNTRL-O	Enter Computer Mode	CNTRL-ESC	Re-initialize display
CNTRL-P	Printer speed select	CNTRL-+	Extend STOP bit
CNTRL-S	Split screen line position	CNTRL-BK	Transmit mode, save buffer
CNTRL-T	RTTY Mode	SHIFT-KN	Transmit mode
CNTRL-U	Unshift on space toggle	SHIFT-AR	Receive when buffer empty
CNTRL-V	Black/white display toggle	SHIFT-0	Morse when buffer empty
CNTRL-W	Word mode, on/off toggle	SHIFT-BT	RTTY when buffer empty
CNTRL-X	Select operating speed		
CNTRL-Y	Keying relay toggle	...and many more...	

Fig. 2. ATR-6800 keyboard commands.

Overall, it's a good unit, but I don't think it is the end of the line. Microlog is actively working on new options and features, as are many other manufacturers. I think we all need to keep our eyes open—it can only get better.

We will catch up on some reader input next month, and take a look at more equipment useful to the RTTYer as time goes by. Questions about RTTY? Even if we covered it a few years ago, you may have missed it. Let me know what you need to find out, and look for the answer here in RTTY Loop.

HAM HELP

I recently obtained a Trio 9R59D general-coverage communications receiver, but no schematic or service manual was available from the previous owner. I will gladly pay for photocopies or an original manual. This receiver was manufactured in the 60s and sold by Simpsons-Sears in Canada. Thank you.

F. G. Clark Forrest VE3BOF
102 Richmond St. N.
Hensall, Ontario
Canada N0M 1X0

I need two things. First, a schematic for a Knight C-577 speech compressor. Second, a schematic/manual for a signal monitor, Model SM7403, made by Defense Electronics, Inc., of Rockville MD. Most important, I need to know what i-f frequency the signal monitor operates with. Without that, I cannot use it!

Any costs for schematics/manuals or copies thereof will be happily reimbursed. Please notify me of what you have.

SSG Gary E. Kohtala WA7NTF
Qtrs 772D, Shiloh St.
Ft. Devens MA 01433
(617)-772-0395

CONTESTS

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BARTG SPRING RTTY CONTEST

0200 GMT March 21 to
0200 GMT March 23

The total contest period is 48 hours but not more than 30 hours of operation is permitted. Time spent as listening counts as operating time. The 18 hours of non-operating time can be taken at any time during the contest but off-periods may not be less than 3 hours at a time. Times on the air must be summarized on the summary sheet. There are separate categories for single-operators, multi-operator, and shortwave listener stations. Use all amateur bands from 80 through 10 meters. Stations may not be contacted more than once on any one band.

EXCHANGE:

The message exchange consists of 1) time in GMT; this must consist of a full four-figure group and the use of the expression "same" or "same as yours" will not be acceptable. 2) RST and message number; the message must consist of a three-figure group starting with 001 for the first contact made.

SCORING:

All two-way RTTY contacts with other stations within one's own country earn two points; those contacts outside your country are worth ten points. All stations can claim a bonus of 200 points for each country worked, including their own. Note that any one country may be counted again if worked on a different band, but continents are counted once only. The ARRL country list is used and, in addition, each W/K, VE/VO, and VK call area will be counted as a separate country. Final score is sum of QSO points times the total number of countries worked added to the number of countries times 200 bonus points each times the number of continents. Note, proof of contact will be required in cases where the station worked does not appear in any other contest log received or the station worked does not submit a check log.

AWARDS:

Certificates will be awarded to the leading stations in each of the three classes, the top station in each continent, and to the top station in each W/K, VE/VO, and VK area. If a contestant manages to contact 25 or more different countries on two-way RTTY during the contest, a claim may be made for the Quarter Century Award (QCA) issued by BARTG and for which a charge of $3.00 (USA) or 15 IRCs is made. Make your claim at the same time you send in your log. Holders of existing QCA awards will automatically have new countries added to their records. However, due to the high volume of work, it will not be possible to prepare and dispatch any new awards or update any existing awards until the final results of the contest have been evaluated and published.

Additionally, if any contestant manages to contact stations on two-way RTTY with each of the six continents and BARTG Contest Manager has received either a contest or check log from each of the six stations concerned, a claim may be made for the WAC Award issued by the American *RTTY Journal.* The necessary information will be sent to the *Journal,* which will issue the WAC Award free of charge.

ENTRIES:

Use a separate sheet for each band and indicate all times on the air. Logs should contain: date/time in GMT, callsign of station worked, RST and message number sent, time, RST and number received, and points claimed. Logs received from shortwave listeners *must* contain both the full report sent and received by the station logged. Incomplete loggings are not eligible for scoring. The summary sheet should show the full scoring, the times on the air, and in the case of multi-operator stations, the names and callsigns of all operators involved with the operation of the station. All logs must be received by May 31, 1981, in order to qualify. Summary and log sheets are available from the Contest Manager at the address shown below. The judges' decision will be final and no correspondence can be entered into, in respect of incorrect or late entries, and all logs submitted will remain the property of the British Amateur Radio Teleprinter Group. Send entries to: Ted Double G8CDW, 89 Linden Gardens, Enfield, Middlesex England EN1 4DX.

TENNESSEE QSO PARTY

2100 GMT March 21 to
0500 GMT March 22
1400 to 2200 GMT March 22

This is the 11th annual QSO party sponsored by the Tennessee Council of ARC. You may work the same station on different bands, modes, or counties. Repeater contacts are not allowed. Mobiles compete against mobiles, portables against portables. Single-transmitter entries only, please. No county-line operations allowed for multiple contacts. Portable stations must set up per Field Day rules. No "list" operations are allowed.

EXCHANGE:

Signal report and state, province, country, or TN county.

SCORING:

Score one point per phone QSO; two points per CW QSO on 80, 1.5 points on other bands. Combine phone and CW score as one contest. TN stations multiply QSO points by sum of number of different states, TN counties, and VE/VO provinces. All others multiply QSO points by the number of different TN counties worked. For stations working outside their home TN county, score 200 bonus points for each county with a minimum of 10 QSOs. A power bonus multiplier of 1.5 is available to all stations operating at 200 Watts dc or less during the entire contest period.

FREQUENCIES:

Phone—3980, 7280, 14280, 21380, 28580.

CW—approx. 50 kHz up from bottom of each band, Novices within their bands.

AWARDS:

Plaque to TN winner, TN mobile, and portable, plus out-of-state winners. Certificates with complete contest summary to every station sending in logs with at least 15 contacts.

ENTRIES:

Logs must show date/time in GMT, station worked, band, mode, exchange, and score. Use separate log sheets for each band with over 50 contacts. Submit a cross-check sheet similar to ARRL CD77 if over 200 QSOs are made. Logs must be legible to avoid disqualification. Logs must be mailed by May 1, 1981, to: Dave Goggio W4OGG, 1419 Favell Dr., Memphis TN 38116. Please include a business-sized SASE with your logs.

CARF PHONE COMMONWEALTH CONTEST

1200 GMT March 21 to
1200 GMT March 22

This contest is sponsored by the Canadian Amateur Radio Federation (CARF) and is open to all radio amateurs licensed to operate within the Commonwealth or British Mandated Territories. Operators may use the entire 24-hour contest period. All contacts must be made on SSB using 80 through 10 meters. Only one contact may be made with any station using a Commonwealth callsign except those within the entrant's own call area. UK stations may not work each other for points.

EXCHANGE:

RS report and a three-figure serial number commencing with 001 and increasing by one for each successive contact in the contest period, irrespective of the band in use. Each exchange must be acknowledged by the receiving station.

FREQUENCIES:

Suggested frequencies are a plus or minus 20 kHz of 3600, 3780, 7080, 14180, 21200, 28480.

SCORING:

Each completed contact scores five points. Additionally, a bonus score of 20 points may be claimed for the first, second, and third contacts with each Commonwealth call area on each band. All UK stations count as one call area.

ENTRIES:

Entries may be single- or multiband. Single-band entries should show contacts on one band only; details of contacts made on other bands should be enclosed separately for checking purposes. Only single-operator entries will be accepted. A single-operator station is

one manned by an individual who received no assistance whatsoever during the contest period. Multiband entries will not be eligible for single-band awards. Points are deducted for errors in the logs. For unmarked duplicate contacts for which points have been claimed, additional penalty points may be deducted. Each entry will consist of the separate band logs, including call area check lists, a summary sheet, and dupe check sheets. Each entry must also be accompanied by a signed declaration that the spirit and rules of the contest were observed, as well as the terms of the contestant's license. Entries should be addressed to: CARF Contests and Awards Committee, PO Box 2172, Station D, Ottawa, Ontario, K1P 5W4 Canada. Under no circumstances should entries be sent via RSGB. The closing date for entries is June 1, 1981.

SPRING VHF QSO PARTY

1800 GMT March 28 to 0400 GMT March 30

Sponsored by the Ramapo Mountain ARC. The contest rules are the same as for the ARRL VHF QSO Parties except FM operation is not permitted below 450 MHz.

EXCHANGE:

Signal report and ARRL section.

SCORING:

One QSO point for 50- to 144-MHz contacts, 2 points for 220- to 430-MHz contacts, and 3 points for 1215 MHz and up. Multiply QSO points by the sum of ARRL sections per band.

ENTRIES:

Use the ARRL VHF QSO Party or similar forms, or send an SASE to RMARC for entry forms. All who submit entries will receive a copy of the results. Mail entries by April 27, 1981, to: Ramapo Mountain ARC, PO Box 364, Oakland NJ 07436.

YL ISSB QSO PARTY—CW

0001 GMT March 28 to 2359 GMT March 29

Two six-hour rest periods are required. Operating categories include: single-operator, DX/WK teams, and YL/OM teams. All bands will be used and the same station may be contacted on different bands for contact points but not as country multipliers. All contacts, however, must be made outside the American phone bands. Two meters may be used, but contacts must be direct and not through repeaters.

EXCHANGE:

Name, RST, SSB'er number, country, state, and partner's call. If no partner, leave blank. If non-member, send "no number."

FREQUENCIES:

3665, 7070, 14070, 21070.

SCORING:

Score eight points for each member contacted on any continent. Non-member contacts count one point. Only member station contacts count for multipliers. Multipliers are each state, country, and province, also, each team contacted, but only once for each team. When DX/WK partners contact each other, it counts as a double multiplier. Final score is sum of QSO points times the total multiplier.

AWARDS:

Extraordinary certificates will be issued to the highest individual score, DX/WK teams, YL/OM teams, and score for highest single-operator category. Regular certificates to the highest state, country, and Canadian province winners.

ENTRIES:

Logs must show date/time (GMT), RST, SSB'er number, partner's call, mode of operation, band, and period of rest time. Summary sheets show number of states, Canadian provinces, countries, YL/OM teams, DX/WK teams, and partner contacts. All entries must be postmarked by May 15, 1981.

Any member desiring to enter the DX/WK Team category should immediately send request to Lyle F. Shaw KC4LF, 6329 Fairway Blvd., Apollo Beach FL 33570. For record purposes, requests should be made in writing. In the week preceding the QSO party, members desiring a partner may request one through system controls on SSB'ers daily systems. No team assignments will be made after the party begins.

YL/OM teams are self-evident in their operation and need not file. Single-operator category members are eligible unless entered with teams. Non-members enter single op only! DX/WK teams consists of a DX and WK member. The team score is the sum of both partners. Score to be determined when both logs are received. When only one log is received, credit will be given as a single-operator. YL/OM teams consist of one YL member and one OM member who are related: husband/wife, father/daughter, mother/son, and brother/sister. Operation must be from the same QTH, using the rig with his/her own call.

WORLD RTTY CHAMPIONSHIP

The IATG Radiocommmunications and CD publications are again sponsoring a series of contests for RTTYers on all continents. The purpose of the contest is not only to increase interest among radio amateurs for RTTY, but also to promote interest in long-range contacts. That is, to stress intercontinental contacts rather than domestic contacts as in previous contests. For this purpose, IATG and CD have organized three contests during the year. The first was back in January but information was received too late for publication. The remaining contests are the North and South American RTTY Flash Contest this month and the Europe and Africa RTTY Giant Flash Contest in May.

For each of the three contests there will be a general winner plus a winner from each of the two continents involved. Separate standings for each continent plus a general standing for each contest, will be published in various magazines. Points for the overall championship will be awarded as follows:

For contest winners—First place, 50 points; Second, 46 points; Third, 43 points; Fourth, 41 points; Etc. to 44th, 1 point.

For continental winners—First place, 25 points; Second, 22 points; Third, 20 points; Fourth, 18 points; Fifth, 17 points; Etc. to 21st, 1 point.

Standings are independent, continental winners can also be general winners.

At the end of the three contests, continental and general standing points will be totaled and a World Champion of the Five Continents will be declared according to the new final standing obtained. Prizes as usual are awarded for the four first-place winners. Consolation prizes will also be awarded.

NORTH AND SOUTH AMERICA RTTY FLASH

1800 GMT March 28 to 0200 GMT March 29
1200 to 2400 GMT March 29

The points and multipliers are awarded in a manner to encourage long-range contacts, which are an indication of the operator's ability and the efficiency of his equipment. The contest committee is open for suggestions or constructive criticism which will be considered for the rules for future contests. They are especially interested in suggestions as to what regulation they might incorporate in future contests to encourage the use of home-made microprocessor and/or programming on commercially available equipment in RTTY. Use all bands from 80 to 10 meters. Operating classes include single- and multi-operator with single transmitter plus SWLs. Each station may be contacted only once on any one band. Remember that all contacts must be on RTTY!

EXCHANGE;

RST, QSO number, and your continent.

SCORING:

QSO points are earned as follows: QSO on 80 or 40 meters—2 points; 20—3 points; 15—6 points; 10—8 points. No points or multipliers for contacts with one's own country. Only two-way RTTY contacts are valid.

Multipliers are given for countries and continents. Use the DXCC country list, plus count each call area of VE/VO, W/K, VK, PY, LU, JA, and UAØ/9 as separate countries. A multiplier is given for each country worked on the 20 through 10 meters. *No* multipliers for contacts on 80 or 40 meters with one's own continent. A separate multiplier may be claimed for the same country if a different band is used (maximum of 3 times). Only countries which appear in at least 3 other logs will be valid multipliers, unless a QSL confirmation is submitted. One's own country is not valid as a multiplier. For contacts with North and South America, both the sender and the receiver will receive 100 points as a multiplier. Each of the remaining continents receive 50 points. An additional 100 points will be given for each contact with North and South America on 15 or 10 meters.

The final score is the total QSO points times the total number of countries times the total number of continents plus the total points for NA and SA stations worked. Example: 600 QSO points times 10 countries worked times 100 continent points equals 600,000, plus 20 stations of NA and SA worked on 15-10 meters gives a grand total of 602,000 points.

Attention! Two promotional periods are included in the contest: 1900 to 2000 GMT March 28 and 1200 to 1400 GMT March 29. Stations operating from Europe, Africa, Australia-Oceania, and Asia contacting NA and SA during these hours will *double* their points for these periods.

Beginner handicaps are offered to RTTYers entering logs in the contest who have not participated in previous contests. They will receive an additional 5% of their final score. Additional handicaps offered are 10% of the total final score of the winner of previous RTTY Championships or 8% of the total final score for the winner of one or more preceding RTTY contests. SWLs also may enter and they should use the same scoring rules. A separate results table will be made for these entries.

AWARDS:

Prizes, as usual, are reserved for the four first-place winners. Consolation prizes will also be awarded.

ENTRIES:

Use separate log sheets for each band. Logs must contain date/time in GMT, callsign, RST and QSO number sent/received, country and continent multipliers, points, and final score. The contest disqualification criteria used by the ARRL in its contests apply also to this contest. Failure to observe any rules will result in exclusion of the entry for the final results and any such log will be considered as a check log. Logs compiling errors exceding 10% of the final score will also be excluded from the final standing. Each log received becomes the property of the IATG Radiocommunications and will not be returned. The decision of the organizing committee in any dispute will be final and any subsequent controversy may not be referred to the civil court. Remember that the contest is valid towards the final standing of the 5-Continent World Championship.

In order to qualify, all logs must be received no later than April 30, 1981. Send logs to: Prof. Franco Fanti, Via A. Dallolio n 19, Bologna 40139 Italy.

AWARDS

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managers of this new service? Meet Laryl Myers N7BMY who is the General Manager. She is relatively new to amateur radio but is already a dedicated brass-pounder— when she finds time. She has an extensive background in filing system management. It took Laryl only two weeks to learn the code and theory for her Technician license and then another two weeks after her ticket arrived to upgrade to General. She has definite goals of attaining 60 wpm on CW and indicates she will be an Extra someday soon! Jokingly, Laryl expresses regret that she doesn't expect to be on the phone bands for some time to come.

As for her counterpart, Laryl's assistant manager is Pat Berry KB7JW. Pat was first licensed in 1962 as K7SGX. He is strictly a CW operator who takes pride in working high-speed rag-chews, So far, his longest QSO has been 24½ hours continuous, but he hopes someday to top that time. Low end of 80 meters, anyone?

How do you use the service? It's all relatively simple. Keep at least two, preferably three, legal sized SASEs on file with the service at all times. Make sure they contain the current amount of first-class postage. Place your callsign in large block letters in the upper left-hand corner and in the middle of the flap on the back of your SASE. When you receive one of your SASEs, send another one to replace it. Don't forget your outgoing QSLs that you owe people. The service needs them to stuff waiting envelopes of the people you've had a QSO with.

To send cards into the outgoing bureau, pre-sort them in alphabetical order by call area. Place no more than 20 in each envelope, along with your 25¢ handling fee. Make sure you place proper postage on your envelope as the service cannot accept postage-due material. Address your cards to: US QSL Service, PO Box 814, Mulino OR 97042.

SIX-METER CROSSBAND AWARD

Sponsored by the Society for the Preservation and Encouragement of Six Meters, this new Crossband Award is awarded in acknowledgement of attaining two or more DX contacts made via six-to-ten meters crossband.

For those not familiar with crossband operation, this particular procedure becomes necessary for a good many European operators whose countries do not allow six-meter transmission due to commercial broadcasting frequencies being subjected to interference. To satisfy both the government needs as well as the wants and wishes of many European six-meter enthusiasts, a crossband effort has proven to be extremely effective and ever increasingly popular.

To apply for this award or to obtain more information about this society, write Armin Montavon WB9ØVC, SPESM Secretary, PO Box 268, S. Elgin IL 60177. The cost of the award is $1.00 to cover the postage and handling.

For those award seekers interested in specialized communications, let's review a couple of video awards being offered for SSTV and ATV respectively.

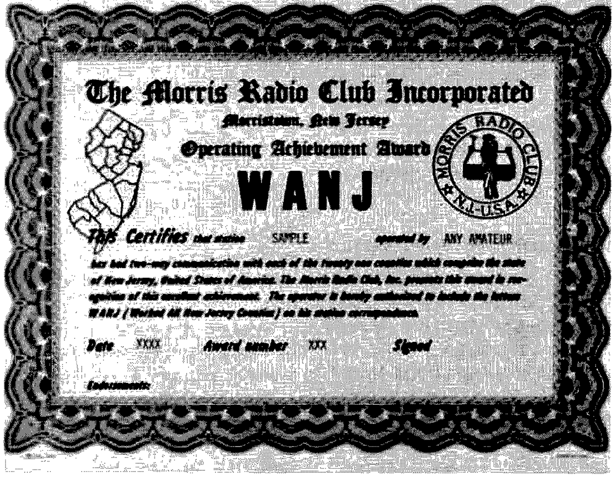
10-METER SSTV NET AWARD

There is a very successful SSTV-Video Net taking place each Saturday at 1800 GMT on 28.680 MHz. An average of 30 stations have been checking in with various interests in SSTV transmissions. To those who make 3 SSTV Net Check-ins, a very special Net Award certificate will be issued. For more details, why not check into the net or write one of the founders of the net? Contact Mike Stone WBØQCD, PO Box H, Lowden IA 52255.

ATV MASTER SCANNERS AWARD

Henry Ruh WB9WWM, publisher of *ATV Magazine*, has written and provided me with details of their Master Scanner Award. The award has various levels of operating achievement: work 5 stations on each of 5 bands, 6 stations on each of 6 bands, 7 stations on each of 7 bands, 8 stations on each of 8 bands, 9 stations on each of 9 bands, and 10 stations on each of 10 bands, or work 25 stations on 10 meters, 10 stations on 6 meters, or 10 stations on any band above 144 MHz.

Only contacts made after August 1, 1978, count toward this award. Submit your verified list of contacts with a $1.00



award fee to Master Scanner Award, PO Box 1347, Bloomington IN 47402.

WORKED ALL NEW JERSEY AWARD

The original Worked All New Jersey Award certificate is again being offered by the Morris Radio Club to all amateurs having established contact with all 21 New Jersey counties. There are no specific modes or bands required but endorsements will be granted for single band or mode accomplishments.

To apply, have your list of 21 counties verified by at least two amateurs or a radio club secretary. Forward this list along with an award fee of $2.00 to: Morris Radio Club, PO Box 53, Whippany NJ 07981.

100 CCXX AWARD

To the many (220-MHz) operators who read this column, the *220 NOTES* of the metropolitan Chicago area have an awards program designed expressly for you.

An attractive certificate is awarded to amateur radio operators who contact a minimum of 100 separate stations anywhere on the 220-MHz band, through a repeater or simplex.

To apply, prepare your list of contacts in order of date and time (GMT) worked. Have this list verified by at least two amateurs or a radio club secretary. Forward this application along with an award fee of $1.00 to: *220 NOTES*, Greg Pietrucha WB9SNZ, 2216 N. Kildare Avenue, Chicago IL 60639.

THE LITTLE BAY AWARD

This seems to be the month for amateur radio clubs. We hope other organizations will take the hint and submit their own awards as the L'Anse Creuse Amateur Radio Club has done. Here we announce their Little Bay Award.

Applicants need to confirm contact with 10 individual members from the radio club. DX stations require only 3 member contacts. A list of members and actual frequencies they monitor may be obtained by writing Ted Bak WB8ZME, 35751 Dunston, Sterling Heights MI 48077.

Once you have established the required contacts and obtained confirmation, submit your list to Ted along with an award fee of $1.00 to cover postage and handling.

WORKED ALL VERMONT AWARD

The Central Vermont Amateur Radio Club wishes to announce that it has once again reactivated the Worked All Vermont Operator Award.

To qualify for this award program, applicants must work 13 of the 14 counties of the state of Vermont. Applicants may utilize any band or mode or any combination thereof, with the exception of repeater operation. There are no time limitations.

To apply, prepare a list of qualifying contacts and have it verified by at least two amateurs or by a local radio club official. Send this list with an award fee of $2.00 to: Central Vermont Amateur Radio Club, c/o Grant Taylor, RFD #1, Box 150, Cabot VT 05647.

FCC

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would be able to make the call lawfully because then two amateur radio stations would be involved. No such convoluted rationale underlies the provisions of § 97.79(d). On its face, § 97.79(d) gives discretion to an amateur operator to allow a non-licensed person (i.e. a third party) to engage in communications using his transmitter, under proper monitoring conditions and supervision by the licensee. We concur with the staff's view that this refers to two-way communications. To say that this would preclude the licensed operator himself, as control operator, from using his own station to make a phonepatch strains credulity and we reject the inference that petitioner draws from its hypothetical situation.

10. Appealing on an equity basis, petitioner avers that under our interpretation of the rule, model aircraft enthusiasts who are not yet licensed amateur operators will be deprived of exposure to amateur radio activity because they are not permitted to control the aircraft by operating the amateur radio transmitter. We reject this argument for the reason that the person who truly has an avid interest in amateur radio has a myriad number of opportunities to advance his interest and to acquire proficiency in the art and hobby of amateur radio. In fact, it is quite probable that the model airplane enthusiast's major interest is in model airplanes, not radio.

11. We believe that any need for more channels for control of model aircraft should be met in the Radio Control Radio Service. In this connection, it is noted that AMA has a petition for rulemaking (RM-3248) currently on file with the Commission which asks for such additional frequencies.

12. In summary, we believe that it would be contrary to the public interest to permit a person who is not a licensed amateur radio operator to operate an amateur radio station to control a model aircraft. For all of the foregoing reasons, the interpretation of § 97.79(d) made by the Commission's staff is hereby affirmed.

Federal Communications Commission.
William J. Tricarico,
Secretary.

[FR Doc. 80-37578 Filed 12-2-80; 8:45 am]

HAM HELP

I would like to obtain information on connecting an FSK/AFSK unit to use with a Macrotronics M-80 (M-800) ham Interface (TRS-80) in conjunction with a Kenwood TS-520. Any type of information is appreciated. All inquiries will be answered!!

James Gonsalves, Sr.
2257 Manhattan Place
Santa Clara CA 95051

I need the current address of Omega-T Systems, or a repair facility for the Omega-T antenna noise bridge, Model TE-01. The company is no longer receiving mail at 516 W. Belt Line Rd., Richardson TX. My bridge generates noise but will not null, even into a dummy load.

Bill Koczon W2HWQ
85 Lakeland Drive
Brick Town NJ 08723

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 8

als to work with, only the organization to make use of them is lacking.

The obvious thing then is to make a trip to Africa, sit down with the leaders of these countries and make them aware of the fantastic resource they have at hand and are not using. Unfortunately, the obvious is not always the best approach... and I guess that holds particularly with the Third World nations.

The weakness of the idea lies in the leaders, who are for the most part occupied largely with staying leaders. Just as the first item of business for an elected official in the US is to get started with his reelection campaign, the bulk of the effort for an African leader is in staying alive and in control. It is a fight for most of them and as a result they are far too busy to really consider matters of benefit to their countries.

Remember, if you will, my writing about the fear that most African governments have of personal communications. A leader who is having to fight daily to stay in power is going to have very little interest in the introduction of low-cost, portable personal communications. He'll rightly think that this will be an invitation for his foes and for terrorists to set up their communications for the purpose of doing him in. This is why the ARRL miniature transistor rigs were so completely rejected. Not that that has been much of a problem, for as far as I know most of these rigs have been either stolen or "mislaid" right here in the US and the whole project a disaster which the ARRL would prefer to cover up.

Visiting hams do not present any perceived danger to these African governments, so our DXpeditions are able to visit and operate from many of these countries. But when it comes to organizing anything in the way of communications for their citizens, that's another matter. The fact is that one is hard put to point to any African nation which appears stable at this time. I've visited a number of them and am getting letters from hams in others, so I'm keeping on top of the situation fairly well. You may be sure that if I see a good opportunity to visit a country with the expectation that I might succeed in getting amateur radio set up, I will be on the next jet.

In the meanwhile, we should be laying the groundwork for this. It *is* important that some representative of amateur radio reach the heads of the African countries and explain about amateur radio. While little may be possible right now, the stage can be set for something later on. The time just might come when the leader of a country is well enough established so he will have the luxury of starting some long-range plans to benefit his country. I hope we are there at that time...with our homework done.

THINKING OF WRITING?

While our top priority for articles is on state-of-the-art construction projects, the fact is that virtually every one of you has at least one good article bottled up in you, just waiting to get into print.

What do *you* enjoy reading about? Well, most other readers are just the same as you...so give some serious thought to having at a typewriter and getting into print.

If you're doing any kind of original designing and construction, be sure that you document every step so that you can help others to enjoy what you've done. Sure, you'll get paid for the article...and you'll hear about it from just about everyone you contact on the air or at clubs. Authors achieve a sort of instant stardom which is remembered for an amazingly long time.

If you're not into building, perhaps you've done some other things which would be of interest...a DXpedition...or even some interesting perspective on everyday hamming. When is the last time you read something interesting about traffic handling? About repeaters? DXing? Or even some idea which might help rag chewers...and heaven knows rag chewers need help more than any other group.

Have you been running some Novice classes and thus have some ideas which might help us get more hams? Or has your club come up with a project which might spark others into similar cooperative projects? Perhaps you know a ham who has done an outstanding job of helping others, organizing a net, or other work which would be of interest and inspiration to all of us?

How do you write? Simple... use a typewriter, double space, leaving generous margins for editing, send in hand-drawn sketches of circuits and the best photos you can manage. *73* pays for all material accepted for publication, unlike other magazines which either do not pay at all...or else may pay upon publication, which can be months later. Many hams, whose names you see often in print, are making their hobby pay very well for them...and in addition are getting the satisfaction of providing pleasure and inspiration for about 150,000 *73 Magazine* readers.

(Send for "How To Write For *73*"—just drop a card to Editorial Offices, *73 Magazine*, at the address below.)

As an author, you certainly want to get the top dollar for your work, not just give it away. You also want it to be read by the widest possible readership. This means you should get it to *73* for publication. Our technical staff will look it over and get back to you within several weeks and let you know if it has been accepted (along with a check). Or they may ask for some changes or additions... or even reject it. You still have three more ham magazine which are hungry for articles, so your chances of not being published at all are remote.

73, which publishes the most articles of all the ham magazines...and which reaches the active and enthusiastic hams ...is your best bet. Is that boast of publishing the most articles just smoke or is it fact? You can count 'em yourself. During 1980, *73 Magazine* published 290 feature articles. In the same time period, *QST*, the next largest ham magazine, published 142 articles...less than half as many.

Send your article to Jeff DeTray, *73 Magazine*, Peterborough NH 03458.

FUN!

John Edwards KI2U
78-56 86th Street
Glendale NY 11385

What are hams *really* like? Have you, like many of us, ever pondered this question? What is it that draws people into amateur radio rather than, say, stamp collecting?

This month, we're setting aside the usual crossword, acrostic, matching, and other puzzles, and replacing them with something different. Something, we hope, that will be just as enjoyable as any puzzle to complete. What follows is a poll—a survey—that will tell us something about ourselves, who we are and why we do what we do.

This is not a scientific survey. For it to be such, we would have to solicit responses from a carefully selected cross section of hams. Instead, what we hope to gather are the random responses of readers of this column. A collection of the gut feelings of amateurs as they answer questions ranging from their personal life-styles to how they view emerging trends in our hobby.

So, please take the time to fill out the responses and mail them back to the address at the top of this column. If you don't want to cut up the magazine, photocopies are fine. You will note that there is no place on the form for your name, address, or call—this is an anonymous survey and we really don't want to know who you are, just what you think! In a few months, we'll be printing and analyzing the responses, and the results should be, to say the least, interesting. Have FUN!

ELEMENT 1—BACKGROUND

1) Sex:
   - A) Male
   - B) Female

2) Age:
   - A) 15 or below
   - B) 16-21
   - C) 22-39
   - D) 40-59
   - E) 60 and above

3) License class:
   - A) Novice
   - B) Technician
   - C) General
   - D) Advanced
   - E) Extra

4) Number of years licensed:
   - A) 1 year or less
   - B) 1-5 years
   - C) 6-10 years
   - D) 11-20 years
   - E) 21 years and up

5) Do you have a new (post-March '78) call?
   - A) Yes
   - B) No

6) How many hours a week do you devote to amateur radio?
   - A) 0-1 hour
   - B) 2-5 hours
   - C) 6-10 hours
   - D) 11-20 hours
   - E) 21 or more hours

7) Which HF band do you use most?
   - A) 80-75 meters
   - B) 40 meters
   - C) 20 meters
   - D) 15 and/or 10 meters
   - E) Don't operate HF

8) Which VHF-UHF band do you use most?
   - A) 6 meters
   - B) 2 meters
   - C) 220 MHz
   - D) 420 MHz and/or up
   - E) Don't operate VHF-UHF

9) Which mode do you use most?
   - A) SSB
   - B) CW
   - C) FM
   - D) AM
   - E) Other

10) How much money have you spent on amateur radio within the past year? (Include QSL expenses, magazine subscriptions, club dues, and other incidental expenditures.)
   - A) 0-$250
   - B) $251-$500
   - C) $501-$1,000
   - D) $1,001-$2,500
   - E) $2,501 and up

ELEMENT 2—SOCIAL CHARACTERISTICS

11) Has amateur radio influenced your career choice?
   - A) Greatly
   - B) Somewhat
   - C) Not at all

RESPONSE FORM

Instructions: Read each question and mark your response by circling the appropriate letter next to the number of the question. Please note that some questions have up to five possible responses, while others have as few as two. Please make only one circle next to each question number or, like the FCC, we will not count the entire question. Attach a separate sheet for any comments you might have.

Element 1:

1) A B
2) A B C D E
3) A B C D E
4) A B C D E
5) A B
6) A B C D E
7) A B C D E
8) A B C D E
9) A B C D E
10) A B C D E

Element 2:

11) A B C
12) A B
13) A B
14) A B C D E
15) A B C D E
16) A B
17) A B
18) A B
19) A B
20) A B
21) A B
22) A B
23) A B
24) A B C D E
25) A B
26) A B
27) A B C D E
28) A B

Element 3:

29) A B
30) A B C D E
31) A B
32) A B
33) A B
34) A B C D E
35) A B
36) A B C D E
37) A B C
38) A B
39) A B
40) A B
41) A B
42) A B
43) A B C
44) A B C D E
45) A B
46) A B C D E
47) A B C D E
48) A B C D E
49) A B C D E
50) A B

12) If a Novice sent you a QSL after a QSO with no return package, would you answer it?
A) Yes
B) No
13) Do you routinely look up the license class of the person you're talking to in the *Callbook*?
A) Yes
B) No
14) Do you think amateur radio was better 10 years ago?
A) Much better
B) Somewhat better
C) The same
D) Somewhat worse
E) Much worse
15) Do you think amateur radio was better 20 years ago?
A) Much better
B) Somewhat better
C) The same
D) Somewhat worse
E) Much worse
16) Did you ever use a "cheat book" to upgrade your license?
A) Yes
B) No
17) If someone offered you a million dollars, tax free, on the condition that you give up amateur radio forever, would you?
A) Yes
B) No
18) Has ham radio ever interfered in your personal relationships? (I.e., time with your wife, husband, children, lover, etc.).
A) Yes
B) No
19) Have you ever tried to interest a family member in amateur radio?
A) Yes
B) No
20) Do you think most hams have a sense of humor?
A) Yes
B) No
21) Do you get upset when you hear hams "kidding around" on the air?
A) Yes
B) No
22) Have you ever intentionally jammed a repeater or otherwise purposely interfered with a QSO?
A) Yes
B) No
23) Do you think amateur radio lowers your neighbor's opinion of you?
A) Yes
B) No
24) If your closest ham friend beat you in a major contest, how would you feel?
A) He must be a better operator than me
B) Contesting is just luck
C) The contest was set up unfairly
D) It was easy for him to win, he has better equipment
E) He must have cheated
25) Do you make most of your friends through amateur radio?
A) Yes
B) No
26) When attending a ham club meeting, flea market, or convention, do you wear a callsign badge?
A) Yes
B) No
27) If you answered yes to the above question, what size is your badge?
A) 1 line
B) 2 lines
C) 3 lines
D) 4 lines
E) Larger
28) If your closest friend won a Collins KWM-380 in a contest, would you feel jealous?
A) Yes B) No

ELEMENT 3—OPERATING HABITS

29) Do you depend on a Morse code reader or microcomputer code display for most of your CW QSOs?
A) Yes
B) No
30) What sort of CW sending devices do you use most?
A) Straight key
B) Regular keyer
C) Memory keyer
D) Keyboard
E) Never send CW
31) If required, could you solidly copy CW at the speed at which you were licensed?
A) Yes
B) No
32) Have you ever purposely operated in an amateur subband you weren't licensed to use?
A) Yes
B) No
33) Do you think the FCC affects amateur radio in a positive manner?
A) Yes
B) No
34) What do you think of the new ham exams? (Answer this even if you have never personally taken one of these new tests.)
A) Excellent
B) Good
C) Fair
D) Poor
E) Terrible
35) Just for the heck of it, have you ever talked to a friend on the "wrong" sideband? (e.g., LSB on 20 meters.)
A) Yes
B) No
36) Do you ever speak to foreign, non-English-speaking hams, in their own language?
A) Always
B) Sometimes
C) I attempt it
D) Rarely
E) Never
37) Do you think "gentlemen's agreements" have any value?
A) Always
B) Sometimes
C) Never
38) Do you feel you are competent to replace the finals in a tube-type rig?
A) Yes
B) No
39) Do you feel you are competent to replace the finals in a transistor-type rig?
A) Yes
B) No
40) Have you ever built an electronic project from a kit?
A) Yes
B) No
41) Have you ever home-brewed an electronic project from a book or magazine?
A) Yes
B) No
42) Have you ever designed your own electronic project?
A) Yes
B) No
43) After meeting a ham radio acquaintance in person for the first time, do you usually think:
A) He is better looking than you thought
B) He is worse looking than you thought
C) He is about what you expected
44) On the whole, compared to the general public, do you think:
A) Hams are much better looking
B) Hams are somewhat better looking
C) Hams are average looking
D) Hams are somewhat worse looking
E) Hams are much worse looking

45) Have you ever operated a specialized mode? (i.e., RTTY, slow scan, etc.)
A) Yes
B) No

46) What do you think of contesting?
A) Great
B) Good
C) Okay
D) Don't like it
E) Despise it

47) What do you think of DXing?
A) Great
B) Good
C) Okay
D) Don't like it
E) Despise it

48) What do you think of repeaters?
A) Great
B) Good
C) Okay
D) Don't like them
E) Despise them

49) What do you think of traffic handling?
A) Great
B) Good
C) Okay
D) Don't like it
E) Despise it

50) Do you ever secretly hope that a mild disaster will strike your community just so you could display your amateur radio skills?
A) Yes
B) No

CORRECTIONS

There are two errors in "The Sweet Sounding Probe" (July, 1980, p. 84). First, output capacitor C6 is drawn with its polarity reversed. Second, there should be a connection indicated at the four-way crossover point of pin 8 of the 555, the left-hand lead of R6, the +12 V line from the regulator, and the line which eventually leads to pin D.

Howard Batie W7BBX
12002 Cheviot Drive
Herndon VA 22070

Readers interested in contacting the author of "Super Duper for Field Day" (November, 1980), p. 114, should use my new address and call. I have moved and there is little hope of any correspondence being forwarded.

David Hein WB8CEB
3004 Bandolino Lane
Plano TX 75075

In "Tracker—The Ultimate OSCAR Finder," January, 1981, pp. 88–95, there are some errors which have caused a bit of aggravation.

The address and telephone number of author WD8DRK, which appear near the start of the program listing on page 92, are incorrect. The correct address is given at the beginning of the article. Bruce's new phone number is (313)-835-0169. The trucking company which has been receiving his calls will appreciate your using the new number.

Lines 492 and 1830 should be deleted from the program; they are not needed.

Line 452 should be changed to read:

```
452 S$=CHR$(162)+CHR$(166)
```

The GOTO 7520 command at the end of line 1505 should be changed to GOTO 1520.

In line 1860, the left-hand bracket should actually be an up-arrow, indicating exponentiation.

Line 3190 should be changed and lines 3192 and 3194 added as follows:

```
3190 IF S=0 THEN S$="00"
3192 IF S<10 THEN S$="0"+RIGHT$(S$,1)
3194 IF S>=10 THEN S$=RIGHT$(S$,2)
```

Finally, the PET version of "Tracker" is no longer available from the authors. A version for the Apple II being planned, but it is not yet available.

Jeff DeTray WB8BTH
Assistant Publisher/Editor

It should be noted that in my article, "CB to 10—part XXIX: put that Hy-Gain CB board to use" (September, 1980, p. 102), if a 40-channel switch is used, then a jumper must be installed at the points on the board indicated by "J104."

All of my boards had it installed, although I have seen boards without them. I guess Hy-Gain had some units using different switches, or the trunk-mounted versions with interface cards that didn't require the jumper.

Many hams have written me about problems getting the trunk-mounted version running. As I cautioned in the article, you also need the mike and interface board. These parts, as described in my article, connect up to the standard circuit board in place of the channel switch (and other controls) to create the trunk-mounted version. There are, however, some nonstandard PC cards which can only be made into the fancy Hy-Gain 16 trunk-mount, microprocessor-controlled rig.

The mike on this rig looks like a calculator, with its keypad and small LED readout. The big difference is that the mike talks to the rig via a serial data line which is decoded by a special IC in the PLL chip location on the board. The main circuit board can be identified easily since it has an 18-pin MM58141N IC in place of the usual 16-pin PLL chip. Because of the serial data connection, the PLL cannot be converted as described in my article unless someone is willing to do a lot of digital design work with the microphone—definitely not worth the effort on a $10 circuit board.

I have talked to the people at Meshna, and they are willing to ship the convertible standard board (current price $8 for the board or $10 for the trunk-mount chassis) to anyone specifying that it is for conversion as in my article. This is a bit of extra work for them as they have to sort through the pile to find a standard unit. People should address requests to John Meshna, *Jr.*, PO Box 62, E. Lynn MA 01904.

Penn Clower W1BG
459 Lowell Street
Andover MA 01810

HAM HELP

I have an Edgecom 3000A 2m transceiver with several problems but no parts placement diagram or schematic-to-component (manufacturers' designation) table. Does anyone have same, or know where I can get this unit repaired? I understand that the original manufacturer is no longer in operation.

Tom Pendarvis WD0EMP
215 Wildbrier
Ballwin MO 63011

I recently acquired a National NC-173 general coverage shortwave receiver. I am in need of a manual and schematic. I will gladly pay any duplication cost and mailing costs.

Gary Stone
WLS-1NC
2 Halifax Road
Havelock NC 28532

I need schematic and service info for GE-TPL model FE73JA6 FM 2-way radio. I will pay postage if I can borrow to make a copy. Thanks.

Tom McLaughlin WB4NEX
13308-D Orange Tree Ln.
Tampa FL 33618

I need a schematic diagram and availability information on a Johnson or B&W electronic T-R switch.

Robert F. Cann W4GBB
1606 Lochwood Dr.
Richmond VA 23233

I need a serviceable 833A tube; please advise condition and my cost including transportation.

Edward Dobbelaere W7LEI
4164 Long Lake Road, SE
Port Orchard WA 98366

NEW PRODUCTS

from page 36

available, over-the-counter, from electronic and personal computer component stores throughout the United States and Canada. Highlighted are microcomputer interface boards, Vector Plugbords™, motherboards, cases, tools, wiring terminals, and kits. A complete price list is included. *Vector Electronic Company, Inc., 12460 Gladstone Avenue, Sylmar CA 91342; (213)-365-9661.* Reader Service number 478.

FIVE-MODE KEYBOARD

A five-mode sending terminal introduced by Curtis Electro Devices offers keyboard origination of Morse, ASCII, and Baudot codes in addition to being a paddle keyer, code practice generator, and contest memory unit. Called the KB-4900, this unit blends the power of a microprocessor with the ease of analog controls and indicators.

Features include a 256-key sending buffer and a 256-key soft-sectored message memory with up to four callups. The two-key lockout and fully debounced keyboard offers all domestic, European, and many commercial prosigns for CW, all Baudot characters, and upper- and lowercase ASCII communication characters. Automatic line length control, word wraparound, hold, and backspace are included. All LTRS and FIGS shifts are automatic in the Baudot mode.

Analog controls (pots) are provided for speed, weight, pitch, and volume, and meters display Morse speed and buffer status. Output is via mercury relays for the keyline and PTT (or KOS) line. RTTY output is a loop switch.

The message memories include three fixed preambles (CQ, CQ TEST, ID and QRZ) plus up to four programmable memories. An automatic serial number can be inserted in any memory or the buffer for contests. An optional real-time clock inserts 24-hour time in the buffer of memory.

The code-practice mode generates either true random (no answers) or pseudo-random five-letter Morse groups in eight lists (with answers). Character spacing can be expanded for easier learning. Powered by either ac or +12 V dc, the KB-4900 measures 12" × ½" × 4½" and weighs 5 lbs.

For detailed specifications, write *Curtis Electro Devices, Inc., Box 4090, Mountain View CA 94040; (415)-494-7223.* Reader Service number 476.

Five-mode keyboard from Curtis Electro Devices.

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The 40-pin DIP hybrid contains a proprietary Teltone LSI device, dial-tone filters, band-split filters, and clock circuits. It requires only a 3.579-MHz color burst crystal and a single 12 V dc source to become a complete decoder circuit. *Teltone Corporation, 10801-120th Avenue N.E., Kirkland WA 98033; (206)-827-9626.* Reader Service number 477.

HIGH PERFORMANCE TOWER GUYS

Philadelphia Resins Corporation announces a new line of PHILLYSTRAN® high performance tower guys which shows significant improvement in performance over previous offerings, particularly in the area of low stretch.

PHILLYSTRAN® has been used successfully by over 400 commercial broadcast stations since its introduction in 1973. In these applications, PHILLYSTRAN® was chosen over competitive materials such as wire strand and GRP rod primarily because of its combination of light weight, high strength, good dielectric properties, and ease of installation. Recently a survey conducted among tower manufacturers, riggers, and station engineers showed that minimizing tower deflection is the most important concern in selecting guys. With this in mind, Philadelphia Resins Corporation initiated a program to improve the performance of its tower guys. The result is an entirely new family of cables called PHILLYSTRAN® HPTG which is specifically designed to be used for supporting large towers.

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For further information, contact *Philadelphia Resins Corporation, 20 Commerce Drive, Montgomeryville PA 18936; (215)-855-8450.* Reader Service number 481.

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COAX-SEAL comes in rolls 60" long, 1/8" thick, and 1/2" wide. 50-foot industrial rolls also are available. *Universal Electronics, Inc., 1280 Aida Drive, Reynoldsburg OH 43068; (614)-866-4605.* Reader Service number 479.

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Quality Service, reasonable rates, all brands. Now USA KDK repair center. **Amateur Radio Repair Center of IEC, Inc., 79 Town Square, Mocksville, NC 27028, 998-2627.**

Columbus OH

All major brands featured in the biggest and best ham store for miles around. Come in and twist the knobs before you buy. **Universal Amateur Radio, Inc., 1280 Aida Dr., Reynoldsburg (Columbus) OH 43068, 866-4267.**

Houston TX

Experimenter's paradise! Electronic and mechanical components for computer people, audio people, hams, robot builders, experimenters. Open six days a week. **Gateway Electronics Inc., 8932 Clarkcrest, Houston TX 77063, 978-6575.**

San Antonio TX

Complete 2 way service shop. Call Dee, W5FSP. Selling Antenna Specialists, Avanti, Azden, Bird, Hy-gain, Standard communications, Genave, Henry, CushCraft, Dielectric, Hustler, ICOM, MFJ, Nye, Shure, Swan, Tempo, Ten-Tec and others. **Appliance & Equipment Co., Inc., 2317 Vance Jackson Road, San Antonio TX 78213, 734-7793.**

DEALERS

Your company name and message can contain up to 25 words for as little as $150 yearly (prepaid), or $15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the May issue must be in our hands by March 1st. Mail to 73 Magazine, Peterborough NH 03458. ATTN: Nancy Ciampa.

PROPAGATION

J. H. Nelson
4 Plymouth Dr.
Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14A	14	7	7	7	7	7	7	14	14	21	21A
ARGENTINA	21	14	14	7A	7	7	14	21	21A	21A	21A	21A
AUSTRALIA	21A	14	14	7B	7B	7B	7B	14B	14	14	21	21A
CANAL ZONE	21	14	7A	7	7	7	7A	14	21	21A	21A	21A
ENGLAND	7A	7	7	7	7	7	14	21	21A	21A	14	14
HAWAII	21A	14	7A	7	7	7	7	7	14	21	21A	21A
INDIA	7A	7	7B	7B	7B	7	7A	14A	14	14	14	7A
JAPAN	21	7A	7B	7B	7B	7B	7	7	7B	7B	14	21
MEXICO	21	7A	7	7	7	7	7	14	21	21A	21A	21A
PHILIPPINES	21	14	7B	7B	7B	7B	7B	7B	7	14	14	14A
PUERTO RICO	14	14	7	7	7	7	14	14A	21A	21A	21	21
SOUTH AFRICA	14	7A	7	7B	7B	14	21	21A	21A	21A	21A	21
U. S. S. R.	7B	7	7	7	7	7B	14	21	21A	14A	14	7B
WEST COAST	21A	14	7	7	7	7	7	14	21	21A	21A	21A

CENTRAL UNITED STATES TO:

	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14A	14	14	7	7	7	7	7	14	14	21	21A
ARGENTINA	21	14A	14	7A	7	7	14	14A	21	21A	21A	21A
AUSTRALIA	21A	21	14	14	7A	7B	7B	7B	14	14	21	21A
CANAL ZONE	21	14	7A	7	7	7	7A	14	21	21A	21A	21A
ENGLAND	7A	7	7	7	7	7	7B	14	21	21A	14	14
HAWAII	21A	21	14	7	7	7	7	7	14	21	21A	21A
INDIA	14	7A	7B	7B	7B	7B	7B	7A	14	14	14	14
JAPAN	21A	14A	14	7B	7B	7B	7	7	7	14B	14	21A
MEXICO	21	14	7	7	7	7	7	14	14A	21A	21A	21
PHILIPPINES	21A	14A	14	7B	7B	7B	7B	7B	7	14	14	21
PUERTO RICO	14A	14	14	7	7	7	14	14A	21	21A	21A	21
SOUTH AFRICA	14	14	7	7B	7B	7B	14	21	21A	21A	21A	21
U. S. S. R.	7B	7	7	7	7	7B	7B	14	21	14	14B	7B

WESTERN UNITED STATES TO:

	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	21	14A	14	7	7	7	7	7	7A	14	21	21A
ARGENTINA	21	14A	14	14	7A	7	7B	14	21	21A	21A	21A
AUSTRALIA	21A	21A	21	14A	14	14	7B	7B	14	14	21A	21A
CANAL ZONE	21	14	7A	7	7	7	7	14	21	21A	21A	21A
ENGLAND	7	7	7	7	7	7	7B	7B	14	21A	14	14
HAWAII	21A	21	14A	14	7	7	7	7	14	21	21A	21A
INDIA	14	14	7A	7B	7B	7B	7B	7B	14	14	14	14
JAPAN	21A	21	14A	14	7B	7B	7	7	7	14	14	21A
MEXICO	21	14A	14	7A	7	7	7	14	21	21A	21A	21
PHILIPPINES	21A	21	14A	14	7B	7B	7B	7B	7	14	14	21A
PUERTO RICO	21A	14	14	7	7	7	7	14	21	21A	21A	21A
SOUTH AFRICA	14	14	7	7B	7B	7B	7B	14	21	21A	21A	21
U. S. S. R.	7B	7B	7	7	7	7B	7B	7B	14A	14	14B	7B
EAST COAST	21A	14	7	7	7	7	7	14	21	21A	21A	21A

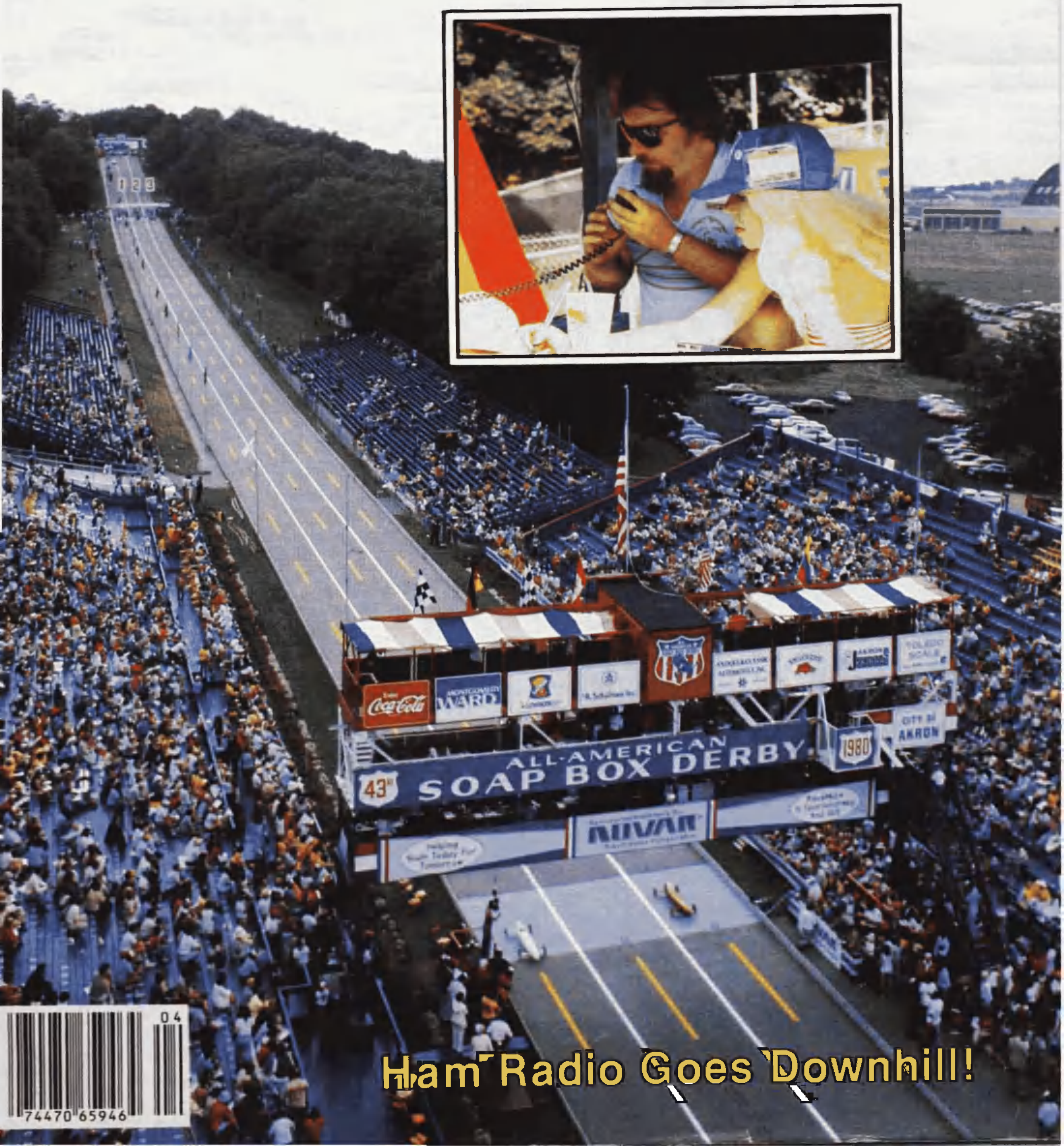
A = Next higher frequency may also be useful
B = Difficult circuit this period
F = Fair G = Good P = Poor
SF = Chance of solar flares

march

sun	mon	tue	wed	thu	fri	sat
1 F	2 F	3 F	4 G	5 G	6 G	7 G
8 G	9 G	10 G	11 G	12 G	13 F	14 F
15 G	16 G	17 G	18 G	19 G	20 F	21 F/SF
22 P/SF	23 F	24 F	25 F	26 F	27 F/SF	28 P/SF
29 F	30 G	31 G				

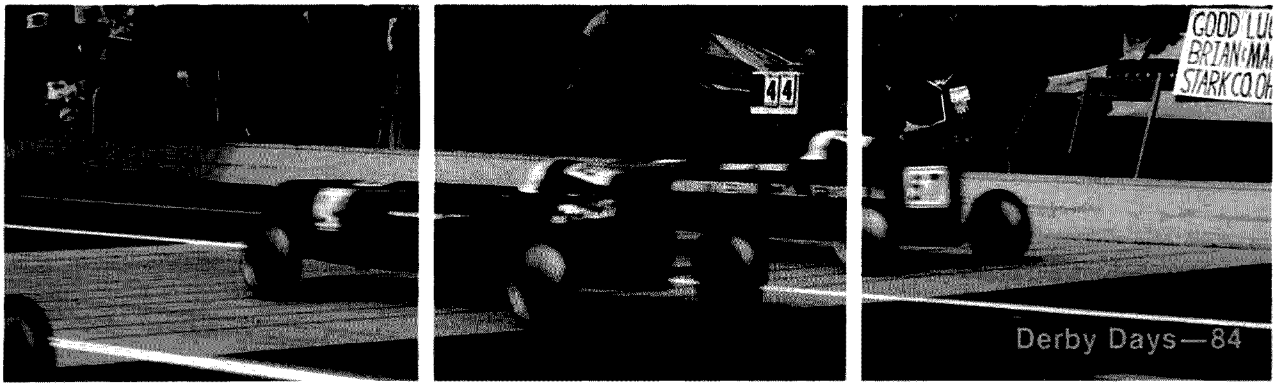
April 1981 $2.95

73 MAGAZINE
FOR RADIO AMATEURS



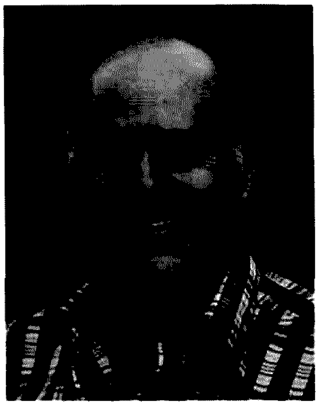
Ham Radio Goes Downhill!

73 MAGAZINE april 81



Derby Days—84

Cover: Photo by Henry Ruminski WD8JOI, Cuyahoga Falls OH.



W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

DOING SOMETHING ABOUT IT

There is one basic reason why the ham market has been soft during the last year and it has little to do with the job market, stagflation, or the recession. The main reason why hams have not been buying very much ham gear lately is that there have been far fewer new hams...and this means fewer enthusiastic newcomers looking for fun.

If amateur radio was growing at the rate of 11% as it did before the proposal of "Incentive Licensing," we would be welcoming about 75,000 new Novices a year. That would represent the 11% growth plus those needed to make up for the dropouts and silent keys. That represents a buying market of over $100M. Even when you spread that amount around among about 200 ham stores, that represents another half million dollars in sales for each store.

Tufts Electronics has moved things around in their store and set up a classroom for teaching the Novice course. It has been so successful that they are now planning for General and Advanced courses as well. They have been charging $35 for the course, which runs for ten weeks, one night a week. Judging from the interest shown in the courses, Tufts is now estimating that they will be able to license about 50 new hams a month.

The money for the courses goes for some of the instruction materials, some for the instructor, and the rest for advertising and overhead. Clubs running Novice courses have found that the more a student has invested in a course, the more likely he is to complete it. That makes sense, when you think about it, but the anti-profit nuisance who turns up now and then wanting the classes to be free louses it up for everyone.

Perhaps you can talk this over with your local ham supplier and get him to set up Novice courses. Remind him that each Novice historically buys about $1,500 in ham gear and books, so it is well worth his while to see that we have as many newcomers as possible. We should also do all we can to get our clubs to have Novice classes and try to empty out the high schools for prospects. Remember that about 80% of these teenage Novices will decide to make electronics their career ...and they just might be the answer to the loss of technology to Japan.

One more reminder: The *73* series of code tapes is the world's fastest way to learn the code...and the *73* theory course is the best one on the market because it stresses learning the theory rather than memorizing questions and answers. These are ideal teaching adjuncts to any Novice class.

RADAR CRUISE CONTROL

One of the benefits of the recent interest in police radar and its detection has been a good deal of research on the use of radar for cars. RCA, in particular, has been working on the problems and has come up with a system which would enable a car to automatically follow the car ahead, keeping pace with it. This is a small radar unit which is connected to the cruise control of a car, either allowing the following of the car ahead or else maintaining speed until a car is detected ahead, at which time the radar would disable the cruise control automatically.

Speaking of radar, the car magazines all seem to be of the opinion that Reagan will be backing an end to the 55-mph speed limit, putting the responsibility for speed control back on the states. Many of the western states are not at all enthusiastic about the limit.

There seems to be convincing proof that our government agencies have been covering up the facts about the speed limit and have been supplying us with highly distorted reports on the supposed benefits. Rather than either saving lives or oil, the speed limit may have both increased traffic fatalities and saved hardly any oil. The major benefit has been to the makers and dealers selling radar units to the police...and detectors to the public. Cozy arrangement.

The other major benefactors of the speed limit have been the CB industry and the communities which have gotten the take from the speeding tickets...billions of dollars.

Some psychologists have pointed out that one of the results of making virtually everyone a criminal is to alienate the public from the police and thus encourage crime...and reduce the cooperation needed.

Perhaps the bright spot of all this will be the developments we can see coming as a result of the radar research.

SAROC

Having been unable to locate anyone who attended, I'm going by reports from third parties: UGH.

Not only were there fewer than 1,000 in attendance, what few there were apparently were

TECH WIZARDS

We seem to be getting more and more technical questions whose answers require more and more of our time which we seem to have less and less of. We would like to revive the Technical Aid Group concept which appeared here 10 years ago.

Please, you wizards out there who *want* to help (without compensation), send us your qualifications (experience, degrees, area of expertise, if any, etc.) and complete address. Then when readers have questions they can talk to an expert.

Don't take this lightly—some questions are difficult and will require some digging. But if you can help, you might save someone a lot of grief.

Write to Editorial Offices, *73 Magazine*, Pine Street, Peterborough NH 03458, attention: Tech Wizards.

TRAVELING HAMS

We believe that there are many interesting stories related to ham radio across this wide world that are begging to be told. When you do travel, keep that in mind. You may be the only outsider who is a ham to visit a hidden valley somewhere. Neither *73* nor any other amateur radio publication has the staff to do this adequately; we are depending on you.

When you have a trip coming up, let us know. We may have heard about something along your route that may be of interest to us all. You might even make a few dollars to put toward your next trip. So, put a note pad and pencil in your camera case and start thinking like a roving reporter.

If you are interested, send your travel plans to Editorial Offices, *73 Magazine*, Pine Street, Peterborough NH 03458, attention: Traveling Hams.

siphoned off by a competing event put on by the local ham club, which has not been silent in its bitter feelings about the SAROC hamfest . . . an event put on mostly by one chap for profit . . . and supported almost solely by *Ham Radio* magazine.

The show did get a great review in *HR*'s Half Right Reports, thus preserving their record for objectivity. Will there be another debacle next year? It seems unlikely.

VEGAS

Though I didn't go to the SAROC mess this year, I did have to get out to Vegas for the Winter Consumer Electronics Show (CES) a couple of days later. The weather was perfect and the town was crowded with about 60,000 attending the CES. With the casinos vying with each other to provide low-cost eats, you can do very well in the town on about $6 per day. Even the local people come to the strip to get in on the $1.49 breakfast buffets.

Other than that, most of the things in Vegas are so tacky that I really dislike the place. The casinos are packed most of the day and night with people pulling the levers of the slots. Are they having fun? I watched several hundred of them and I saw not one smile. Even when the jackpot would eventually dump on them they accepted it stoically and went back to seeing how fast they could get the coins back into the machine.

At the airport, while I was waiting for my plane, I watched a shabbily-dressed couple get $100 in dollars and start feeding them into a slot machine. By the time I'd finished my ice cream, the $100 was gone. I never saw one sign that either of them was enjoying the experience. They just stood there silently, as though hypnotized, sliding in the dollars, three at a time.

It is not really difficult to win in Vegas . . . at least until they get to know you . . . but you have to know what you are doing and spend some time learning how. I've written about this in one of my other magazines in more detail. Obviously, before you tackle the professionals, you want to have your system not only perfected, but very well practiced. This is where the computer comes in . . . affording you practice without having to pay for it. It is far better to learn for free and take your lumps than to try to get your gambling education at $2 a throw.

Quite a number of people have come up to me at shows and tried to argue that you can't really win at gambling in Vegas. When I pry into their knowledge of the subject, I find that they know virtually nothing about it.

Continued on page 120

Well . . . I Can Dream, Can't I? **by Bandel Linn K4PP**

"Your ½-Watt QRP rig is putting in a bone-crushing signal here in central India . . ."

AWARDS

Bill Gosney WB7BFK
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

I wish to thank the many readers who have supported the *73* Awards Program and this Awards column over the past year and a half. I've received letters from all over the world supporting both projects.

In answer to the many letters received recently, the *73* Awards Program is quite extensive. As you read through the September and October, 1980, editions of *73*, you see featured nearly twenty individual awards being made available to licensed amateurs. We would like to cater to your many ideas for adding a few more awards to the program, but we have to limit our portfolio so that it is manageable by the staff. As we all know, *73 Magazine* is only one function of the Peterborough crew!

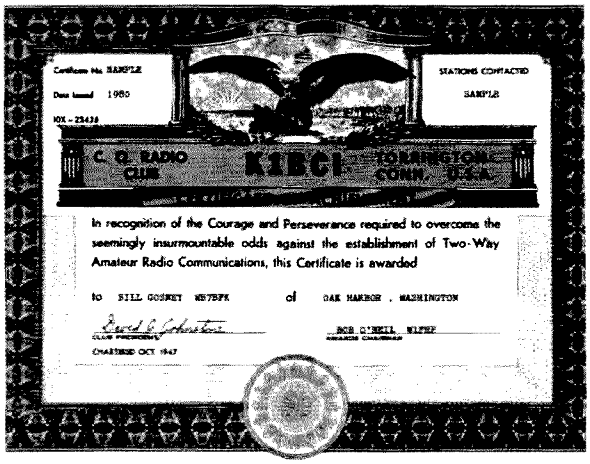
Please, don't let my comment discourage you. You people have a lot of super ideas for different awards. Personally, I would recommend that you initiate and fund your award concept locally. What a great way for a radio club, for example, to gain international recognition! Take the Whidbey Island DX Club...with the founding of the International Island DX Award, we have seen applications made from even the rarest of countries and stations. We've seen the popularity of the club and its DX Award grow significantly over the past three years to where now it is the center of attraction.

A radio club award can mean a way of strengthening the club's treasury. Those projects which previously were restricted due to finances now can become reality. The easiest part of it all, once you have your award program organized and can send your rules to me to publish in this column, is just standing by...within a month you'll begin seeing letters of application pouring in.

The most important comment I can offer about a newly-founded award is that it has to be something different to be in demand. So, give your award idea some thought. Plan your requirements with the thought in mind that your award is not for everyone. Make the rules somewhat difficult, yet not too restrictive. Don't make the award so simple that you practically give it away. If an operator doesn't have to work towards a goal, the certificate on the wall won't be of any value to him or those who see it on display.

Finally, I would like to see clubs getting involved with award programs on a larger scale. The majority of award sponsors seem to be major magazine publishers and national radio societies. Somewhere along the line, most of the clubs lost their confidence and only a few have taken the initiative to design an award and offer a challenge to award seekers of the world.

Perhaps now clubs will recognize the significance award programs have to an active group. Why not form a committee and consider such an endeavor this week?



CQ AWARD

The CQ Radio Club of Torrington offers a certificate for contact with its club members. This is open to any amateur station on any band, any mode, at any time.

To qualify, amateurs within Connecticut must make 15 contacts with members; other stateside amateurs need to contact only 10 member stations; DX stations must establish 5 member contacts.

There are no charges for this award; however, donations to offset postage would be appreciated. Send your list of contacts to: Robert J. O'Neil W1FHP, Awards Manager, Hard Hill Road, Bethlehem CT 06751.

THE HEX AWARD

Paul Hilton N3BCZ recently wrote and provided me with details of an award being sponsored by the Lancaster Radio Transmitting Society, Inc. The award is a beautiful hand-colored certificate, authenticated by the officers of the Lancaster organization.

To qualify, applicants must make contact with at least thirteen Lancaster County radio operators. There are no mode restrictions, but contacts via repeater are not valid.

To apply for the award, send your QSL confirmations to the club trustee. Be sure to enclose sufficient postage for the safe return of your cards. In his letter, Paul failed to mention if there was an award fee. It is assumed there is not. You may forward your application to: Robert Wenger, 402 S. State Street, Ephrata PA 17522.

If you are an active county hunter, which a heck of a lot of our readers are, you might take a hard look at four very challenging awards being offered by Ray Teeter N2RT.

THE UNITED STATES OF AMERICA COUNTY AWARD

The USA County Award is available to applicants who can meet the requirements of any of the 12 award categories.

There is a category for each call district, and an applicant must work the required number of counties in that district to qualify.

1st call district—67 counties
2nd call district—83 counties
3rd call district—94 counties
4th call district—749 counties
5th call district—584 counties
6th call district—58 counties
7th call district—257 counties
8th call district—226 counties
9th call district—266 counties
10th call district—681 counties
Alaskan call district—4 counties (judicial districts)
Hawaiian call district—5 counties

When applying, you *must* state which call district you are applying for. Claiming all call districts requires 12 applications, and the recipient also will receive a nice trophy.

For each Call Area Award, there are three award classes. Class A—all counties in the call area worked; Class B—⅔ of the counties worked in the call area; and Class C—⅓ of the counties worked in the call area.

To apply for the USA County Award, prepare a list of claimed contacts in order by county within each call area. Be sure to list the usual logbook information, including the county and state of the contact. Do not send QSL cards! Have your list verified by at least two amateurs or a local radio club secretary. While there are no mode or band restrictions for this award, you may request endorsements and receive recognition at no additional charge if a request for such is made at the time of application.

For each Call Area Award being applied for, enclose an award fee of $1.00 and forward to: Ray Teeter N2RT, RD 2, Canaan Heights, Locke NY 13092.

CHN MOBILE ACHIEVEMENT AWARD

Also made available by Ray Teeter, the CHN Mobile Achievement Award is offered in three award categories.

To qualify, applicants must either (1) work mobiles in all the counties of any one state, (2) work the same mobile in all counties of any one state, or (3)

Continued on page 44

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

QRP ARCI ANNUAL QSO PARTY

2000 GMT April 18 to
0200 GMT April 20

The contest is open to all amateurs and all are eligible for the awards. Stations may be worked once per band for QSO and multiplier credits.

EXCHANGE:

Members—RST, state-province-country, and QRP number.

Non-Members—RST, state-province-country, power input.

SCORING:

Each member QSO counts 3 points. Non-member QSOs are 2 points, and stations other than W/VE count 4 points each. Multipliers are as follows: More than 100 Watts input, ×1; 30-100 Watts, ×1.5; 10-30 Watts, ×2; 3-10 Watts, ×4; 1-3 Watts, ×6; less than 1 Watt input, ×10.

Final score is total QSO points times total number of states-provinces-countries per band times the power multiplier.

FREQUENCIES:

Novice—3710, 7110, 21110, 28110.

SSB—1810, 3985, 7285, 14285, 21385, 28885, 50385.

CW—1810, 3560, 7040, 14060, 21060, 28060, 50360.

Try SSB on even hours, and don't forget Novice frequencies.

AWARDS:

Certificates to the highest scoring station in each state, province, or country with two or more entries. Other awards will be given depending on activity. One certificate to highest scoring Novice/Technican overall. One certificate for the station showing three skip contacts using the lowest power.

LOGS AND ENTRIES:

Send full log data, including full name, address, and bands used, equipment, antennas, and power used. Entrants desiring results sheet and scores, *please* enclose a business-sized envelope with sufficient return postage. Logs must be received by May 20th to qualify. Send all logs and data to: QRP ARCI Contest Chairman, William W. Dickerson WA2JOC, 352 Crampton Drive, Monroe MI 48161.

YL ISSB QSO PARTY—PHONE

0001 GMT April 18 to
2359 GMT April 19

Two six-hour rest periods are required. Operating categories include: single operator, DX/WK teams, and YL/OM teams. All bands will be used, and the same station may be contacted on different bands for contact points but not as country multipliers. Two meters may be used, but contacts must be direct and not through repeaters.

EXCHANGE:

Name, RS, SSBer number, country, state, and partner's call. If no partner, leave blank. If non-member, send "No Number."

FREQUENCIES:

3925, 7290, 14332, 21373, 28673. Listen for DX on 3765 and 7090. Listen for VK on 3690 on 75-meter phone, as their top frequency is 3700. It is requested that stations spread out to relieve congestion on 14332. Use frequencies from 14280 to 14345. Remember the nets on 14313 and 14336. Also DX stations use 14160 to 14190 for contacts among themselves.

SCORING:

Score five points for each member contacted on any continent. Non-member contacts count one point. Only member station contacts count for multipliers. Multipliers are each state, country, and province. Also, each team contacted, but

Continued on page 117

CALENDAR

Apr	4-5	ARRL Open CD Party—Phone
Apr	8-9	DX/YL to NA/YL Contest—CW
Apr	11-12	ARRL Open CD Party—CW
Apr	15-16	DX/YL to NA/YL Contest—Phone
Apr	18-19	YL ISSB QSO Party—Phone
Apr	18-20	QRP QSO Party
Apr	25-26	Helvetia Contest
May	2-3	County Hunters SSB Contest
May	9-10	Rocky Mountain Division QSO Party
May	10	DARC Corona 10-Meter RTTY
May	16-18	Michigan QSO Party
May	23-24	Europe and Africa Giant RTTY Flash
Jun	6-7	VK/ZL/Oceania RTTY DX Contest
Aug	8-9	European DX Contest—CW
Aug	15-16	SARTG Worldwide RTTY Contest
Sep	12-13	European DX Contest—Phone
Sep	12-13	G-QRP-Club CW Activity Weekend
Sep	12-14	Washington State QSO Party
Sep	26	DARC Corona 10-Meter RTTY
Nov	8	DARC Corona 10-Meter RTTY
Nov	14-15	European DX Contest—RTTY
Dec	26-31	G-QRP-Club Winter Sports

RESULTS

1980 MICHIGAN QSO PARTY

Michigan

W8PBO	98,600
K6RO	67,235
WA8VNZ	66,470
W8YY	52,445
K8AQM	50,660
WA8MAM	50,150
WA8QAF	42,948
N8ADW/8	41,820
WB8AYW	40,885
WB8ZJL	37,520

Out-of-State

VE3DAP	17,784
K3NB	14,820
W1AQE	8,244
WA9BZW	7,440
NØBNW	6,640
W3PYZ	5,740
W7ULC	5,565
WD8SBR	5,066
K9CW/2	4,536
N3AHA	2,938

RESULTS

1980 HELVETIA CONTEST

Europe

CT4MS	1,764
OK6ZG	16,704
EA7ALG	13,965
F9KP	18,972
G3ESF	10,455
GD4GWQ	945
HAØKDA	17,940
HA7SQ	7257
IN3NJB	5,924
ISØODV	1,296
LA2GN	4,089
LZ2KKZ	13,650
OE1DSA/3	22,935
OH9NV	15,147
OH3PB	13,572
OK3KFF	9,207
OK1AVD	8,316
ON7YD	10,688
OZ1BLO	1,280
PA3AFF	720
SM4CGM	2,223
SP8ARY	1,938
SP1KRU	1,680
UK4PNZ	29,700
UA2EC	792
UK5IBM	22,680
UK2WAF	21,504
UO5OWC	4,817
UP2BAW	35,787
UQ2MF	1,599
RU2RCU	7,200
YO2BEO	3,308
YU2CRM	8,880
YU3AIJ	5,520
Y43ZN/A	9,360

DX Stations

EA9GT	3,612
JA1ADN	11,884
JT1AN	105
OA4ZP	396
OD5LX	924
PY4KL	741
UA9CAL	22,320
UD6CN	2,160
UJ8JAS	578
UL7QF	1,660
UM8MBA	540
VE2WA	2,592
VE3HNO	351
VE4MF	960
VE5JQ	624
VO1AW	11,172
VK3AEW	2,592
KA1EP	8,894
N2UN	15,875
W3ARK	10,701
W4OEL	20,532
W5EIJ	867
W6UA	9,120
W7ULC	4,860
W8DA	10,062
AE9X	270
WØLHS	108
HB9BAI/4X	20,352
9G1KL	2,304

FCC

TYPE-ACCEPTANCE REQUIREMENTS EXTENDED FOR EXTERNAL RADIO FREQUENCY POWER AMPLIFIERS (DOCKET NO. 21117)

The Commission has decided to extend for an indefinite period its type-acceptance requirements for external radio frequency power amplifiers of the kind used to amplify Citizens Band radio transmissions illegally.

The Commission instructed its staff to draft an order extending the type-acceptance and related technical requirements indefinitely. The requirements were adopted in 1978, effective for three years, to cope with the problem created by the large number of amplifiers being marketed and promoted for use in and around the CB frequencies. External amplifiers of the sort used to amplify CB signals illegally can cause serious interference to TV and radio reception.

Type acceptance, in this case, requires submission of a sample of the model amplifier to the FCC for approval, along with technical data, before it is manufactured and placed on the market. The number of prototype units that can be manufactured in preparation for submission for type acceptance is limited to 10.

The requirements apply to all amplifiers and amplifier kits capable of operation below 144 MHz. They cover most amplifiers used in the Amateur Radio Service.

The Commission said numerous manufacturers and distributors of amplifiers designed for illegal operation have ceased manufacture and marketing since the requirements were adopted, though some are continuing.

The effectiveness of the type-acceptance requirements in halting promotion of amplifiers for illegal applications indicates that they should be continued, it said. Notice of the continuation was given in the order that originally implemented the type-acceptance requirement.

Action by the Commission, December 18, 1980, by Second Report and Order (FCC 80-750). Commissioners Ferris (Chairman), Lee, Washburn, Fogarty, and Brown.

CORRECTIONS

In the January, 1981, Review section, the first two TS-820 mod kits (front end and balanced mixer) were incorrectly sourced to S-F Amateur Radio Services. These mods are, in fact, produced by W6TOG, and are available through authorized distributors (S-F is not one). All mail-order inquiries should be directed to the address given below. Both the QRO kit and the Magicom board are available still from S-F at the address given at the end of the review.

Jerome H. Ginsberg W6TOG
TM Limited
6108 Hazelhurst Place, Suite 9
North Hollywood CA 91606

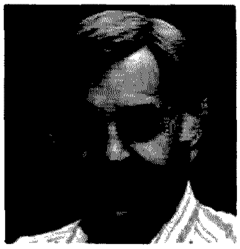
In "A Programmer's Potpourri" (September, 1980, p. 95), Program 11(a), please insert F = 0 at line 0225.

Peter Stark K2OAW
Mt. Kisco NY

In my January, 1981, article "Cheap and Simple," p. 51, an error can be found in the Parts List. Capacitors C1 and C2 should be switched. While this error exists in the Parts List, the text of the article is correct, C1 is 10 uF, 25 V, and C2 is 13,000 uF, 25 v.

Vern A. Weiss WA9VLK
Kankakee IL

LEAKY LINES



Dave Mann K2AGZ
3 Daniel Lane
Kinnelon NJ 07405

Most of us thought that the world had learned its lesson about appeasement when Neville Chamberlain and Edouard Daladier engineered the Munich Pact, thus preparing the way for Adolf Hitler's rapacious appetite for territorial aggrandizement. We thought that appeasement had been thoroughly discredited as a bankrupt tactic, unworthy strategically and unworkable from a practical sense.

It appears that we have not learned that historical lesson, and we may be compelled to relearn it.

We show overweening leniency toward parasites and criminals; we extend the hand of friendship (generally prompted by either economic or political expediency) toward foreign nations which despise us; we lower academic standards so that unqualified boobs can occupy space in our universities, and, closer to home, we grant concessions to the undeserving in amateur radio.

Two things happen when you appease. You sharpen the recipient's appetite for more, and you make it unnecessary for him to appreciate what he has, for he comes to the swift conclusion that he deserved to get it all the time. Giving something for nothing is a certain prelude to disaster.

Through the years, we have witnessed a gradual frittering-away of quality in favor of quantity, and nowhere is this more clearly evident than in ham radio. The implementation of the "mail order" license was a costly mistake. Likewise, the reinstitution of Incentive Licensing was a kick in the teeth, not only to the Amateur Service, but to every ham holding a General class ticket, for it arbitrarily deprived him of privileges once fairly earned and rightfully enjoyed. At the same time, it fell far short of the intended mark, which was to encourage upgrading on a wide scale.

The sad fact is that only a small proportion pursued the golden goal of Extra class. They went as far as Advanced simply because their sole interest in upgrading was to continue operating on accustomed frequencies. I have asked literally thousands of hams why they upgraded, and most had not done it in order to improve skills or knowledge but merely in order to be able to work DX or avoid the congestion in the crowded General portions. Certainly the piddling few kilohertz of sequestered space in the CW portions and in 15- and 75-meter phone bands did not strike anyone as all that attractive, at least not when measured against the difficulty of learning Extra class theory and increasing the CW speed up to twenty words per minute.

I cannot speak for all amateurs, of course, but as a DXer of long standing, I can state with conviction that to those who share that interest with me, there is little point in acquiring the Extra; it is meaningless in real terms.

Newington, ever-obsessed with the idea of recruiting more and more members, has sold itself a delusion: that there is an unlimited pool of potential amateurs out there, and that any and all of them should be recruited through any means, even code-free licensing. Perhaps amateur radio has gained several good people who were at first unqualified, but it is even more likely that there is a huge army of lids who could never be anything but a detriment, no matter what was done for them.

All that separates the deserving from the undeserving is the FCC examination. And for the ARRL to keep granting credence to the idea of an "entry level" code-free license (a cryptic term which means a giveaway) is an absolute abomination, a breach of faith with every League member. The major contributing factor toward the mess on 27 MHz is that anyone can apply and get a license without lifting a finger to prove that he is qualified. The regulations may call for the CBer to possess a copy of the appropriate rules, but he is not required to read them or to be familiar with their provisions. He does not have to know anything, nor does he have to demonstrate his willingness to learn anything. All he needs to do is to buy a piece of equipment, hook it up to an antenna, plug it into the wall socket, and begin yammering into a microphone.

And now the powers that be are again proposing that the door be opened to more unqualified "space cadets," so that they can bring their ignorance into the Amateur Service. Pursuant to a request by FCC Chairman Ferris, and with the support of three "high level" officials on the Commission Staff, a Notice of Proposed Rulemaking is being drafted which is intended to implement a waiver of the code for amateur licenses.

That this ostensibly is aimed at bringing in those who are involved in computer science is altogether beside the point. Of course there is an important future in amateur radio for all sorts of applications of the new digital techniques. An editorial in *QST* for June, 1980, mentioned several areas: station control, contest logging, satellite applications, repeater "bookkeeping," orbital predictions, azimuth-elevation tables, signal processing, automatic error correction, antenna design computations, direction-finding techniques, and message handling. But, as I say, all this is beside the point. The fact is that the doorway to ham radio has never been closed. Anyone with a desire to become an amateur can acquire the necessary knowledge and skill. The only thing that ever stood in the way was an applicant's laziness and inertia.

But the FCC operates on the present-day assumption that high standards are set up as a deliberate bar to the entry of the broadest possible number, that difficult criteria are evidences of some desire to exclude, and are therefore undemocratic. And, instead of opposing this with all the strength at its command, we see our ARRL expressing uncertainty with respect to amateurs' feelings in the matter. I will wager anything that with the possible exception of a few isolated bubble-headed utopian idealists, the huge majority of U.S. amateurs firmly oppose the granting of any code-free license.

Some insist that because some, even most, have no use for CW, it ought to be abolished as a prerequisite. I say, bullfeathers! It may not be in general use by the majority; I won't argue the point. But to me, its chief purpose is to test the willingness of applicants to earn the license.

There are some individuals who can't qualify for driving and flying licenses. They are incapable of sufficient coordination, or their minds can't grasp the written material. But you don't see anyone proposing an "entry license" for them. You don't see bar associations endorsing an "entry level" so that incompetents can practice law, nor do you see a State Medical Board asking for changes that would permit the non-qualified to acquire "entry level" licenses to practice obstetrics or neurosurgery!

Yet, this is precisely what proponents of such schemes are really driving at. Do you seriously believe that they do so because they are sincerely interested in the growth and future of amateur radio? Or is it somehow tenuously connected to a bonanza in the sales of equipment to new licensees? Not that I object to that; it is important to our free enterprise system. But, at the same time, nothing prevents anyone from buying the *License Manual* in order to qualify for a

Continued on page 120

NO-CODE LICENSE?

Here's your chance to speak up! Send us a postcard with your **Yes or No** answer to this question:

Should there be *any* form of no-code license in the Amateur Service?

Mail your reply to Editorial Offices, *73 Magazine*, Pine Street, Peterborough NH 03458.

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
4006 Winlee Road
Randallstown MD 21133

April may be the month for fools, but the biggest fool of all around here would be me if I ignored your letters and questions. So this month let's turn to the mailbag.

Some time back, I mentioned that Dave Lundquist WA2UWK was in need of information for the Lenkurt 25-A demodulator that he had acquired. Indications are that Dave got all the information that he asked for, and more. With the help of Sheldon Daitch WA4MZZ and Rich Strehlow KAØCSG, and who knows how many others, both Dave and I now have a bit more information on the Lenkurt.

This unit was (is?) in use by various wire services to distribute signals on slow-speed teleprinter channels. It is configured to allow tone pairs from around 300 Hz to 7 kHz, center frequency, to be used. Thus, several different signals could share the same line, using different audio tone frequencies, with the differentiation made by the receive filter in the Lenkurt unit. Hopefully, Dave will be able to adapt the thing to amateur RTTY. Good luck, Dave!

There seems to be quite a bit of interest in connecting various teleprinters to low-level TTL circuits. A1C Randy L. Bray, stationed at Bergstrom AFB, Texas, writes that he tried to drive a compact Model 28-KSR Teletype® from a demodulator yielding a TTL-level output. A slight lack of drive there, no? Well, being the industrious serviceman that he is, Randy went on to devise the circuit shown in Fig. 1. This uses a matched pair of 4N25 optoisolators to convert the TTL level to a plus-minus six-volt swing, suitable for driving the polar input of his printer. To take care of occasional upside-down stations, he uses one section of a 7404 TTL hex inverter, which may be switched in to up-side-up the upside-down renegade. Looks like a nice piece of work, Randy.

Along the lines of interfacing, Reginald Theriault, from Rimouski, Quebec, is currently using a Model 28-ASR Teletype and a HAL ST-5 demodulator on 60-wpm, 5-level RTTY. He has recently come by a video terminal and wonders how to use it on RTTY. Reg, the terminal you describe is set up, as are most terminals, to use the eight-bit ASCII code, described in RTTY Loop a few months back. As a serial RS-232 output is available, the physical connection of the terminal to a demodulator such as the ST-5 should not be too hard. However, you will be running ASCII, not Baudot/Murray code. Although this is legal in the United States, I am not sure about Canada's viewpoint. Further, most RTTYers are still using Murray/Baudot (try to keep things fair!). There are two main ways to convert to five-level code, if you want to: a stand-alone hardware conversion or a computer.

The hardware conversion would use a UART to input the serial data and convert it to parallel, a ROM and associated chips to look up and change code groups, and another UART to output the transformed code, perhaps at a different speed. This method is cheap, it works, and several schemes have been published in *73* through the years.

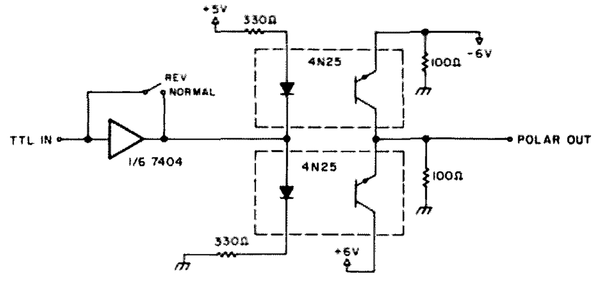


Fig. 1. TTL-to-polar conversion.

A computer may be programmed to do the same conversion, from one code to another and back again, and will do it just as well as a simple board, at many times the cost. But what you gain is some intelligence in the conversion. The computer can provide features such as message buffers, automatic identifiers, and other bells and whistles which make operating a real pleasure. Now, I don't think I would run out and buy a computer just to run RTTY, but once you have one you won't believe how many new uses you can find.

This leads us to another question: which computer? Well, from the RTTY point of view, I really don't think that matters much. My biases run toward the 6800 family, but that is because I have one and have written quite a bit of software for it. The TRS-80, by Radio Shack, is clearly one of the most popular microcomputers on the market, spawning accessory suppliers and even whole magazines (have you tried *80 Microcomputing* yet?). A typical question comes from John. T. Gubernard K2LSX, of Bergenfield, New Jersey, who writes that he has a TRS-80 and is looking for ways to get on the air with it.

Guess what else the mail brought? One of our *73* advertisers, Vic Frump K8EXJ, passes along information about his Bit-Byter RTTY system for the TRS-80. This system is designed for either a Level I or Level II computer and has quite a list of features, including split-screen operation, with received information scrolled in the bottom two-thirds of the screen and the transmit buffer in the top third, automatic RTTY and CW identification, single-key CQ, RY, or QBF, and 60- or 100-wpm operation. The unit keys the loop, so interfacing to most systems should be straightforward. Interested? Drop Vic a line at UHF Sales & Service Co., Route 1, Box 52A, Evans WV 25241. Be sure to mention RTTY Loop when you write, OK?

Pictures on RTTY is always a good topic, but, unfortunately, one which has caused quite a bit of concern in these pages in months past. As I write this (in January), there still is no word on the ongoing saga of Teleprinter Art, Ltd. There are pictures out there, however, and you don't have to pay for them! Russ Lawson K1MOU drops me a note that several active hams have reams of pictures they will gladly send to anyone, over the air. Ken WA4MNT, in St. James City, Florida, says that he has quite a few, and W. E. Symons K4IH passes along a similar list as long as your arm.

Most letters I get are questions or requests for this and that bit of information. I would like to acknowledge one this month that was just a nice note. I can remember back a few years, when I was an intern, how tight my time was and how precious every spare moment became. This schedule only gets worse the further into the system you go, through residency and Fellowship. That is why this note, from Joseph R. Salvatore, M.D., now a Fellow at Roger Williams General Hospital in Providence, Rhode Island, means so much. Joe was one of my interns a few years ago, and I lost track of him when he left the area to further his education. I don't know what his callsign is now, but I am sure that he does not have much time to operate. Thanks for reading the magazine, Joe, and best of luck.

Our sister publication, *Kilobaud Microcomputing*, has been giving quite a bit of space to communicating over telephone lines. These Computer Bulletin Board Systems (CBBS) now form a viable means of getting information across the country without worrying about propagation conditions. Users of 6800 systems might be interested in an article in the February, 1981, issue which details the method I use to hook up to the CBBS locally. By the way, if you want to leave me a message, you might try the Baltimore Micro-Mail Service, at (301)-655-0393, calling *only* between the hours of 10 am and 10 pm, eastern time, or the Prodigy system, at (301)-337-8825, available 24 hours a day. Both of these systems are ring-back, CP/M-based computers. To access, call the number, let the phone ring once, then hang up and dial again. The computer will answer when you call back in.

Going to look at another piece of equipment next month. What is it? You may not think you need it, but once you've bought one you wouldn't be without it. Curious? Don't miss next month's RTTY Loop!

LETTERS

AMATEUR RADIO DAY

About 40 amateurs live in this northwest area of Arkansas, around Rogers. We have secured through the Official Centennial Commission, Saturday, May 9, to be set aside as Amateur Radio Day, as part of the events during the summer. Please help us celebrate that day by working one of the Official Centennial Amateur Radio Stations. The K5BP call letters will be used on about 7,283 kHz LSB or 21,363 kHz USB from 1400 UTC to 2200 UTC. Send confirming QSL card with a #10 SASE to K5BP, Dept. 1881, General Delivery, Rogers AR 72756 to receive an Official Centennial Certificate.

Glenn E. Webster W5VIX
Rogers AR

DE PY2AA

We, from LABRE—Liga de Amadores Brasileiros de Radio Emissao—are glad to announce that there has been set up a beacon, here in Sao Paulo—SP—on the six-meter band, for propagation research purposes.

The beacon is on 50.055 MHz and has an output power of 25 Watts. The antenna is an omnidirectional ground plane which is about 25 feet above the ground level, on the top of the League building.

The format transmitted is a long dash, along with "de" and the call: — de PY2AA.

We would very much appreciate any kind of report; they can be sent directly to PY2AA—Beacon Project, PO Box 22, 01000—Sao Paulo—SP, Brazil.

We will keep you informed on all free local beacon activity.

Hugo Adelino da Silva PY2DSQ
Sao Paulo—SP—Brazil

AND WAYNE SAYS...

There seems to be quite a controversy over Dick Bash's publications, and the fire was recently fueled by Skip Tenney's editorial. If I remember correctly, you were quite enthusiastic about Dick's publications. We find we are being put on the spot by some of our customers after seeing Skip's editorial, and I am trying to feel out some of the more prominent members of the amateur fraternity to determine what their thoughts are on this whole issue.

Warren L. Spindler K2IXN
Ham-Radio World, Inc.
Oriskany NY

Yes, Warren, I have some thoughts on the Bash cheat books. I am not aware of ever having been enthusiastic about them. Indeed, I have refused from the first to allow Bash to advertise in 73, for which we are paying with the loss of about $1,000 per month. I'd say that we are putting our money where my mouth is.

The editorial in HR *about the Bash books was read with entertainment by many. If you will look back in the April, May, and June, 1980, issues of* HR *(and some in* HRH*), you'll find that their Ham Radio Bookstore advertised and sold the book they are now being righteous about. I refused to carry ads for the book or to handle it in our Radio Bookshop.*

As I understand it, HR *was enthusiastic about the Bash books up until they got a call from the FCC. The FCC has been very uptight over the books and I have heard that they called Tenney of* HR *and put it on the line: If he wanted any more FCC information for his Half Right Reports, he should stop advertising for Bash. The ads stopped and the info to* HRR *continued.*

The Bash books are not much worse than the old ARRL Q & A manual in that they strongly encourage the memorization of answers rather than the understanding of theory. I feel that this is bad for those who suck in on this easy way to their first license. This is why my license manuals emphasize learning the theory rather than memorizing answers. Memory quickly fails... and any change of questions quickly confuses applicants. If the theory is understood, not only is any test simple but the foundation for going ahead to higher classes of license has been laid.

The memory route leaves the Novice with no real comprehension of radio theory, so he is then committed to ever more difficult memorization as he goes for the General and Advanced licenses. His ignorance will immediately be perceived by anyone he talks with over the air, making the use of his license less than fun. You can't fool people into thinking you really are a ham when you aren't. They see through the sham.

The really sad part of all this is that there is nothing complicated about understanding the theory. We've had kids four years old able to comprehend it and pass the test. Yes, it takes a bit of time and thinking. You know, it is incredible how much effort people will devote to not having to think! You might get the idea that it is painful to think instead of it being one of the most exciting of human experiences.

Now, to answer your question ... if I were in your position, I would not *sell the Bash books. —Wayne.*

AN UNBIASED VIEW

Just finished reading Larry Kahaner's excellent article, "Who Really Invented Radio?," but found it to be a "floppy copy" of hundreds of other writings, with the exception of a few new names with numbers identifying the modern-day authority of early radio.

Like many others, I also agree that America's N. B. Stubblefield invented, manufactured, and demonstrated a wireless device that transmitted and received both music and voice *before anyone on this planet*, and, like L. H. Hortin, I am tired of explaining that today's radio, as we know it, is Stubblefield's "wireless telephone" transmitter/receiver, and not Signor Marconi's dot and dash performer, or even Tesla's electrostatic transmitter.

Furthermore, English scientific publications such as yours really invented the word *"radio"* —several years *after* Stubblefield's famous broadcast demonstrations—to describe any and all sources of energy that radiated and/or created heat. The truth of the matter is that Stubblefield's scientific "wireless telephone" terminology and achievements were lost to the world by the stroke of a writer's pen, confusing knowledgeable men of both that time and even now! Luckily, Murrayites such as Hortin, Johnson, and many others, who know the real story, still exist.

It would appear that those two radio shack jocks, Riley Ray and William Call (also known as W4LMF and KJ4W respectively), should have known that "wireless telephone" is radio, no matter how you look at it, feel it, broadcast it, or just plain hear it, before tattling Murray's local gossip to the world.

Troy Cory Stubblefield,
Grandson of N. B. Stubblefield,
and son of Oliver Stubblefield
Universal City CA

73 METHODS WORK

I've never written a letter to any magazine before, but I feel I must this time.

I have no technical background or training whatsoever that is electronics or radio-related. In fact, until 1979 I didn't even know how to use a soldering iron! Using your *73* code tapes and theory courses, I have progressed from Novice to Extra class since July of 1979 (just passed Extra class exams January 7, 1981). That's a period of a little over 1½ years, and there is no way I could have done it without the help of your code tapes and study guides.

I can't thank you enough for all that your organization has to offer. Your training and teaching aids are second to none. Keep up the good work and you'll make a lot of newcomers, like myself, very pleased.

Bob Burdick KA1DOS
Ayer MA

PEKING TRAVELS

I read your article in this January's *73* and I thought I should mention that I was in China in December, 1979, and at that time I saw several allband radios in the communes.

In Shanghai, at the Children's Palace (for bright kids), there was a room where the students were assembling transistor radio kits.

I stayed at the Peking Hotel in

Continued on page 123

REVIEW

KENWOOD TR-7800

I have operated a lot of different two-meter rigs in my short life, and I am picky. When I first saw the Kenwood TR-7800 two-meter FM transceiver at a show last year, I made several unkind remarks about the rig to my companions. "Ha!" I said. "Look at that ridiculous keyboard entry system. That won't work in the car!"

I now wipe the egg off my face and present my sincerest apologies to my friends, not to mention the poor tortured soul in the booth. This is one of the best two-meter rigs I have ever used! Kenwood has designed this rig to be at home in both base and mobile applications, which is no minor undertaking.

In a way, my first impression was right—the keyboard is not easy to use while driving. What I missed was that it is rarely necessary to use that keyboard at all. This rig is equipped with an extremely flexible memory system, which allows 15 frequencies and their transmitter offsets to be stored in memory and recalled with the push of a button on the microphone. The memories are maintained even when the power switch is off.

Add four AA nicads and the rig will remember your favorite frequencies when there isn't a 12-volt power supply for miles around. No more peering at a washed-out display while fighting rush-hour traffic. No more calling a friend feverishly while your rig is on the wrong offset. Groping for the MHz switch or the 5-kHz button also have been mercifully banished from the two-meter experience. In short, this rig offers just about everything the dedicated FMer could ask for—either in a mobile installation or as a base station.

TR-7800 (front view) with Bird Ham-Mate Thruline* Wattmeter.*

Basic Performance

It's no use having all these sophisticated features if the basic performance isn't up to snuff. Before we go any further, let's examine the 7800's performance characteristics.

The 7800 is very compact, measuring only 6-7/8" wide, 2-1/2" high, and 8-1/16" deep. Electronic performance is excellent. Actually, the design of the receiver and transmitter sections of the 7800 is very similar to that of its older brother, the TR-7625. Many improvements have been made, but the basic design is a tried and proven one. There appears to be some additional filtering in the receiver to increase selectivity, and more reliable finals were used in the transmitter output stage.

Southern New Hampshire is not what could be considered an rf saturated area, so the fact that we never encountered any intermod problems doesn't mean too much. Still, all indications are that the 7800 should handle intermod at least as well as any other top-quality synthesized rig. Squelch action was very sensitive and sharp, more so than other popular rigs we have tested. The squelch control can be set barely above the noise threshold, and weak signals will open the squelch, but noise won't. Received audio is excellent, both through an external speaker and through the larger-than-usual built-in speaker. Since the built-in speaker is top firing, you won't have any problems if you mount the rig on a shelf or the transmission hump of a car.

Transmitter deviation was set perfectly, as was the output of the DTMP encoder. The *73* repeater uses a digital tone decoder, and if the tone levels on a pad are set too high, the decoder rejects them. The TR-7800 has one of the few pads we have seen that doesn't need some adjustment to work properly.

Transmitter output is rated at 25 Watts on high power. Our sample put out over 30 Watts throughout the entire 144-147-MHz range. Low-power output is internally adjustable and we set it at 2.5 Watts. The transmitter's final stage is protected against high swr by sampling reflected power. As swr climbs, transmitter drive is reduced. I left the rig key-down with no load for over a minute, and the only thing that failed was my nerve. I figure that if anyone transmits for more than a minute without any antenna connected, it won't be Kenwood's fault if the finals blow!

Squelched receive current consumption was 0.4 A and maximum current required was 6 A in the high-power transmit mode. The rig draws about 3 mA even when the power switch is off to maintain the frequency and offset memories. Four AA nicad batteries can be installed inside the case to maintain the memories when the rig is completely disconnected from a power source. The nicads will maintain the memories for several days at a time and are automatically charged at 30 mA whenever the transceiver is on.

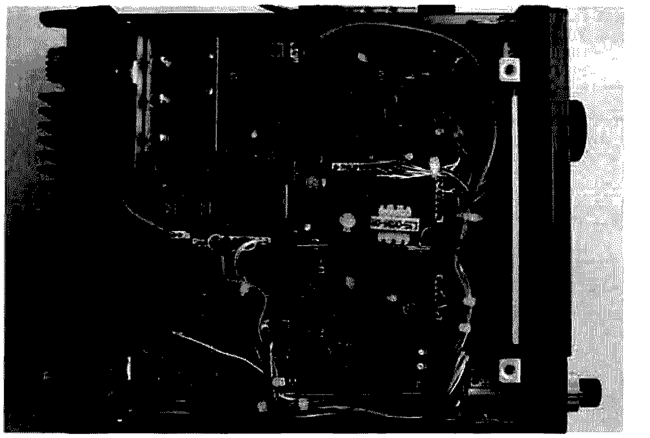
In short, the TR-7800 functions so well that its basic performance characteristics can safely be taken for granted. There is nothing temperamental about this rig, so you are free to enjoy its sophisticated bells and whistles. With no further ado, let's take a good look at those bells and whistles.

Frequency Agility

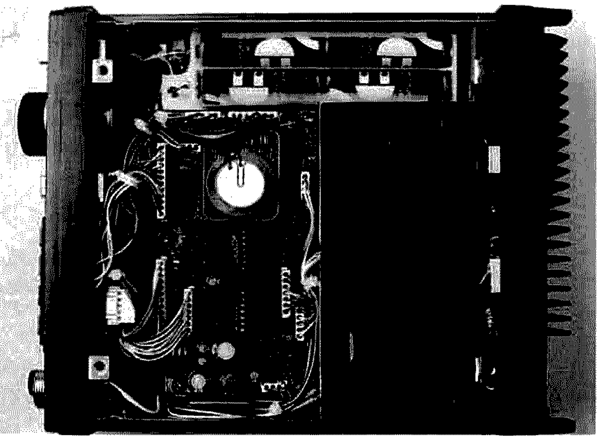
The front panel is fairly simple and the controls are easy to understand. There are several methods of selecting an operating frequency on the 7800. The first is by entering the last four digits of the desired frequency on the keypad. 146.52 MHz would be entered as 6520. If operation other than simplex is desired, the offset also is entered via the keypad.

The second method of frequency selection is to scan through the band using the up/down switches located on the microphone. The band can be scanned in 5- or 10-kHz steps, with an audio tone accompanying each step.

A third way to change frequencies is by depressing the SC button on the front panel. Don't ask me what SC means—I haven't a clue! What it *does* is automatically scan the band looking for signals. When it finds a signal, it pauses for about five seconds and then continues its scan. If you want the 7800 to come to a complete stop, you can press the transmit switch, the C button on the tone



Top view of TR-7800.



Bottom view of TR-7800.

pad, or one of the scan buttons on the microphone.

Each time you change frequencies using one of the above methods, the 7800 reverts to the simplex mode. Let's suppose that you are operating on 146.76, with the transmitter offset set to −600 kHz. If you scan up to 146.85, the rig will revert to simplex, and you'll have to punch the negative-offset button again. This would be annoying if there weren't yet a fourth method of frequency selection. This fourth method of tuning is one of the features that makes the TR-7800 a truly outstanding two-meter rig, and it deserves close examination.

There are fifteen memories available to the 7800's operator and they hold the offset as well as the frequency. Memories 1 through 13 are programmed by entering the receive frequency and a standard offset (+, −, or simplex). Memories 0 and 14 allow the receive frequency and any transmit frequency to be entered separately, so you can operate on any repeater split. Memories are selectable from the scan switches on the microphone, the SC switch on the keypad, or rotary knob on the front of the rig. The large LED readout always displays the frequency of operation, and the smaller two-digit display tells which memory has been selected.

The memories really enhance my enjoyment of two-meter activities. The ability to scan through 15 memories from the microphone makes this rig as safe in mobile use as a crystal-controlled rig, yet it offers almost unlimited frequency options. Since the rig beeps every time it steps through a frequency, you can go from repeater to repeater without even looking at the rig, much less touching it. The little keyboard also works fine, even with my large fingers, but the keyboard is a little too small to be used safely by the driver of a vehicle in motion.

The 15 memories also can be automatically scanned. When you use any rig in the band-scanning mode, it is always stopping on something that you don't want to hear. The 7800's memory scan feature allows you to be very selective about what you listen to.

More Features

I already can hear the screams of protest from all you old codgers who were weaned on big Motorola microphones. Yes, the microphone is small, but it seems to have been carefully designed. Even my massive paws handle it with ease. There is a very good reason for Kenwood's little microphone—stick-shift cars.

Ever try to jam 'er down into third with a big clunky microphone in your hand? Hard to do. You'll have no trouble shifting while holding on to the little Kenwood mike. Clearly, small microphones have arrived!

I have one complaint about the Kenwood microphone: It isn't equipped with a standard hang-up lug. It does have some kind of hook arrangement that is apparently popular in Japan, but since no mating hang-up clip is provided with the radio, you'll have to home-brew your own.

The instruction manual does a fairly good job of explaining how to connect and use the rig, and it contains a good schematic and block diagram. The manual would be a lot more effective if it made better use of the English language. I would encourage Kenwood to have their manuals proofed and edited by a native speaker of English in the future! A separate service manual is also available, but it wasn't ordered in time for review.

Compulsive input checkers will be pleased with the momentary-contact "reverse" switch, which allows one to listen on the input frequency and transmit on the output frequency of a repeater. Priority channel operation is also available. When the priority Alert switch is depressed, the 7800 scans whatever frequency is programmed in channel 0 for activity every five seconds. If there is activity, the rig beeps to let you know. You can switch over to the priority channel by pushing the priority Operate switch. Handy, eh what!

Also on the front panel is a tone switch. Activation of this switch supplies power to a user-supplied CTCSS encoder. Connections are provided inside the rig for ground, post-filter audio input, and +8 V dc. The +8 V dc is supplied only during transmit. The setup is tailor-made for a Communications Specialists encoder, but something could be home-brewed to fit in the space fairly easily.

To those of you concerned that all of this flexibility may be unreliable, relax. I remember a radio (which shall remain nameless) that came out a few years ago offering most of the features of the TR-7800. This disaster was filled with acres of mechanical switches and TTL chips. Naturally, it ran extremely hot and was unreliable. The features of this rig and the TR-7800 may be similar, but the designs are worlds apart. The 7800 uses a single microprocessor rather than discrete logic chips, and its schematic positively reeks of conservative design. It's not at all unreasonable to expect the TR-7800 to stand up to the rigors of daily use and abuse better than more conventional synthesized rigs.

There are a lot of other details that quickly endear the TR-7800 to the jaded two-meter operator. Ever scratched up a rig when you stack your two-meter rig on top of other equipment in the ham shack? Kenwood thoughtfully included four rubber feet that screw into the bottom of the rig. The slide-in mounting bracket included with the rig is one of the slickest acts in town.

Many rigs have a front-panel layout that makes them difficult to operate in the dark. The knobs and switches on the TR-7800 are carefully shaped and placed for ease of use.

The microphone would need five pins to connect the ground, audio, scanning, and PTT lines to the rig, but the TR-7800 has six pins in its mike connector, leaving a spare for the inventive ham. One possible application that immediately comes to mind is the power connection for a touchtone™ mike or an autodialer. Just connect 12 volts to the spare terminal in the mike connector and you're in business!

Conclusion

The TR-7800 is one of the most carefully thought out rigs I have ever used. Unlike many other synthesized rigs, the fancy features don't substitute for good performance. This rig's basic characteristics are beyond reproach, and I could explain

every function to another ham in less than three minutes. I rarely see a piece of equipment that doesn't have some peculiar flaw that really aggravates me. The 7800 is one of the few that doesn't. If you are about to exchange some of your hard-earned dollars for a two-meter rig, the Kenwood TR-7800 deserves your serious consideration.

For more information, contact *Trio-Kenwood Communications, Inc., 1111 West Walnut, Compton CA 90220.*

Paul Grupp KA1LR
73 Staff

KANTRONICS MINI-READER

The age of functional miniaturization is upon us. Kantronics, well established for their reputation in amateur license training tapes and accessories, has released an ultra-compact version of their famous Field Day RTTY/Morse reader.

The Mini-Reader still possesses all of the features of its larger predecessor, but has been reduced to the approximate size of a standard calculator. Measuring only 5-3/4" W × 3-5/8" H × 1-1/4"D, the Mini-Reader features 10 brilliant fluorescent characters. The display moves from right to left, Times-Square style, as the message writes across the full range of alphanumeric characters.

The primary mode is its RTTY/CW reading capability. The Mini-Reader will follow the mark signal at 60, 66, 75, and 100 wpm—any shift. A sharp audio bandpass filter rejects co-channel interference and heterodynes, assuring accurate copy. For CW reception, the Morse function will automatically track 3-80 wpm, self-adjusting to speed. Two of the characters may be used to display the Morse speed.

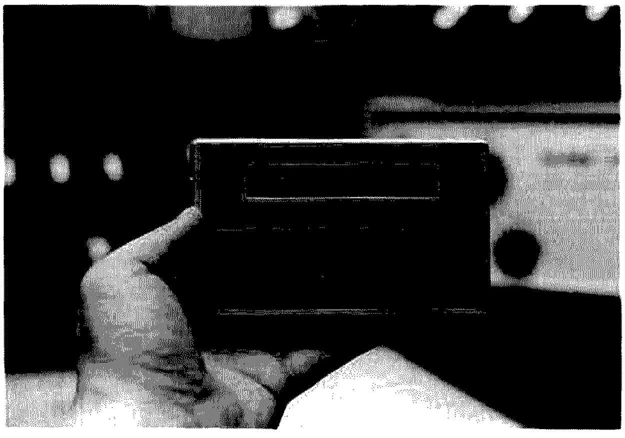
The Mini-Reader can be used as a code-practice display, assisting the user to develop a perfect fist. If your "v"s look like "e e e t" you have some work to do!

A built-in digital clock shows hours, minutes, and seconds, and may be used as a 24-hour timer as well. And for audio circuit design around the shack, the Mini-Reader can double as a frequency counter from dc to 79 kHz! Computer buffs will find the 100- and 300-baud ASCII a little fast to read, but isolated data sets can be stored and displayed.

We decided to give the Mini-Reader a thorough workout by coupling it to a Kenwood R-1000 general-coverage receiver and seeing how it would perform throughout the shortwave bands. One of the most pleasing observations was made right at the start: no RFI! The Mini-Reader switching circuitry was totally inaudible in the adjacent receiver, meaning that the days of RFI from RTTY demodulators have been relegated to the past, and they won't be missed!

In actual use, the Mini-Reader is simply affixed to an appropriate ac adapter (12 V dc at 240 mA) and plugged into the speaker or earphone jack of the receiver or transceiver. Front-panel push-button selection allows the user to select the functions of his choice.

We found the brilliant fluorescent characters even easier to read than the LEDs of the larger and more expensive Field Day model. And even happier, the price of the Mini-Reader is $150 less than the Field Day II SWL model—$314.95!



Kantronics' Mini-Reader.

We were told by Kantronics that the small size of the Mini-Reader was made possible by abandoning the pure digital circuitry of the earlier Field Day products and programming a microprocessor for control.

The Mini-Reader portends a new breed of microprocessor applications, and amateur radio will benefit from the wave of products.

For more information, contact *Kantronics, 1202 E. 23 Street, Lawrence KS 66044.* Reader Service number 479.

Robert Grove WA4PYQ
Brasstown NC

THE UNIVERSAL COMMUNICATIONS 2300-MHZ DOWNCONVERTER KITS

Coffee cans, snow scooters, and stop-sign-shaped PC boards in every direction. That was the general situation when a group of friends and I recently purchased a number of the 2100-MHz downconverter kits from Universal Communications. These MDS, or pay-TV, converter kits were advertised in *73*, and they seemed like an ideal way to try the rapidly growing frontier of microwave TV. We were not sure exactly what we were getting into, but the enticement of unique movies was definitely an incentive!

I won't elaborate on our phone-order difficulties, but it soon became apparent that we were in a pileup with the rest of the U.S. in trying to place our order. Fortunately, we got through on the third day of trying. The downconverter kits arrived COD three days later. Fast! The Universal Communications kit consists of the PC board, all associated board parts, a short length of hardline coax which is used for the antenna, and very good instructions/information on microwave techniques.

Construction began (immediately!) by winding three rf chokes on supplied resistors, then mounting all the components on the PC board. The board was then tack-soldered onto the back (bottom) of a one-pound coffee can, with the hardline coax routed through a small hole into a whip antenna. This arrangement provided an approximate 11-dB gain over the basic whip, and perfectly mated the PC board to the coffee can. This one particular trademark, we later learned, is what sets Universal Communications' boards apart from its competitors'.

Finally, the local oscillator's stripline was trimmed to the desired frequency range (a cutting chart was included) and a coax output cable was connected. (This single line feeds dc voltage to the converter while also feeding converter output to the TV set. Varying the voltage remote-controls downconverter tuning.) All six of us sequentially used a borrowed 0-to-16-volt power supply for checkout, and five converters worked the first time. The sixth unit was cleared soon thereafter, with simple soldering techniques being at fault. Each of us then modified existing 12-volt regulated power supplies using information supplied in the Universal Communications packet.

A day later, we were into studying microwave systems, components, and gain-improving techniques for fringe-area setups. Several nearby residents mysteriously lost their shiny, new garbage can lids around this time, then we found a local source of "snow scooters" and gain flourished. The "snow scooter," or "snow coaster," is an approximately three-foot, parabolicly-shaped dish which, when fitted with struts to support the coffee-can setup, provides approximately 18 dB of gain—and relatively good picture reception compared to the basic coffee-can or garbage-can-lid setup. Our personal observations revealed that previous pictures with sustantial snow were improved to almost snow-free quality, and each additional improvement of approximately one dB made further substantially noticeable improvements.

Gain improvement at these microwave frequencies, however, is slow in happening: A larger dish helps; a higher-gain rf amplifier also helps. (Universal Communications also sells these transistors for $15, and they are definitely worth it, unless one can wrangle a very high-gain/low-noise 50- or 75-dollar equivalent.) We also found that adding extra lengths of parallel conductors to the Universal Communications PC board capacitors and using low-noise microwave diodes provid-

FUN!

John Edwards KI2U
78-56 86th Street
Glendale NY 11385

Shortwave listening? Why not! While SWLing may not be a part of amateur radio, there's no denying the very close relationship between the two hobbies. While CBing may have usurped SWLing as the main gateway to ham radio, thousands still get their first taste of hobby radio by listening to the international shortwave giants on a portable radio. In any event, it's a well-known fact that many hams are closet SWLs. As a matter of fact, more than one prominent DXer has been known to guard his top shortwave QSLs as jealously as many of his most-prized ham pasteboards.

So, whether the closest you get to shortwave listening is fighting the BBC World Service on 40, or if you regularly scan 41, 19, and 13 meters more often then 40, 20, and 15, the world of SWLing is something we should all know a little more about.

ELEMENT 1—CROSSWORD PUZZLE
(Illustration 1)

Across

1 Belonging to a famous Soviet station
8 Typical shortwave mode (abbr.)
9 Announced
10 Skyhook (abbr.)
12 Shortwave "boundaries" (abbr.)
13 Signal skipping zone (abbr.)
14 Not me, but ______
15 SWL's bible (abbr.)
17 Signal attenuation
20 DX signals usually travel over this
21 Radio interference (abbr.)
22 VOA's Delano transmitter's state (abbr.)
23 Time station
24 High antenna location
27 Receiver (abbr.)
28 British radio organization—not BBC (abbr.)
29 Greek (abbr.)
30 23 across' state (abbr.)
31 VOA's IS—"______ Doodle"
32 Amateur roundtable (abbr.)

Down

1 U.S. propaganda station
2 Morning (abbr.)
3 Belonging to RAI
4 Below shortwave
5 Former clandestine island
6 Tenth month (abbr.)
7 HCJB's continent
9 Sudanese prefix
11 Immediately
16 Return postage requested (abbr.)
18 Telegraphic regret
19 Broadcast outlet (abbr.)
22 Radiotelegraphic code (abbr.)
23 Logging stations can be hard ______
25 Old boy (abbr.)
26 To desire QSL
29 Morse "good night"

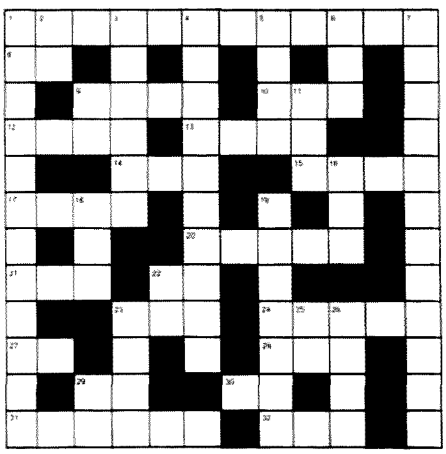


Illustration 1.

ELEMENT 2—MATCHING

While not "shortwave" in a strict technical sense, listening to distant broadcast-band stations is an activity stretching back over 60 years. Here, match the call of the station to its QTH. All stations listed run 50 kW and operate 24 hours a day. All have been licensed since the earliest days of broadcasting.

Column A	Column B
1) KDKA	A) Atlanta GA
2) WOR	B) Nashville TN
3) WWL	C) Portland OR
4) KGO	D) Denver CO
5) KSL	E) Spokane WA
6) KNX	F) San Francisco CA
7) WBT	G) Des Moines IA
8) WJR	H) Rochester NY
9) WSB	I) Los Angeles CA
10) WGN	J) Pittsburgh PA
11) WLW	K) Ann Arbor MI
12) WSM	L) Philadelphia PA
13) KOB	M) Salt Lake City UT
14) KOA	N) Cincinnati OH
15) KYW	O) Albuquerque NM
16) WHO	P) New Orleans LA
17) WBZ	Q) Boston MA
18) KXL	R) Detroit MI
19) KGA	S) New York NY
20) WHAM	T) Chicago IL
	U) Charlotte NC

ELEMENT 3—SCRAMBLED WORDS

Unscramble these words dealing with shortwave listening:

titieslui	catsodrab	plisrotac	tandlicense
dabn	tisecmod	gropram	letnis
sucim	losegiuri	tarlveni	gaugelan
tenrenvomg	granpopada	renegein	servosae
breactila	nefgoir	arlye	tactis

ELEMENT 4—TRUE-FALSE

	True	False
1) Israel radio has broadcast in the slow-scan television mode.	____	____
2) Radio Moscow regularly broadcasts on 40-meters a show about amateur radio.	____	____
3) Private interests aren't allowed to operate shortwave broadcast stations in the U.S.	____	____
4) Utility stations are owned by public utilities such as power and water companies.	____	____
5) The planet Jupiter can be heard daily on 18, 22, and 27 MHz.	____	____

Continued on page 118

NEW PRODUCTS

The MFJ-494 Keyboard Keyer.

NEW MFJ KEYBOARD

The all-new MFJ Keyboard Keyer, model MFJ-494, is a full-fledged keyboard that sends CW, Baudot, and ASCII, with 50-character text buffer, 30-character programmable message memory, 4 automatic messages, 2 random-code practice modes, speed and buffer metering, back-space delete function, and buffer memory hold function; just plug it in your paddle and it's a full-function keyer.

Simple one- or two-keystroke combinations execute all commands.

The 50-character text buffer can be filled prior to sending (preprogrammed) or it can be filled at any given speed if you type faster than the code is being sent. When the buffer approaches full, the sidetone pitch changes and a red LED comes on to warn you to slow down to prevent buffer overflow.

The 30 characters of programmable memory provide enough memory for contester or DXer when used in conjunction with the 4 automatic messages contained in the keyboard. The 4 automatic messages let you call CQ, CQ TEST, QRZ, and ID without using all of your programmable memory.

Two code-practice modes let you work on your code proficiency. The first mode is pure random code with random-length groups. The second mode is 5-letter groups with 8 separate repeatable lists (with answers) to check your learning progress. Space between letters may be expanded to improve recognition in both modes, and in the second mode you may select alphabet only or alphanumeric plus punctuation.

A meter tells you your sending speed (speed may be set before sending begins), or you may just push a button and the meter tells you how much buffer you have used and how much you have left.

The model 494 will forgive you for making errors while the buffer is in use. To correct an error, simply backspace over the error and resume typing.

A buffer memory-hold function lets you hold the buffer memory or pause without losing the buffer. You can send with paddles while the buffer is being held; this makes possible operating full break-in.

A push-button lets you key your rig continously for tuning and testing, and a 2-keystroke combination gives you continuous dits for tuning and testing that extends the life of your finals.

The keyboard is also a full-function keyer. Just plug in your

Continued on page 122

OSCAR ORBITS

Courtesy of AMSAT

The OSCAR satellites are subject to atmospheric drag, of course, and the present period of intense solar activity has accentuated the problem. During this period, our sun has been expelling huge numbers of charged particles, some of which find their way into the Earth's upper atmosphere, increasing the density (and thus the drag) there. It is through this region that the OSCARs must pass. OSCAR 8, in a lower orbit than OSCAR 7, is the more seriously affected of the two.

If the drag factor is not considered when OSCAR calculations are performed, long-range orbital projections will be in error. For example, by the end of 1979, OSCAR 8 was more than 20 minutes ahead of some published schedules. The nature of orbital mechanics is such that extra drag on a satellite causes it to move into a lower orbit, resulting in a shorter orbital period. Thus, the satellite arrives above a given Earthbound location earlier than predicted.

Using data supplied to us by Dr. Thomas A. Clark W3IWI of AMSAT, the equatorial crossing tables shown here were generated with the aid of a TRS-80™ microcomputer. The tables take into account the effects of atmospheric drag and should be in error by a few seconds at most.

The listed data tells you the time and place that OSCAR 7 and OSCAR 8 cross the equator in an ascending orbit for the first time each day. To calculate successive OSCAR 7 orbits, make a list of the first orbit number and the next twelve orbits for that day. List the time of the first orbit. Each successive orbit is 115 minutes later (two hours less five minutes). The chart gives the longitude of the day's first ascending (northbound) equatorial crossing. Add 29° for each succeeding orbit. When OSCAR is ascending on the other side of the world from you, it will descend over you. To find the equatorial descending longitude, subtract 166° from the ascending longitude. To find the time OSCAR 7 passes the North Pole, add 29 minutes to the time it passes the equator. You should be able to hear OSCAR 7 when it is within 45 degrees of you. The easiest way to determine if OSCAR is above the horizon (and thus within range) at your location is to take a globe and draw a circle with a radius of 2450 miles (4000 kilometers) from your QTH. If OSCAR passes above that circle, you should be able to hear it. If it passes right overhead, you should hear it for about 24 minutes total. OSCAR 7 will pass an imaginary line drawn from San Francisco to Norfolk about 12 minutes after passing the equator. Add about a minute for each 200 miles that you live north of this line. If OSCAR passes 15° east or west of you, add another minute; at 30°, three minutes; at 45°, ten minutes. Mode A: 145.85-.95 MHz uplink, 29.4-29.5 MHz downlink, beacon at 29.502 MHz. Mode B: 432.125-.175 MHz uplink, 145.975-.925 MHz downlink, beacon at 145.972 MHz.

At press time, OSCAR 7 was scheduled to be in Mode A on odd numbered days of the year and in Mode B on even numbered days. Monday is QRP day on OSCAR 7, while Wednesdays are set aside for experiments and are not available for use.

OSCAR 8 calculations are similar to those for OSCAR 7, with some important exceptions. Instead of making 13 orbits each day, OSCAR 8 makes 14 orbits during each 24-hour period. The orbital period of OSCAR 8 is therefore somewhat shorter: 103 minutes.

To calculate successive OSCAR 8 orbits, make a list of the first orbit number (from the OSCAR 8 chart) and the next thirteen orbits for that day. List the time of the first orbit. Each successive orbit is then 103 minutes later. The chart gives the longitude of the day's first ascending equatorial crossing. Add 26° for each succeeding orbit. To find the time OSCAR 8 passes the North Pole, add 26 minutes to the time it crosses the equator. OSCAR 8 will cross the imaginary San Francisco-to-Norfolk line about 11 minutes after crossing the equator. Mode A: 145.85-.95 MHz uplink, 29.4-29.50 MHz downlink, beacon at 29.40 MHz. Mode J: 145.90-146.00 MHz uplink, 435.20-435.10 MHz downlink, beacon on 435.090 MHz.

OSCAR 8 is in Mode A on Mondays and Thursdays, Mode J on Saturdays and Sundays, and both modes simultaneously on Tuesdays and Fridays. As with OSCAR 7, Wednesdays are reserved for experiments.

OSCAR 7 ORBITAL INFORMATION FOR APRIL

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
29169	1	0032:20	85.4
29182	2	0126:35	99.0
29194	3	0025:53	83.9
29207	4	0120:08	97.5
29219	5	0019:26	82.3
29232	6	0113:41	95.9
29244	7	0012:59	80.7
29257	8	0107:14	94.3
29269	9	0006:32	79.2
29282	10	0100:47	92.8
29294	11	0000:05	77.6
29307	12	0054:20	91.2
29320	13	0148:35	104.8
29332	14	0047:53	89.6
29345	15	0142:08	103.2
29357	16	0041:26	88.1
29370	17	0135:41	101.6
29382	18	0034:59	86.5
29395	19	0129:14	100.1
29407	20	0028:32	84.9
29420	21	0122:47	98.5
29432	22	0022:05	83.4
29445	23	0116:20	96.9
29457	24	0015:38	81.8
29470	25	0109:53	95.4
29482	26	0009:11	80.2
29495	27	0103:26	93.8
29507	28	0002:44	78.7
29520	29	0056:59	92.2
29533	30	0151:14	105.8

OSCAR 8 ORBITAL INFORMATION FOR APRIL

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
15658	1	0122:17	78.8
15672	2	0127:03	80.0
15686	3	0131:50	81.2
15700	4	0136:36	82.4
15714	5	0141:22	83.7
15727	6	0002:57	59.1
15741	7	0007:43	60.3
15755	8	0012:29	61.5
15769	9	0017:15	62.7
15783	10	0022:01	63.9
15797	11	0026:48	65.1
15811	12	0031:34	66.3
15825	13	0036:20	67.5
15839	14	0041:06	68.7
15853	15	0045:52	69.9
15867	16	0050:38	71.2
15881	17	0055:24	72.4
15895	18	0100:10	73.6
15909	19	0104:56	74.8
15923	20	0109:42	76.0
15937	21	0114:28	77.2
15951	22	0119:14	78.4
15965	23	0124:00	79.6
15979	24	0128:46	80.8
15993	25	0133:32	82.0
16007	26	0138:18	83.2
16021	27	0143:03	84.4
16034	28	0004:37	59.9
16048	29	0009:23	61.1
16062	30	0014:09	62.3

OSCAR 7 ORBITAL INFORMATION FOR MAY

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
29545	1	0050:32	90.7
29558	2	0144:47	104.3
29570	3	0044:05	89.1
29583	4	0138:19	102.7
29595	5	0037:38	87.5
29608	6	0131:52	101.1
29620	7	0031:11	86.0
29633	8	0125:25	99.6
29645	9	0024:44	84.4
29658	10	0118:58	98.0
29670	11	0018:17	82.8
29683	12	0112:31	96.4
29695	13	0011:50	81.3
29708	14	0106:04	94.9
29720	15	0005:23	79.7
29733	16	0059:37	93.3
29746	17	0153:52	106.9
29758	18	0053:10	91.7
29771	19	0147:25	105.3
29783	20	0046:43	90.2
29796	21	0140:58	103.7
29808	22	0040:16	88.6
29821	23	0134:31	102.2
29833	24	0033:49	87.0
29846	25	0128:04	100.6
29858	26	0027:22	85.4
29871	27	0121:36	99.0
29883	28	0020:55	83.9
29896	29	0115:09	97.5
29908	30	0014:27	82.3
29921	31	0108:42	95.9

OSCAR 8 ORBITAL INFORMATION FOR MAY

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
16076	1	0018:55	63.5
16090	2	0023:41	64.7
16104	3	0028:26	65.9
16118	4	0033:12	67.1
16132	5	0037:58	68.3
16146	6	0042:43	69.5
16160	7	0047:29	70.7
16174	8	0052:15	71.9
16188	9	0057:00	73.1
16202	10	0101:46	74.3
16216	11	0106:31	75.5
16230	12	0111:17	76.7
16244	13	0116:02	77.9
16258	14	0120:48	79.2
16272	15	0125:33	80.4
16286	16	0130:19	81.6
16300	17	0135:04	82.8
16314	18	0139:50	84.0
16327	19	0001:23	59.4
16341	20	0006:09	60.6
16355	21	0010:54	61.8
16369	22	0015:39	63.0
16383	23	0020:25	64.2
16397	24	0025:10	65.4
16411	25	0029:55	66.6
16425	26	0034:41	67.8
16439	27	0039:26	69.0
16453	28	0044:11	70.2
16467	29	0048:56	71.4
16481	30	0053:41	72.6
16495	31	0058:27	73.8

AWARDS

from page 12

be a mobile station yourself, giving out contacts in all the counties of any one state. As you can see, there are 50 state awards for each category listed above. A potential of 150 individual awards if you mastered them all! Whew! You may work any band or mode.

As with the other awards, do not send QSL cards! Have your contacts verified by at least two amateurs and forward this list and a $1.00 award fee to Ray Teeter N2RT, RD 2, Canaan Heights, Locke NY 13092.

73 AWARDS PROGRAM

WORK THE WORLD AWARD

72 K2AIO	74 9V1UK
73 N7AKO	75 VK2VUO

NORTH AMERICAN CONTINENT AWARD

109 K2AIO	112 VK2VUQ
110 N7AKQ	113 WD8KXT
111 9V1UK	

SOUTH AMERICAN CONTINENT AWARD

98 K2AIO	101 WB2FFY
99 N7AKQ	102 VK2VUO
100 9V1UK	

EUROPEAN CONTINENT AWARD

125 K2AIO	128 VK2VUQ
126 N7AKO	129 N3BCZ
127 9V1UK	130 WD8KXT

OCEANIC CONTINENT AWARD

81 K2AIO	83 9V1UK
82 N7AKQ	84 VK2VUQ

AFRICAN CONTINENT AWARD

84 K2AIO	87 9V1UK
85 N7AKQ	88 VK2VUQ
86 WD4LYA	

ASIAN CONTINENT AWARD

79 K2AIO	82 VK2VUQ
80 N7AKO	83 WB2FFY
81 9V1UK	

73 DX COUNTRY CLUB AWARD
2 x SSB

51 9V1UK	53 VK2VUQ
52 OE1UHB	

DX CAPITALS OF THE WORLD

10 OE1UHB	11 WB9UIA

10 METER DX DECADE AWARD

1 WB4WRE/M	5 DA2AL
2 AC3Q	8 WB4TZA
3 W5TJO	7 WD5JRG
4 WD0AVQ	8 WA4ZLZ

WORKED ALL USA AWARD
MIXED BAND

31 W1AGA	37 K7DBV
32 KA2CLQ	38 KA4JOS
33 KA4BNQ	39 WD8IDD
34 W4DDP	40 KA2GZE
35 AH8AX	41 KA6IYE
38 DF8ZP	

WORKED ALL USA AWARD
75/80 METERS

1 KA0AZQ	4 KS4B
2 WD0BOS	5 WB9UKS
3 KA5AOP	6 KB5FN

DISTRICT ENDURANCE AWARD

1 AJ8L (50 min.)	3 WB8CDM/7 (12 min.)
2 WL7ACY (55 min.)	4 WA3PMI/7 (38 min.)

O5 AWARD OF EXCELLENCE

32 KA7GKO	38 KA3CBC
33 KA2GMJ	39 KA7HPP
34 KA8FXC	40 WD4PLF
35 VE7DZR	41 KA1FKX
36 KA8GIX (7 MHz)	42 WD9IWC
37 KA8GIX (21 MHz)	43 KA6IYE

Full details of the *73* Awards Program can be found in the August and September, 1980, issues of this magazine. Why not become part of the fastest growing awards program around!

BONANZA AWARD

The Bonanza award is probably the most demanding of all the awards being offered by Ray.

To qualify, applicants must work the same mobile in the various counties of a single state. There are three categories in which to apply. Class A—working the same mobile in all counties of a single state; Class B—working the same mobile in ⅔ of the counties within a single state; and Class C—working the same mobile in at least ⅓ of the counties of a single state.

Both the applicant and the mobile contact will get awards for their efforts. To apply, prepare your list of contact dates and times, band and mode of operation, county and state of operation, and last and most important, the mobile contacted in each case.

Have your list of contacts verified by at least two amateurs or a local radio club secretary. Send a $1.00 award fee and your application to: Ray Teeter N2RT, RD 2, Canaan Heights, Locke NY 13092.

UNION COUNTY AWARD

Here is an historical award being offered by Ray which requires the applicant to work Union counties of the United States.

Offered in three award categories, applicants must, for Class A, work 18 Union counties of the USA; for Class B, work 12 Union countries; and for Class C, work at least 6 Union counties of the USA.

Send your list of verified contacts along with a $1.00 award fee to Ray Teeter N2RT, RD 2, Canaan Heights, Locke NY 13092.

ARMSTRONG PIONEER AWARD

The Major Armstrong Memorial Amateur Radio Club has instituted the Armstrong Pioneer Award, an honor to be bestowed annually on the amateur who has, in the opinion of the voting members, done outstanding service for an amateur community.

Any amateur operator or group of amateurs may nominate a ham whom they feel meets the criteria listed below. Nominations opened November, 1979, and will be accepted for as long as the award program exists. Members of the Major Armstrong Memorial ARC will review each year's nominations every spring, determining by vote the amateur who, in the spirit of Major Edwin H. Armstrong, inventor of Frequency Modulation, has contributed the most to amateur radio through pioneering efforts.

The following criteria should be observed when considering an amateur for nomination: (1) the nominee should be a licensed amateur or group of amateurs; (2) the nominee should have made a significant contribution to ham radio by experimentation and development in new or little-used bands or modes (examples: development of equipment for SSTV, OSCAR, RTTY, EME; revival of neglected modes like facsimile; technical developments that help populate little-used bands, etc.); or (3) the nominee should have made a significant contribution to ham radio by promoting the use of such bands or modes (examples: efforts to keep 10 meters during sunspot minima via nets, clubs, beacons, etc.; efforts to increase activity on 1296 MHz and microwave bands; efforts to keep AM or other obsolete modes alive via nets, contests, etc.; efforts to promote the concept of amateur radio in countries where it is not permitted, etc.).

The examples are only that; the committee hopes the ham fraternity will respond with news of any kind of amateur radio pioneering.

Talk about this award nomination at your next club meeting. Send your statement about the nominee you select to: Major Armstrong Memorial Amateur Radio Club, Inc., PO Box 1234, Englewood Cliffs NJ 07632.

THE REVEREND JOHN FLYNN MEMORIAL AWARD

This award has been instigated by the Alice Springs Community College Radio Club of Australia. It was founded in memory of Reverend John Flynn, who pioneered the Australian Inland Mission, the Royal Flying Doc-

Continued on page 120

LOOKING WEST

Bill Pasternak WA6ITF
c/o The Westlink Radio Network
Suite 718
7046 Hollywood Blvd.
Hollywood CA 90028

THE SIX-METER READER REACTION DEPARTMENT:

Though it's taken some time, we are now really getting input and ideas concerning amateur radio's repopulation of the six-meter band. One of the most interesting letters received came from Lew Collins W1GXT, and it reads:

I read your September, 1980, column, Looking West, with much interest since I have been working on the development of a six-meter bandplan for a number of years. In addition, I have been a user of the band during all those years, and thus feel I am qualified to offer some insights into the six-meter problem that are not available to a passive observer such as you. I am hopeful that the comments that I am offering, which may on the surface sound a bit negative, will be received by you in the constructive spirit in which they are intended.

In my opinion, *three* factors led to the demise of six meters as you remember it: 1) The growth of two-meter FM/repeater operation, 2) The ever-present TVI problem on six, and 3) The decrease in solar activity. Probably item 1), as correctly observed in your article, was the major factor. I claim that the bulk of six-meter activity was of the low-power, rag-chewing local nature that you remember, with a little DX sprinkled in for excitement. The six-meter station with a pair of 4-400s and six-over-six yagis was the exception, rather than the rule.

TVI has always been a serious problem for the six-meter operator, particularly in those areas with channel 2 (Boston, New York, Los Angeles, etc.). The consumer electronic equipment of the 70s not only exists in unprecedented quantity, but the interference rejection properties in general are poorer as manufacturers strive to remain competitive. Many six-meter operators who went QRT because of TVI discovered they could have as good or better local communication without the TVI hassles by getting on the local two-meter repeater. Unknown to you, the diehards with the big rigs and big antennas sat quietly by waiting for the DX openings of 1979-80. Just read a few issues of K5ZMS's newsletter if you don't believe me!

I must take exception with your statement that none of the existing input-output spacings is workable. (Otherwise, why would so many different standards flourish?) I could list numerous counter examples to your claim, but perhaps the most striking is the repeater located on the WCAU-TV tower in Philadelphia which uses 120-kHz input-output separation! This repeater has wide-area coverage and hundreds of users.

The basic parameter in designing a duplex transmission system, such as an amateur repeater, is *not* the number of kilohertz separation between the transmitter and receiver frequencies, but rather the percentage separation. Thus, if we are to adopt 220-MHz standards for use on six meters, the optimum input-output separation is: $1.6/223.5 = 0.0072$, which works out to be 380 kHz at 53 MHz. Interesting enough, North Shore RF Technology, who pioneered the notch-type duplexer for the amateur market, produced a six-meter duplexer for 400-kHz spacing.

The 220-kHz separation used in southern California and the 200-kHz value used in eastern New England were both derived the same way, but starting with the now universal 600-kHz separation used on two meters. $0.600/147.0 = 0.0041$, which gives 216 kHz at 53 MHz.

There is another side to this input-output separation issue which you totally neglected in your article. While it is true that the greater the input-output separation, the easier it is to make a repeater work, that is not necessarily true for the *system* consisting of *one* repeater plus a *number* of mobile users. Specifically, many of the amateurs who operate six-meter FM use high-quality transceivers which were originally manufactured for the land-mobile market by Motorola, General Electric, RCA, etc. These are not the old vacuum-tube boat anchors you remember from your early days of amateur FM, but are frequently solid-state or hybrid designs offering the state-of-the-art in mobile transceiver performance.

In order to produce a quality transceiver, the front-end as well as the transmitter exciter stages are fairly narrowband to minimize spurious output and responses. Consequently, there is a definite upper limit imposed upon a repeater's input-output separation by the user's radio, assuming that the user desires to have the capability of simplex as well as repeater operation. (It is my observation that most six-meter FMers desire to maintain a simplex capability. In fact, one of the major advantages of six over two is that the simplex working range is greater. That is why I originally got on six meters.)

"...I believe you do not take the amateur radio control enthusiasts seriously enough...they will not QSY without a fight. I would like to see you propose a plan based on FCC regulations as *they now exist*...so that it could be put into effect sooner rather than later."

I must also point out that you have made an error in using and interpreting Carson's Rule. Carson's Rule *does not* say that the bandwidth of an FM signal is infinite, although an *exact* mathematical analysis of an FM signal does lead to that conclusion. What Carson's Rule *does* say is that an FM signal does not have *appreciable* sideband energy outside of the band $B = 2f + 2W$. All Carson's Rule says is that an FM signal occupies more bandwidth than does AM; practically speaking, both have finite bandwidth.

The issue of whether the repeater or user transmitter should be closer to TV channel 2 is a bit more complex than you have indicated. Although I happen to agree with your position on this matter, others have argued loud and long for the other way around.

Unfortunately, I believe you do not take the amateur radio control enthusiasts seriously enough, and if you have not heard from them by now, it is merely because they have not read your proposal. In my experience, they view 53.1, 53.2, 53.3, 53.4, and 53.5 MHz as their private domain, and they will not QSY without a fight. Space does not permit going into this complex issue here.

There have been numerous attempts over the past ten years to move the national simplex channel from 52.525 MHz to something else, such as 52.520, with no success. There are hundreds (maybe thousands) of six-meter FMers in the less densely populated areas who operate 52.525 MHz exclusively, and, consequently, there is a great deal of resistance to change. I believe that any realistic bandplan will have to accommodate this long-established frequency, even if it doesn't make sense logically.

Your proposed use of 50.00 to 50.25 MHz is slightly at variance with accepted practice there, and needs slight revision. SMIRK, the Central States VHF Society, and other well-known VHF DX groups should be consulted on this point.

In summary, I am in complete support of your appeal for a national six-meter bandplan. However, I believe your proposal has some major flaws which must be corrected if it is to gain acceptance. Otherwise, we will just progress from having N different six-meter plans to having N + 1 such plans. In addition, I would like to see you propose a plan based on the FCC regulations as *they now exist*, so that it could be put into effect sooner rather than later.

Keep up the good work.

Best regards,
Lewis D. Collins W1GXT

As you can see, Lew spent quite a bit of time in preparing his commentary. There is much with which I agree, and points on which I disagree. The important thing is that he took the time to write. Next month, I'll answer Lew's letter. In the meantime, keep your thinking caps on.

Eric Shalkhauser W9CI
527 Spring Creek Road
Washington IL 61571

The History of Ham Radio
—part XIII

Reprinted from QCC News, a publication of the Chicago Area Chapter of the QCWA.

On the lighter side of amateur radio, during the long winter nights, there evolved within the fraternity a new phase of activity. It had its inception in the many curious, humorous, and indescribable stories under the pen name of

The Old Man

who now, through the lapse of time, has become a hallowed legend. The legend is now permanently memorialized in the Wouff Hong Story.

According to research, the ever-present references to the fabulous wouff hong came about like this: In the days when amateur radio was in swaddling clothes, way back in about 1914, there emerged a personality known as the Old Man.

As reality would have it, this individual was, as all amateurs were and are to this day, afflicted with the sad but ever-present problem of raucous disturbances, be they man-made, nature-made, or even fabricated right within the shack of the beholder. This perpetual problem was known in the days of yore as "Rotten QRM." But to go on with the research.

Plagued in the very early days of wireless communication with such interference, driving sane but determined listeners (wishing to remain that way) to distraction, especially when the headphones were securely clamped over both ears, listening intently for what the Morse dots and dashes were meant to convey, there emerged the following effusive but clear and loud verbiage into print [the Old Man exclaiming]:

"Fellows, [all excited and boiling over] fellows, this QRM business is getting my nanny—here it is midnight—I have smoked myself into a state of funk—the floor is covered with burnt matches—I am losing a perfectly good temper—there is no sign this will not continue all night long . . . How long do the radio bugs sit up at night anyway?—What are we going to do about

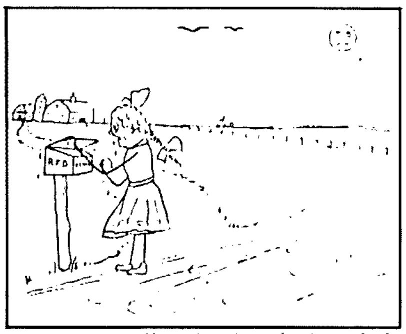
8 QST January, 1917

Rotten QRM

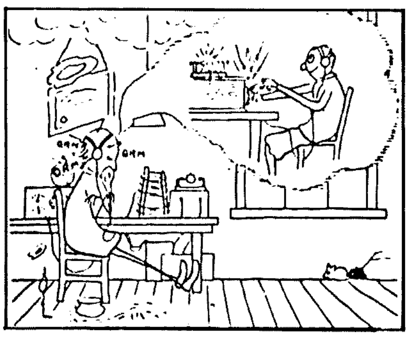
By "The Old Man."

Say, fellows, here's the old man again This time he's all excited and boiling over. In fact he's so wild about some "Rotten" subject that he has fallen back to some queer dialect and shouts about "wouff hong's", "rettysnitches", and some disorder known to the trade as "ugerumf". What do all these mean? Better read the article and see. —Editor.

Smoked himself into a state of funk.



Poor girl in Ill. who hasn't heard from her fellow in 24 hours.



Rubber band—Commercial tone.

this business?—When we heard some commercial station say QRM we had to look it up on the chart to see what it meant. . . Later we began talking to the fellow over on the other side of town, and then was born our amateur QRM.

"But when we have a fellow who has not written to his girl for a full twenty-four hours, and who positively must get the message to her over in Illinois, it becomes a serious matter to have someone else getting gay with the ether, especially when the latter has no conception of the existence of the word 'brevity.' The trouble is, the young squirts don't stop to think. Willy with his sputtering spark coil discharge sends out this hogwash—now listen to this . . .

" 'Yes yes jst wyd glucky wait a mt muddy wouff hong bliftsky monkey motor.' We assume from this message that Glucky is being asked to wait a minute while Bliftsky seeks a wouff hong with which to wallop a monkey the next time the latter faces towards the motor. I do not think I know just exactly what a wouff hong is. Probably some piece of apparatus used in the southern states to beat monkeys with.

"It is this form of uninteresting 'conversation' which clutters up the air with QRM. Of what moment is it to the rest of the world that this fellow Bliftsky is going to smear somebody's monkey with a wouff hong? When anybody relapses into such a mental slop as to want to operate with a thing named a wouff hong, he ought to keep his trouble to himself and not compel all of us respectable amateurs to listen to his drool. To slave and slobber a lot of foolish twaddle like this when that poor girl in Illinois has not had a letter since yesterday is plain wicked.

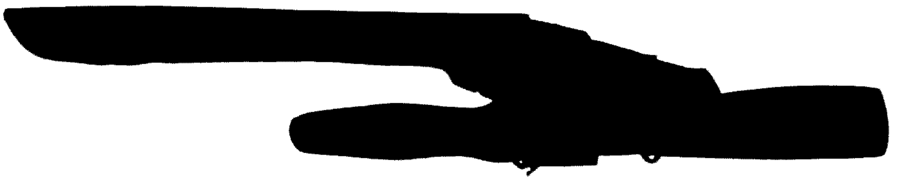
"Or just cast a lingering look at this:

" 'Biirgrmph bru rotary ge ge ugerumf om with my set rettysnitch spitty tone hit in potimus?' Now what do you suppose the poor gink was trying to say when he unreeled that? You have to guess a lot in wireless, and how would you guess this? Something is wrong with this fellow's biirgrmph, his rotary also has a bad case of the ugerumf and somebody around the place must have spit on his rettysnitch, because his tone was so rotten it hit him on his potimus. Sounds bad to me. Why will some people send such personal matter by wireless when the whole country can overhear? It isn't decent, and it makes the QRM more rotten than ever, and just think of the way it makes a perfectly good logbook appear.

"I spent the better part of an hour trying to make out what ailed the poor fellow's biirgrmph, but had to give it up. What we ought to do is to organize an Anti-QRM Association. Then let us elect for Chairman the worst plug-ugly we can find in these U.S.A. Then let us chip in a little money and hire a clerk with a bad disposition who will write letters threatening the life of everybody whom the members report as causing needless QRM. Let us rise, fellow bugs—down with the fellow with the scratchy spark coil—down with the fellow, the unspeakable skunk who calls somebody and sends a long relay message repeating each word three times when the station to which he is sending is sending one thing at a time himself.

"There, by heck, I have that stuff off my back and chest. Now you over there in Illinois, get this call—let everybody stand back from now on—I'm tired and sleepy and cross—and I don't care who I QRM, until I get that pin cleared off. . ."

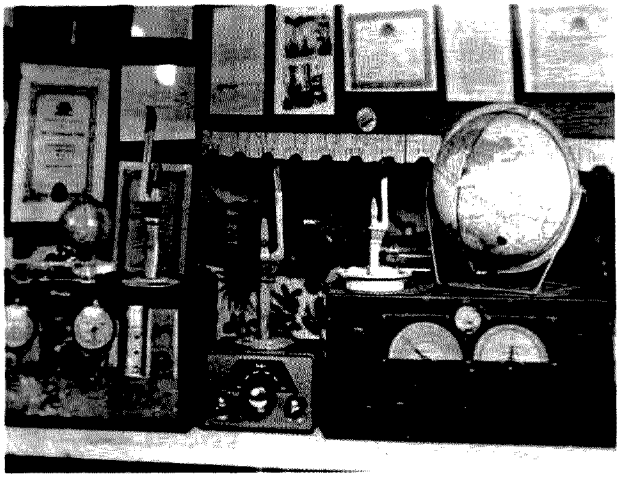
That was the way the Wouff Hong was brought into being, and it will continue to dominate the cold and blustery nights at ham gatherings to perpetuity—Believe it or not!! ■



THE ORIGINAL WOUFF HONG.

THE OLD MAN

WELL! WELL! WELL! LOOK WHO'S HERE. A picture of THE OLD MAN. It came in the mail, just like all his stories.



Three Wouff Hongs decorate a ham shack.

Robert A. Nickels WAØOHO
802 S. Myrtle St.
Kimball NE 69145

Build a Frequency Counter—That TALKS!

—state-of-the-art for blind hams

The availability of low-cost speech synthesizer technology has opened many doors for the sightless amateur. The introduction of a "talking calculator" several years ago was the first and most affordable example of synthesized speech instruments which are useful to the visually-handicapped amateur.

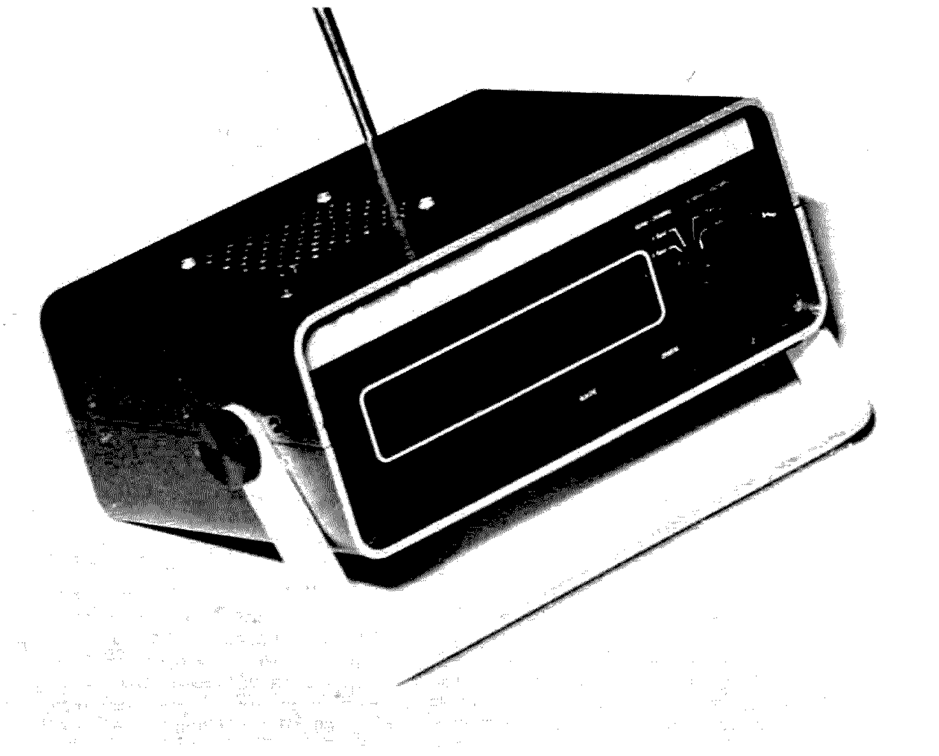


Photo A. There is little evidence that this DSI Model C-700 frequency counter has a voice of its own. The push-button in the left-hand corner of the cabinet top triggers an 8-digit readout. Volume and audio-visual controls are on rear panel.

Through the courtesy of the manufacturer, Telesensory Systems, Inc., of Palo Alto, California, the heart (or, more appropriately, the voicebox) of the Speech Plus Calculator recently has been made available at a reasonable price. Since that time, several efforts have been made to interface this module to available amateur equipment. Most have been relatively complicated, requiring from 10 to 30 or more IC packages.

Thanks to the forethought of the designers, a simple and very easy to duplicate interface is possible, eliminating a major barrier to more widespread use of synthesized speech in digital equipment. The model C-700 frequency counter, manufactured by DSI Instruments of San Diego, California, is based upon the LSI Computer Systems LS 7031 counter IC, which is ideal for this application. Other test equipment may be connected to the synthesizer module in a similar manner. The only

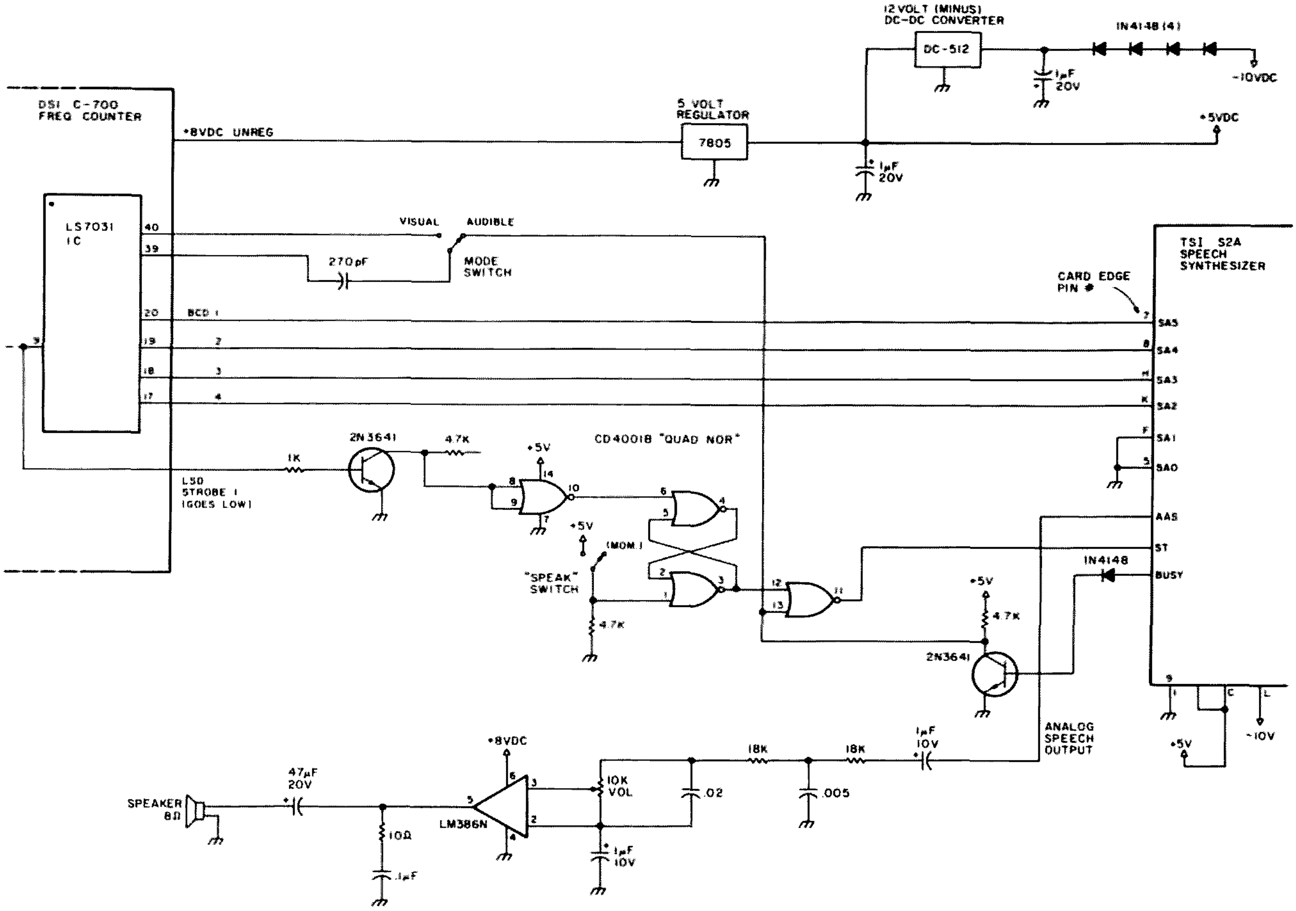


Fig. 1. Talking Counter schematic.

requirement is access to the display multiplexer clock circuit, as will be explained later.

The Telesensory Systems (TSI) model S2A synthesizer module was selected for the Talking Counter. This module provides all ten numerals, plus a few common math and calculator-type words in its 24-word vocabulary (see Table 1). Larger, 64-word models are available, but their higher cost and added features weren't necessary for this application.

The TSI module is easily interfaced to TTL levels using a negative bias voltage which can be easily obtained by use of a small and inexpensive dc/dc converter in systems where a source of minus voltage is not available. In a year of playing with the synthesizer module, it has proven to be quite rugged and resistant to handling and breadboard accidents. So, perish the thought of ruining a $95 board!

TSI provides application notes which offer suggestions on appropriate filtering to eliminate excessive noise and hiss from the digitized audio signal. Since a non-standard audio amplifier was used in the prototype, some changes were made. The filter shown on the schematic is recommended by TSI for the common LM386 audio amplifier IC. Some conditioning is required to make the "Busy" line TTL compatible, but all inputs can be driven directly by TTL or CMOS circuitry.

To make speech, the appropriate BCD code is set up on the S2A input and the Start line is pulsed. Speech will begin on the negative edge of the strobe signal. Also, once speech has begun, the S2A will signal this by means of the Busy line. This pin will go active when the module is "talking," returning to the off state when finished. By simple gating, it is easy to make the speech board say complete words, without "stuttering" or interrupting itself.

In order to make a typical digital display "speak," it will be necessary to start at the left-hand side and step across the display from left to right, "saying" each digit along the way. Some designs choose to latch every digit or to try to get in sync while the display is operating. Neither approach is easy, and neither is necessary, because of what started out as a shortcut for the chip designer.

With a limited number of pins on an IC, it is impractical to dedicate an individual set of digit and segment pins to each digit in a multidigit display. So, nearly every display designer relies on multiplexed displays, where four common BCD data lines are shared by all digits. Then, each individual digit is turned-on or "strobed" when its data is valid. Since the digit strobes occur pretty often (usually every millisecond or so), persistence of vision makes it appear that each display is lit up all the time. The multiplexing clock runs fast, to avoid flicker, but isn't critical.

It is so non-critical that the chip designer often relies on a simple RC time delay to make the oscillator

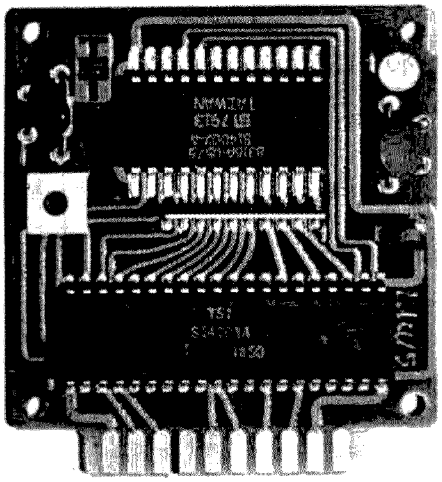


Photo B. The S2A speech synthesizer board from Telesensory Systems, Inc. The large IC is the CRC micro-controller. The entire 24-word vocabulary is contained in the smaller 16K ROM. All connections are by way of the double-sided card edge connector (10 pins per side).

work. But, recognizing potential need for a specific multiplex rate, the designers at LSI allowed provision for user control of the multiplex rate on the LSI 7031 counter IC. By removing the capacitor normally used for the on-board clock, it is possible to control the scan oscillator in the chip.

A Scan Reset pin is provided, which advances the scan counter in the IC to the left-hand digit. This pin could be used to reset the scan counter, but it wasn't found to be necessary. However, by applying a pulse to pin 39, the scan input, the counter IC would step across the display, left to right, just as was desired!

The actual interface is very simple, consisting of just one 40-cent CMOS gate package in addition to power supply and audio amplifier parts (see Fig. 1). The speech readout is initiated by pressing the Speak switch, which sets an R-S flip-flop and allows the strobe line to go true. There will be a short pulse when the Busy line signals the end of the word, and this acts as a clock pulse to move the scan counter in the counter IC on to the next digit.

The process continues until the last digit is spoken, when the positive edge from the eighth counter digit serves to reset the flip-flop and terminate the speech. The only connections required to the counter are the four BCD data lines, the addition of a switch to the scan input to select visual or audible display, and a wire to the eighth digit strobe. Because of the ease of interfacing this circuit, it should be easily duplicated, and

TSI Model S2A Synthesizer Vocabulary List

Data Code (Octal)	Word
000	Oh
001	One
002	Two
003	Three
004	Four
005	Five
006	Six
007	Seven
010	Eight
011	Nine
012	Times-Minus
013	Equals
014	Percent
015	Not used
016	Low
017	Over
020	Root
021	Em
022	Times
023	Point
024	Overflow
025	Minus
026	Plus
027	Clear
030	Swap

Table 1. The "voice" of the S2A is that of Dr. Forrest Mozer, inventor of the speech-generation algorithm used by the LSI controller. The speech synthesizer is a static-sensitive device and normal MOS handling precautions should be observed.

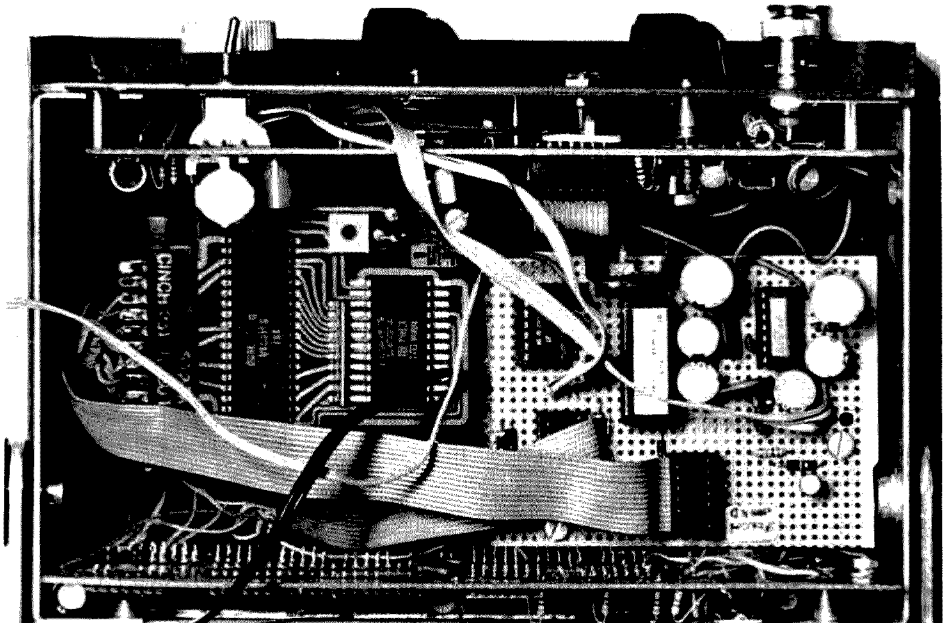


Photo C. Inside the counter. The speech board is visible on the left and the power supply and amplifier-interface circuit board are on the right. Note DIP-plug connections to counter mainframe. Large module at right is dc/dc converter that generates −10 volts for synthesizer. Speaker is mounted to top cover.

possibly adaptable to other equipment.

A glance at the databook reveals that several popular A/D chips commonly used in digital multimeters and some clock ICs provide similar access to the multiplex scan clock. In fact, just about any device with a multiplexed display would be a good candidate for an artificial voice implant!

Construction is non-critical, and inside the metal DSI case, no problems with rf have been encountered. Removal of the lead-acid battery pack provided plenty of space for the TSI module and the interface/amplifier board. Connections are merely tack-soldered to the counter PC board, with plug-in DIP cables to the added board. Power can easily be robbed from the counter, with a 7805 regulator and the dc/dc converter used to power the synthesizer. Minus 10 volts is needed, but since a minus 12-volt converter was available, a few diodes were used to drop the voltage a bit. Some experimentation may be needed to fine tune the audio filtering for a specific amplifier-speaker configuration. Use of a good-sized speaker helps intelligibility, as does tweaking the clock pot on the S2A board.

Further enhancements could include leading-zero suppression and automatic "point" insertion for locating the decimal. But the added complexity and circuitry required may offset any possible advantage. After a few minutes use, one becomes quite adept at reading frequencies, and frills aren't missed while enjoying the "Cylon-like" sound of the counter!

One idea worth exploring, though, is to separate the "talker" by itself, making it easier to use one synthesizer on several instruments. But in a few years, advances in speech technology will decrease costs enough that one won't mind having a dedicated voicebox in every instrument. In fact, applications for artificial-speech devices are by no means limited to aids for the handicapped.

It is quite handy to check frequency without crawling underneath a dash-mounted radio, or to be able to get a frequency report right from the repeater's mouth. At least one repeater uses the TSI modules for ID and telemetry, and more applications for this versatile and affordable module just await the experimenter's imagination!

A Talking Counter is a valuable tool for the blind ham or technician. The marriage of the DSI counter and the TSI synthesizer is a natural and, hopefully, will open the door for more useful and inexpensive applications of modern artificial speech synthesis techniques. ■

References

1. Model S2A speech synthesizer is available from Telesensory Systems, Inc., 3408 Hillview Ave., PO Box 10099, Palo Alto CA 94304.

2. Information on the LS 7031 counter IC is available from LSI Computer Systems, Inc., 1235 Walt Whitman Rd., Melville NY 11746.

3. The DC-512 dc/dc converter is available for $9.95 each from The Megavision Corporation, PO Box 122, Columbus NE 68601.

✓ Reader Service—see page 82

Peter Carr WB3BQO
329 Little Avenue
Ridgway PA 15853

In the Stack

—R/Cers, don't be grounded by control channel congestion! Put your ship on six!

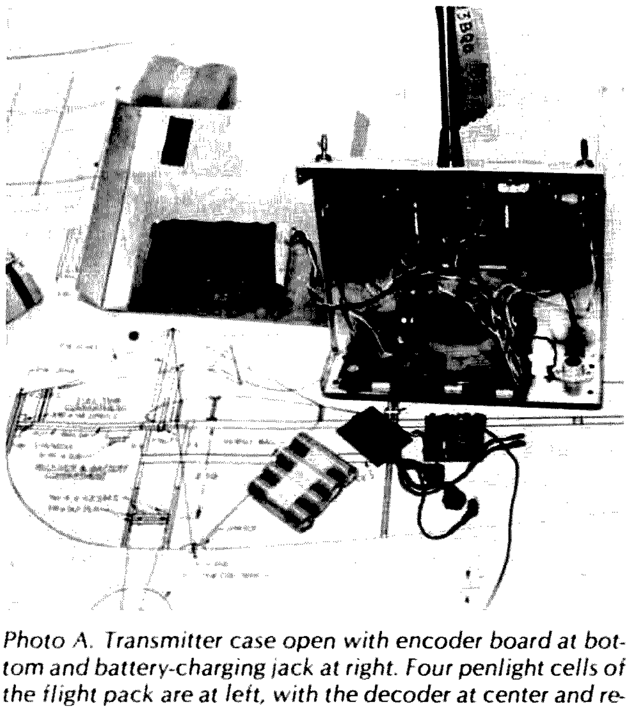


Photo A. Transmitter case open with encoder board at bottom and battery-charging jack at right. Four penlight cells of the flight pack are at left, with the decoder at center and receiver at right. Eight-cell transmitter pack at upper left is held to the rear panel of the case with silicone rubber. Switches at the top of the transmitter case are sixth- and seventh-channel controls. They are for dropping bombs or parachutes, operating retractable landing gear, or anything that does not need to be proportionally controlled.

The model airplane contest is under way. Over a hundred pilots and their planes are gathered in the open meadow. At the pilots' briefing, your radio control frequency is announced as being the most crowded. This means that instead of selecting the time to fly when conditions are best, you must wait to be called to the flight line to fly. Only one R/C rig can be in operation at one time, or the resulting interference will cause the model to crash.

With ten or more pilots on the same frequency as you, the rotation of the roster means a long wait between flights, and being hurried when your name is called. The additional pressure of being on a crowded frequency on top of the usual "first flight nerves" is unsettling and will not help your scores. There ought to be a better way!

For hams, there is a better way. While there are only seven channels for R/C operation in the 72-MHz band for non-hams, there are five channels from 50.100 to 50.500 MHz in the six-meter band. While these are not exclusively for R/C operation, the ARRL and most ham groups throughout the world have agreed to reserve them for radio-control purposes. At a typical contest, there may be four or five hams flying, so the crowding on any particular frequency will be very light. Now, instead of having to wait to be called up to fly, you can pick the best time and choose the right conditions, not being bound by the frequency roster.

While there are several factory-built radios on the six-meter band, most hams prefer to put together a kit. The best known of these is from Heathkit®, and this brand is always well represented at the flying field.

Ace R/C, Inc., of Higginsville, Missouri, and Royal Electronics of Denver, Colorado, also make radio kits for the six-meter band. While all three firms offer some flexibility in the choice of styles in components, Ace seemed to have the widest variety of gear at lower prices than the others.

Since most R/C rigs operate on the same basic principle, the choice of gear comes down to the specific use to which the rig will be put. For small three-foot-wingspan models flown in small spaces such as school yards, the smallest and lightest rig is best. For quarter-scale monsters weighing twenty-five pounds and spanning nine or ten feet, the size and weight of the rig don't mean a thing. It takes very powerful servos powered by large capacity batteries to move the ailerons or elevator on these biggies.

The radio in the photos is the seven-channel kit from Ace R/C, with the transmitter housed in a Royal Electronics case. In operation, the rig controls the plane like this: The pilot's thumbs rest on the two control sticks on the transmitter. Each stick moves both forward and back as well as from side to side. The right stick controls the ailerons (left/right) and the elevator (forward/back). The left stick controls the rudder (left/right) and the motor speed (forward/back). The remaining controls are operated from switches and levers on the front and top of the case—bomb-drop, landing-gear retract, and wing flaps.

Each stick moves a potentiometer which varies the width of a digital pulse that becomes part of a pulse train. The pulse train has a clock pulse and seven data pulses, one for each control. The transmit carrier is turned on and off by the pulse width (A1 emission) set by the pulse train. In the aircraft, demodulated pulses come from the receiver, which is of standard superhet design, to the decoder board. Here, the clock pulse enables the circuitry to route the first pulse after the clock to the elevator, the next pulse to the ailerons, and so on, until all seven data pulses are distributed to the proper servos.

A servo is an electronically-controlled electric motor. It moves an arm that is mechanically connected to whatever control on the plane you wish to control. When the data pulse enters the servo, it is compared to an on-board pulse-generator output which is controlled by a pot, physically positioned by the servo output arm. The on-board pulse is determined by where the arm is currently, while the data pulse from the ground indicates where the pilot wants the arm to be positioned. A difference between these two pulses produces an error, which causes the servo motor to rotate in the proper direction to move the arm/pot combination to reduce the error. At zero error, the motor stops and the servo idles, waiting for a new position indication to be sent up from the ground via the pulse train. While the transmission method is digital pulse, the net effect on the plane is smooth control, since the pulse-recurrence frequency is high enough to preclude stepping of the controls.

In actual use, all this highbrow theory is not important to the pilot and his plane. As the pilot thinks "let's do an axial right roll," his thumb moves the transmitter's right stick to the right, and as the plane half-rolls to inverted, he pushes the stick forward for down elevator, holding the nose up as the second half of the

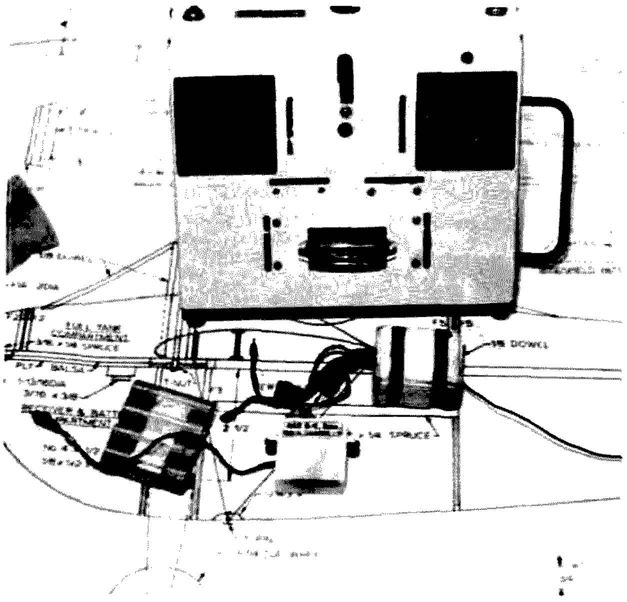


Photo B. The system buttoned up and ready to install in the aircraft. A 6PDT switch (not shown) turns the airborne unit on and off. The receiver/decoder case is covered with thin foam rubber for protection. The servo at lower center is one of four in the basic system.

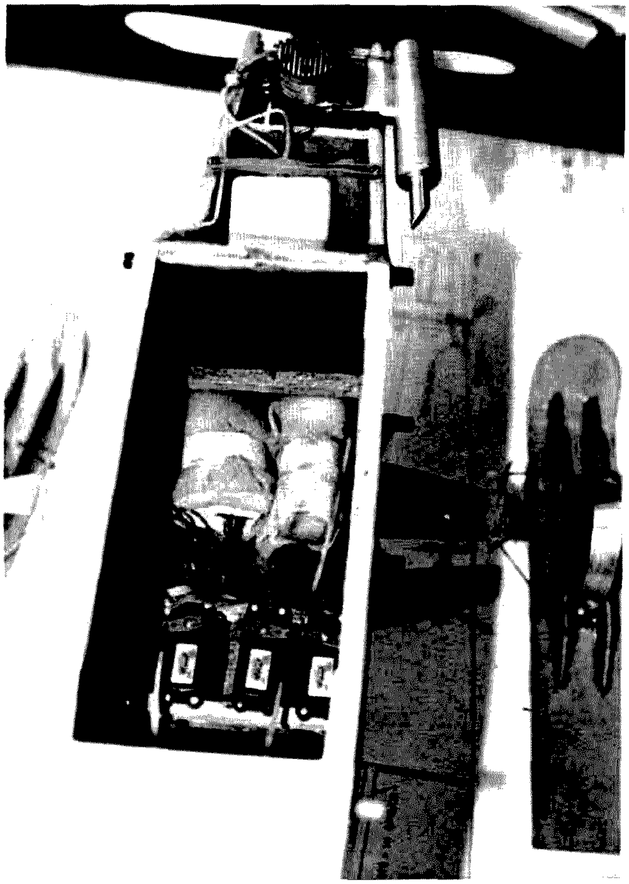


Photo C. The radio room of a typical powered aircraft. Receiver/decoder and battery are both wrapped in one-inch foam to dampen vibration from the engine. The three servos control rudder, elevator, and motor speed.

roll is completed. The system allows the pilot to make the plane behave realistically, as if under the guidance of a miniature pilot. It allows the pilot to fly famous historical aircraft in the same way that the full-size aircraft were operated, and to try new designs with no personal risk.

The instructions for building the kit are laid out in the same fashion that Heathkit uses. Each step is checked off, with nothing left to chance. The many illustrations make parts placement easy. While the whole system is complex, the sequence of assembly and attention to the smallest detail make it one of the easiest kits to build.

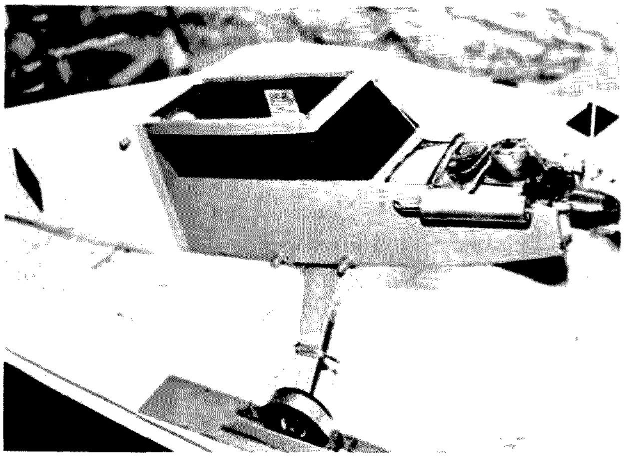


Photo D. The aircraft minus its wing. Power is a .40-cubic-inch engine with 10-inch diameter propeller. The fuel tank (just behind the engine) carries 13 ounces of model engine fuel. The skis are required for operation in that "flakey sunshine" so common to winter in the northeast.

Unlike most amateur gear, this radio operates in a very hostile environment. In powered planes, the engine is a single-cylinder unit and not very well balanced. This 20,000-rpm massage will loosen a poor solder joint in short order. Any metal-to-metal contact produces static noise which can jam the incoming data stream to the receiver. If severe enough, the noise will effectively lengthen the pulses, making the servos all run to one extreme, which could result in a spiral dive into the ground.

Nicad batteries in the transmitter and airborne system have their own requirements of care and feeding and dislike vibration as much as the circuitry does. By using heat-shrink tubing over connector/wire junctions, taping batteries together solidly, and wrapping the receiver and battery pack in foam rubber, the effects of vibration will be greatly lessened.

Ongoing maintenance is the only way to keep the radio from having trouble. To help with this, a monitoring system was built into the transmitter to check on vital voltages. At the top right corner of the transmitter case, a small LED is mounted in a grommet. The LED will not light on less than 8.9 volts and is wired across the string of eight AA cells, which are 9.6 volts at full charge. When the LED goes out, very little time remains for the pilot to land the plane, or gravity will do it for him.

The transmitter encoder uses about 6.0 volts from the battery. A bad cell would not put out the LED, but may tear up the pulse train at the encoder board. For this reason, the meter at the lower center of the transmitter case monitors encoder current and is much easier to see than the LED in full daylight.

Tests of the airborne battery are made using a Heathkit expanded-scale voltmeter, Model GD-1188. It costs about $17.00 and reads the battery under simulated load. Using a mating plug, the meter is connected to the battery through the charging jack at the on-off switch. This tests the cells, all the wiring, and the switch itself, so items most likely to cause trouble are tested as a unit. This is the last check made before the plane is closed up for the day's flying.

The model airplane version of Murphy's Law states that your radio will become inoperative only on the day before the big contest. With a factory-built rig, the only option is to return the radio for service and miss the fun. With kits, all the prints and schematics are on hand, and by knowing how the radio went together originally, the chances of beating Murphy and fixing the problem are very good.

No matter what type of plane your rig ends up controlling—be it a highly-detailed scale fighter or a simple glider—there is no feeling quite like the one you get from flying a plane and radio that you built yourself. And come contest day, when it's time to hand in your transmitter at the impound desk, it will feel great to be able to say to the official that your rig is the custom job on six meters. ■

R/C Kit Manufacturers

Ace R/C, Inc.
Box 511E
Higginsville MO 64037

Royal Electronics, Inc.
3535 South Irving St.
Englewood CO 80110

Heath Co.
Benton Harbor MI 49022

Janice Shillington N9YL
49 Jacobsen Avenue
Glendale Heights IL 60137

All the News that Fits

—make your club newspaper a winner!

Wouldn't it be neat if . . .! It would be a great idea to have our own . . .! What great editorials I could write . . .!

Have you had these ideas in your mind lately, only to be stymied by the logistics involved? Do you have newsprint in your veins? Were you captivated, as a child, by the miniature print set you received from Santa Claus? (I never did get the knack of setting the type correctly with my super duper mini-print shop.) Have you mentioned the idea of having your own newspaper at a club meeting only to open the floodgates to who, what, where, why, and, more to the point, how?

Let's investigate the possibilities.

Why have a club newspaper? Amateur radio is communication. Most news is spread via the radio on club nets. So why have a newspaper? The same argument could be applied to television news. Most of us watch the up-to-the-minute local and international news on our favorite TV channel, but many of us also grope in the early dawn to fish out the newspaper from the bushes to read what we heard about the night before. Newpapers give substance to the news. We can learn more when we read (and reread). When the facts are clearly stated in black and white, then we learn at leisure.

We read newspapers to find out what's happening, to catch up on what we missed, and to learn more details about the events we're interested in—to be in the know.

Club newspapers do all this and more. More, because it's a local paper giving tidbits of information about people we know and things we ourselves are involved with. The club newspaper is a uniting factor, keeping everyone up to date and making members more active. Even inactive members feel more a part of the club when they read their club newspaper.

Although club activities are important to club members, most things are not national news to be printed in *QST* or other amateur journals. So, members have a chance to see their name in print, to be congratulated in upgrading or to be congratulated (or consoled) on their recent marriage, or birth of a new baby or grandchild, or anniversary—things that are important to us as people. (Much to the amazement of many, hams are people, too!) The club newspaper unites members on a social basis.

A ham is more likely to communicate about his latest antenna than to mention on the air that he is a newlywed or that the new baby is keeping him up nights. Getting to know one another on a social basis as well as on the air is a good way of keeping a club active and growing. We feel more like friends than just radio comrades.

Club newspapers are more than just club newspapers. That's right, club newspapers are publicity or public relations for amateur radio. The best public relations are not necessarily the biggest, flashiest commercials with catchy tunes behind them. The best public relations is everyday personal contact.

Ask a doctor or dentist what his best source of advertising is. He will probably tell you he doesn't advertise, that his patients are referred from other patients (word of mouth). Even with regard to a movie or a show or a restaurant, we tend to value our friends' opinions and recommendations. Their personal comments will sway us. If Tom said the restaurant had terrific food, Dick might try it. If he doesn't like the food, he'll think Tom has terrible taste.

But he tries it; he looks into it because his friend suggested it. With hundreds of thousands of amateurs around, amateur radio has its best publicity potential in its own people. This tells us all to be amateur radio conscious. Mention it in conversations; wear "I Am a Ham" T-shirts. T-shirt slogans are the rage. Everyone wears them. How about "Ride the Radio Waves with Amateur Radio"? Think of something creative and wear it! Wear your handheld radio on your belt. (Don't forget the ham radio belt buckle.) When people ask you if you're a police-

man, say, "No. This is amateur radio." Pull out a copy of your club newsletter and hand it to them.

You see, your club newsletter makes amateur radio a more tangible thing. People can look at it, read it, and perhaps become curious about "these crazy people." (I have wondered in the past if it is a requirement that a person be crazy to become a ham.) One way or another, the whole world is crazy, so we're all susceptible to the magic of amateur radio. All amateur radio needs is exposure.

Take extra copies of your newsletter with you in your car and pass them around. Leave them in your employee cafeteria for others to see. Give beginning amateur radio books and kits for Christmas presents. Start a ham station where you work. In amateur radio publicity, it's the little things that count. If everyone does a little, amateur radio will have a lot.

In our investigation of "why" an amateur radio club newsletter, we have delved into the "what." A club newspaper can be anything from a one-page edition to a twelve-page paper (or more).

Where does the money come from? Most clubs are their own publishers and take the funds from the club treasury. Usually, the treasury is supplied from club dues, hamfests that were held, or even raffle money. It is evident that in most clubs the treasury is not an unlimited source of supply.

Cost is a relevant factor in the type of newspaper your club will have—the kind of paper, printing, number of pages, etc. One big expense is postage. Check to see if your club qualifies for nonprofit bulk mailing privileges with the post office. However, going first class does have its advantages. The main advantage is that the member receives the newspaper within a respectable amount of time. I have received bulk mail as much as two weeks after the proposed event even though the senders felt they mailed it early.

Most club newspapers that I have seen use one 15-cent stamp and sometimes have double issues with 28 cents in stamps. If standard 8½" × 11" paper with a sub weight of 20 is used, one stamp will cover six sheets (12 pages) if no envelope is used. Just fold over the newsletter and address the bottom half of the last page and staple. Or five sheets (10 pages) can be sent in a standard size envelope with one stamp. (Warning: The post office is always changing its rates and rules, so keep abreast of the latest with your local post office.)

A club newsletter, first of all, contains club news: the date, time, and place of the next meeting and a description of the program for the meeting. Lists of activities such as foxhunting, Field Day, radio calibrating day, club picnic, a Christmas party, or anything that the club is currently involved in, can be put into the club paper.

Next, include congratulations to the members on upgrading and any personal notes that you can dig up during the month. Then, depending on the amount of space left, you can fill in with amateur-related articles such as: comments on amateur radio news at large, regulations, FCC changes, antennas, etc. Anything and everything that the editor and members can think of can be put in the club newsletter, except politics. The club newspaper is a written account of club activities and members' interests.

Who? is always the 64-thousand-dollar question. Be assured, if you bring up the idea, you will be the first one considered for the job of editor. Experience is useful in any case, but not a real consideration. The real consideration is the willingness to do the job. Some clubs just make it the responsibility of one of the officers, such as a vice-president, for a one-year term. Somehow it's not so bad to know that you only have to do 11 issues. (You get one issue off for summer vacation.)

No matter who is the editor or responsible person for the newsletter, he/she will need the cooperation of the whole club. There is nothing more frustrating for an editor than to be at deadline and not have the necessary information. An editor is not an investigative reporter who has to sift through all the scuttlebutt and info to find the true facts. An editor reports the news as given to him.

Where does all this news come from? *The members!* If someone is a little too modest to report an upgrade such as passing the Extra exam when all he was trying for was his Novice license, then one of his friends should report it. It is up to the members to keep the newsletter interesting. Too many members think, "Oh, they'll hear about it." Or, "That's not important enough." *Anything* concerning the members is of interest in a club newspaper.

It is the responsibility of the editor to correlate all of the various items and to lay out the material on the pages. The editor cannot manufacture news. Since this is a volunteer, non-paying, do-it-in-your-free-time-when-you-could-be-DXing job, the editor does not have the time to search out stories. The more people who contribute to the newsletter, the more of a club newspaper it is, instead of just a one-man show.

One thing I have found: Don't just ask in general for people to contribute information or articles. An editor must impose upon his friends. "I heard about your new antenna, Bill. Would you please write something up on it? Anything at all, Bill, that you want to tell us about your new antenna." You must ask directly on a specific topic. The more people you ask, the better your chances are of getting any copy back in return. Many members are surprised that you are even interested in their projects and are happy to comply with your request. (Maybe not happy, but they grit their teeth and do it.)

An editor's job is to plan. After relevant club news, any other articles or info of interest to amateur radio in general can be included, depending upon the amount of space available. This is why it's so important to have a specific deadline. When the deadline comes, the editor gathers all the information submitted to him during the past month and figures out how much space different articles need and what looks good where.

Don't despair. It's not really hard and the more you do it, the easier it becomes. But let me repeat—there is nothing more frustrating for an editor than to be at deadline and not to have the information needed. A joy of an editor's life is having too much material! Then he can plan what will go into the next issue and be that much ahead of the game.

It's just too easy to let the other guy do it. If a newspaper is to be successful, the members must cooperate. The beauty of it is that the members really don't have to do very much. Each gives a little and the news comes flowing in. Letters to the editor are always interesting. Members can send in their public service reports such as calling in traffic accidents and other related public service info. The local ARES EC can submit material to the editor about

ARES activites or even just give pep talks via the newsletter. But the vehicle of the newsletter must be used or it will die or atrophy. If the members don't care enough to send in the material, after a while the editor will feel that he is wasting his time.

The form in which the material for the newsletter is sent depends upon the individual club. The varying factors are many. Some editors (or a club typist) type up the entire newsletter and send it to the printer. Others give out specifications on, for example, margins and ask that the individuals hand in the material already typed. The editor then pastes up the various articles, using rubber cement. Many editors are just happy to receive the material and ask only that the handwriting be legible!

Keep in mind credit lines. It's wrong just to copy someone else's work word for word and pass it on as your own. If it's copyrighted, then write to the party involved to get permission to reprint. This is very simple to do and most people are glad to give a nonprofit organization cooperation. If your source is another newsletter, just be sure to give a credit line to the author of the article and the newsletter in which you found it. The Golden Rule is certainly applicable in this situation.

One great source of extra information (filler) is the National Aeronautics and Space Administration's publication, *Tech Briefs*. This is a collection of the various research and development projects carried on by NASA. *Tech Briefs* applies space technology to Earth problems. It's an impressive publication, sent out quarterly. There is usually something of interest to hams in the publication. When I wrote for permission to reprint, the reply, from Louis Mogavero, Director, Technology Utilization Office, was:

"NASA *Tech Briefs*, once published, are considered to be in the public domain. They may be reprinted by anyone, without permission from NASA."

If you're interested in receiving a copy, just write to: Director, Technology Utilization Office, PO Box 8757, Baltimore/Washington International Airport MD 21240.

Another good source that gives permission for reprinting is *HR Report*. *HR Report* is an up-to-the-minute newsletter published weekly, reporting happenings in amateur radio across the country. It makes great filler copy. All they ask is that a proper credit line be given. If you're interested in receiving it, write: *HR Report*, Greenville NH 03048.

Worldradio News is an amateur newspaper published monthly concerning radio news in the world. They say, "*Worldradio* is an international conversation. You are invited to take part. Our newspaper is written by its readers.

"Our goal is to be a valuable resource of ideas and experiences beneficial to the amateur radio community. We publicize and support the efforts of those who bring the flame of vitality into this avocation."

Editors of club newspapers may exchange their newsletter for a copy of *Worldradio News*. They also automatically grant permission to reprint. If you're interested, write: Worldradio, Inc., 2120 28th Street, Sacramento CA 95818.

Another interesting untapped source of information is your own collection of amateur radio contacts. Along with my QSL cards to foreign lands, I enclose a note with a copy of the newsletter, asking for stories about amateur radio in their countries or just information on themselves. Everything considered, I've gotten terrific response. I always send them a copy of the newsletter with their story, written in their own words, with their byline. This is a good way for amateurs to create international goodwill. Not only that, it's educational for us to learn about how others in the world operate and live. Communication between people is the only hope for world peace.

How to get your paper printed is a goodie as far as problems go. The best thing is to find a ham who is also a printer, and use your power of persuasion to have him print up the newsletter. If you have the president of a large company like Xerox® in your club, persuade him to volunteer, and you're in like Flynn!

Lee Knirko W9MOL is editor of *QCC News*, the publication of the Chicago Area Chapter of the Quarter Century Wireless Association; also, he was president of the Amateur Radio News Service. Lee suggests:

"There are generally three ways to produce a paper. Offset press, photo process (Xerox or other electrostatic copier), and duplicator. Each has its advantages and disadvantages, including the cost per page. Generally, though, clubs usually use what is available. Particularly when it is free or cheap! Finding a ham printer using offset is the best of all worlds because of the flexibility and low cost per page, particularly if a fairly large quantity is printed, say over 200-300 copies. If fewer than, say, 25 copies are distributed, offset is expensive and one of the other methods is more favorable."

Xerox is a popular process used with club newspapers. Lee says:

"Many, but not all, tricks available to offset reproduction can be done with Xerox. You can reduce (8-1/2" × 11 from 11" × 14" is the most favorable), print two sides, and automatically collate. The quality is not as good as offset, particularly for photos (screening helps), large black areas, or material previously Xeroxed. We now pay about $75 an issue for 250 copies including photos and other graphics at my local ham printer."

Club finances, of course, influence the number of pages and type of printing done for the newsletter. There is only one way to find out the best method for you and your club: trial and error (which also is known as "Research and Development"). As Lee W9MOL says, "Bear in mind that reproduction quality is *not* the most important element in a club paper. If the *content* is there for *your readers*, they won't care how it's reproduced."

One nice thing about editing a club paper is that you get very few complaints. (I wonder why . . . ?)

Eeks!! What do I say? You simply report the news in your own words. Everyone has his own style of writing. Keep in mind to have the five Ws—who, what, where, why, and when; you won't go too far wrong. Lee W9MOL has more advice:

"Before starting on an issue, you need to make a list of everything you might put into your paper. Then you need to type the material or get someone else to type it for you. You then pick and choose, expand or contract, to fit space needs. The first sentence is the 'grabber' designed to catch the readers' attention so they'll read on. Get some sample newsletters and study them for help in developing your own style."

Also have a standby dictionary. It's amazing how simple words don't "look" right when you know it's going to be printed hundreds of times. See if you can coerce someone to proofread for you. When you're familiar with the content and

writing, it's very hard to find your own mistakes until after it's printed. Then every error sticks out like a sore thumb.

Another help for editors is the Amateur Radio News Service: a volunteer organization dedicated to helping anyone involved with PR work or newspapers. Once a month, ideas are pooled from editors and PR people from all over the country and are printed in the *Bulletin*. They also have a booklet that is sent to new members entitled *The Club Paper*, which goes into detail as to the mechanical aspects of printing. If you're interested, write to Fran Norrick WB9WPS, Secretary, ARNS, Route 6, Box 239, Kankakee IL 60901.

Be an administrative editor. This is your chance to be an executive! As Lee says, "Consider the administrative editor who persuades his or her club's officers and members to submit good material, finds someone who likes to draw cartoons, recruits some volunteer typists, locates a ham printer, organizes a circulation committee, and oversees to see that they have the finest paper for the club."

The more reporters you can assign, the more columnists you can draft, the more fun your newsletter can be for the club members.

If you know of any ham who is into computers, draft him to do the address labels. Appoint a committee to be responsible for collating (putting the pages in order), stapling, addressing, and mailing. Don't forget the stamps!

Make your next club project your club newsletter. Participation is the key to success. Cooperation is the byword.

Do it! Be it! Say it! Amateur radio news—write it today.■

Glenn Jacobs KC7M
Poverty Flat AZ 85925

My Infernal Tower

—tales of a flying fiasco

Up! The higher the better! My Novice antenna was barely high enough to walk under. The next one wasn't much above the roof. Higher! Tie sawmill scraps together with coathangers. Guy them to the fence and the woodshed with baling wire. Get that droopy dipole up there!

Good enough? No. Crooked as a dog's leg, and ugly besides. And with all the effort, it isn't as high as the electric wires to the east. And there is still 200 feet of rock to the west. Signals coming in all the way from Hawaii are not tough enough to penetrate much rock. Maybe there isn't such a thing as "good enough." Maybe "good enough" is just an illusion.

A man came to my store and traded a nice TV antenna and mast for some used duffel bags. Before the sun went down, that hardware was all standing on end. TV reception was better, even if the programs weren't. The FM station from fifty miles over the mountains came in perfectly. We could listen to beautiful music. And I had a taller skyhook. That was the real motive.

W7KJM lent me an inverted vee and an NCX-3. I tied a dead padlock to a length of nylon line and slung it over the TV antenna and hauled up that loaner. Aha! Forty meters is mine!

But even the top of the thing is lower than the highlines. *Nothing* would do but a tower. But towers seem to start at a month's wages. And they have no upper limit. Besides, it seemed sinful to spend anything on a *hobby* as long as I still owed on the homestead mortgage. ("Mort" is Latin for "dead." "Gage" is Latin for "pay-'til-you-are.")

The Final Solution

Anyway, one fine day we made a last back-breaking payment and the mortgage company sent us our title. And a few days after that an ad appeared:

> COLOR TV $75. Waterbed $100. 30' aluminum twoer [sic] $90. Trash-trailer $250. 537-XXXX

Now, a "twoer" thirty feet long might be a boat—but not for $90. Then, again, it might be a tower. It was a long-distance call, but I dialed during daylight.

"Popopopopop. Popopop. Popopopopopo pop," etc. "B-r-r-r-r-r-r-r. B-r-r-r-r-r-r-r," etc.

"Raunchy Realty. Betty speaking. May I help you?"

"You advertised a tower for ninety dollars?"

"Yes, sir. Would you like to look at it?"

"Yes, ma'am. Could you tell me . . .?"

"Yes, sir. We'll have it all cleaned out and the lights on by tomorrow noon."

"Lights?"

"Naturally."

"On a thirty-foot tower?"

"Tower?"

"Yes, ma'am. Tower. Maybe I have a wrong number. Excuse me."

I hung up and dialed again.

"Raunchy Realty. Betty speaking."

"Uh, this is me again. Is somebody in the office selling a tower?"

"Wait. I don't know. Uh, I thought you wanted to rent that garage for ninety dollars. Fred. Ff-rr-ee-dd! Somebody wants a tower."

"Tower? Oh, yeah," I heard in the background, along with a typewriter. "George has one he wants to get rid of. It's that pile of scrap iron in the alley."

It was fifty miles away. We were there very shortly. George was not there but his tower was. It looked so pitiful lying in three pieces by the garbage cans. It didn't look like it would even reach the eaves, much less the high-lines. I picked up a section in each hand. It was not aluminum, but steel. Even so, it didn't weigh much. I had really expected something much, much heavier. On the other hand, the sections seemed stiff enough, braced that way.

Well, this was what I came for. George showed up and I paid him with money I had borrowed on my credit card. We went home, and the thing laid out behind the house for an unconscionably long time.

The most obvious thing to do was to dig a big hole next to the peak of the roof, stand the bottom section in it, and fill the excavation with wet cement. I could bolt on the other sections after the concrete cured and brace it to the house.

No. That was the only direction we could ever hope to build onto our house.

By-n-by, I traded a fairly good swivel chair (that only needed a little welding and only had a small rip in the cushion) for three unequal lengths of nearly straight one-inch pipe with only a little surface rust. They would not fit into the tower legs. After two hours of hard filing, they were still a smidgen too big. I took them to the welder. He told me what it would cost to turn them down on his lathe. Too much. Inspiration struck. I took the pipes to the hardware store. For a buck, the nice man threaded the first four inches on each one. That reduced the diameter a little and they fit into the tower legs just fine.

I dug a hole and calculated the amount of concrete to fill it up. Fifty bucks?! No way!

I bought ten bucks worth of instant-mix concrete and gathered about a ton of rocks. I joined the pipes to the bottom of a tower section and stood it up in the bottom of the hole and plumbed it with a carpenter's level. The carpenter was using some other tool at the time and didn't mind a bit.

By choosing the rocks carefully, there was not a lot of space between them. A layer of rocks and a pour of soupy cement poked down with a stick; another layer of chunks and more liquid stone. The pre-mix and the stones and the hole came out remarkably even. I smoothed it off immediately and again an hour later. At sundown, I carved a date in it and covered it with dirt so it wouldn't dry out before it had a chance to cure. (Contrary to common belief, concrete does not harden by drying out. It actually combines with the water and becomes a different sort of substance.)

There stood my stub of a tower for a long time. It began to look like the situation described in Luke 14:28-30. I climbed up, balancing the second section on end, and tried to fit it on top of the first. Maybe it can be done. Maybe a suicidal maniac will accomplish such a thing, someday. I won't try it again. Ever.

Success By Committee

W7KJM promised me a crew for an antenna-raising party if I would put the whole thing together. So, I got all the bolts, insulators, guy wire, and turnbuckles I thought I needed. I set the guy anchor posts deep in the ground and tamped buckets of rocks around them. I took that lonesome section off its makeshift base and put the whole tower together and attached the guys.

Exactly at the appointed hour, Ed, Ray, Paddy, Bob, Randy, and Dick drove up in a convoy.

One minute later they were all driving away again. The tower was up and guyed. They barely stopped for the sandwiches and Kool-Aid my wife brought out to the "party." They wouldn't accept pay or thanks.

"That's what ham buddies are for, Glenn."

That was quite a while back. I admire the tower every day. (What else is it good for? I don't have an antenna to put on it.) I climb it sometimes for the superb view from the top. I made a brace for the base because those three pipes go eye-high out of the ground before the tower even begins.

Today I bought nine feet of 1¼-inch pipe for a mast. It was a foot too long to go into the tower from the side. No way was I going to carry it up to the top and try to stuff it into the socket from above. At the price I paid, I sure didn't want to saw off a foot of it. Finally, I dug a hole in the ground and shoved the mast into the tower *from below ground*.

It is night. As I write this, my tower and mast rise way above the electric wires. Maybe I will have an antenna soon. There's this guy down in Phoenix with a 20m beam for sale. If he'll just wait until the garage-man finishes putting a new motor in my pickup, I'll borrow some money on my credit card again and go buy it. It's only a five-hundred-mile round trip, and I want to take my children to visit their grandparents, anyway. ■

Apples: Five Bits or Eight

—tired of "Space Invaders"? Then turn your Apple II on to RTTY!

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If you have run out of things to do with your Apple II lately, you might like to try this project. It will get you operating on 5-bit RTTY and, with a little rewiring, 8-bit ASCII also. For 8-bit ASCII, you will have to rewrite the program. The Apple II interface in Fig. 1 is built around the COM 2502 UART. The AY5-1013 is an exact replacement and may be used. The system can be used with any SSB or FM transceiver.

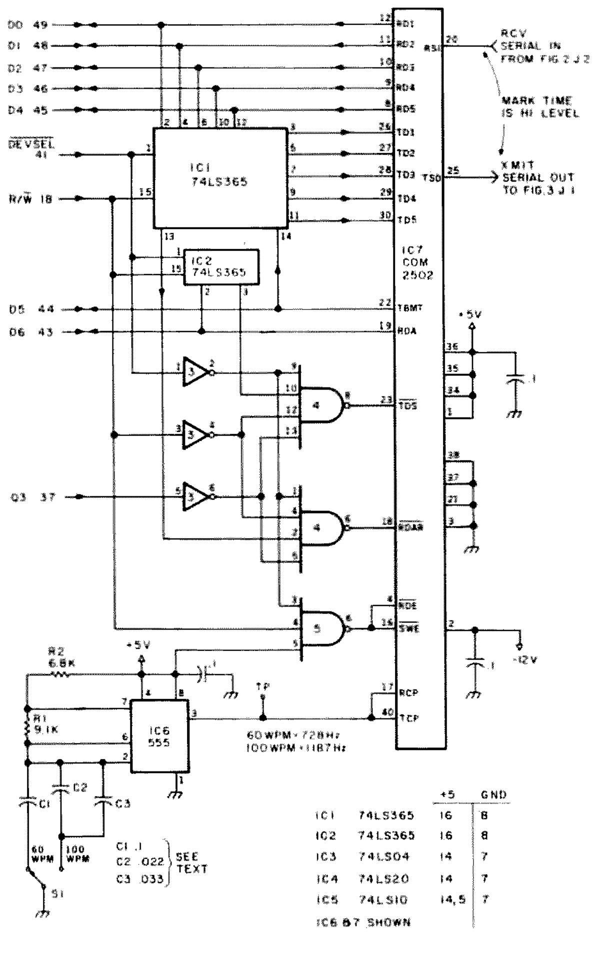

Fig. 1. Apple II interface.

How It Works

See Fig. 1. During receive, the UART accepts serial data at pin 20, RSI. When one complete character has been received, it is available in parallel form at RD1 through RD5. We know this character is ready when RDA goes high. RDA is tied to the Apple's data-bus bit 6 which we test in the program. The character is processed and printed on your TV monitor. Next, the Apple sends $\overline{\text{RDAR}}$ on bit 5, which resets RDA to low so that we can tell when the next character comes in.

During transmit, the UART tells us it is ready to transmit the next character by bringing TBMT high. TBMT is tied to data-bus bit 5. When the Apple detects bit 5 high, it puts the next character to be transmitted on data-bus bits 0 through 4 and sets bit 6 high also. Bit 6 high is $\overline{\text{TDS}}$ and enters the character into the UART at TD1 through TD5. The UART then clocks the character out serially at TSO. One start bit and two stop bits are added by the UART.

Enabling $\overline{\text{RDE}}$ and $\overline{\text{SWE}}$ puts the received data and status bits on the data bus. When not enabled, these outputs are at a high impedance and will not disturb Apple operation. IC6 is the 16× clock generator. Provision is made for either 60- or 100-wpm operation.

Fig. 2 is the demodulator. Receiver audio is fed into J1 from your receiver headphone jack. The speaker is handy for listening to incoming signals. The audio bandpass filter is not necessary but can help with QRM and QRN. Also, the output of the filter can be fed to a scope for use as a tuning indicator of sorts. More on this later. I used an Autek filter. You can use any kind of filter you wish, or none at all. During FSK, when the demodulator senses a 2295-Hz tone, it puts out a high level at J2. When a 2125-Hz

tone comes in, it puts out a low level. In FSK (10 meters and below), 2295 Hz is used as the mark time; 2125 Hz is used as the space. This gives a downward shift of 170 Hz. In AFSK (6 meters and above), the tones are reversed. S1 selects FSK or AFSK and will be labeled during alignment.

Fig. 3 is the modulator. The input at J1 is from the serial output of the UART. For a high input, we get a 2295-Hz tone at J2. A low input gives us 2125 Hz out. The output of the XR210 is made into a sine wave by the low-pass filter so that our transmit signal will not be too wide. The filter cutoff is about 3 kHz. S1 allows you to identify in CW. S2 is wired in at the mike jack the same way as a PTT switch. S3 selects FSK or AFSK.

Construction

The interface is built on an Apple hobby/prototype board, Apple part number A2B0001X. This board is made to plug into the I/O slots at the back of the Apple. S1 is brought out in back of the Apple so that you can get at it. No layout is included with this project because nothing is critical. You should have no trouble if good general construction practice is used. Capacitors C1, C2, and C3 must be of good quality, like mylar™ or polystyrene. It is a good idea to construct the IC6 circuit on an experimental basis first and trim C1, C2, and C3 to get the clock frequency within 1%. A frequency counter is the only good way to do this. At 60 wpm, the frequency at IC6, pin 3, should be 728 Hz plus or minus 7 Hz. At 100 wpm, it will be 1187 Hz plus or minus 10 Hz. This trimming can be done with small value mica or ceramic capacitors. After you have built the circuit on the Apple board, check the clocks again. They may need a little more trimming.

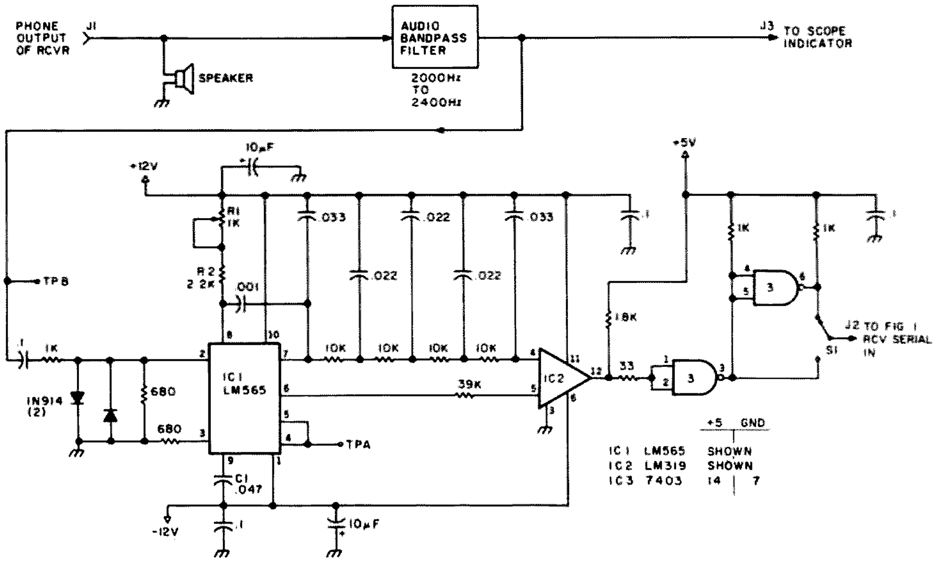

Fig. 2. Demodulator schematic diagram.

My SSB phone-jack output is 8 Ohms, so a speaker at J1 works fine (see Fig. 2). If yours has a higher impedance, you may need a transformer to match to the speaker. The power supply for Figs. 2 and 3 is separate from the Apple. If you wish, you could use power from the Apple for these circuits also. C1 should be a good quality capacitor. S1 is brought out to the front panel.

C1 in the modulator (Fig. 3) should be of good quality. S1, S2, and S3 are brought out to the front panel. The chokes are the common 88-mH variety or equivalent. In all circuits, resistors are quarter- or half-Watt 5%. All capacitors not mentioned may be of any type.

Alignment

First do the modulator. With S1 in normal, hook the scope to J2 and make sure you have an audio sine wave. Adjust R3 for about 1 volt or enough to run your frequency counter. Now hook the frequency counter to J2. Put S3 to FSK and short J1 to ground. Adjust R2 for 2125 Hz. If you can't get 2125 Hz, adjust both R1 and R2 for 2125 Hz. Put S3 to AFSK and adjust R1 for 2295 Hz. These controls are interacting, so go back and forth several times until you have the correct tones. The tones are very stable and will stay within 1% drift easily. Now verify the conditions listed in Table 1.

The output at J2 should be a nice-looking sine wave.

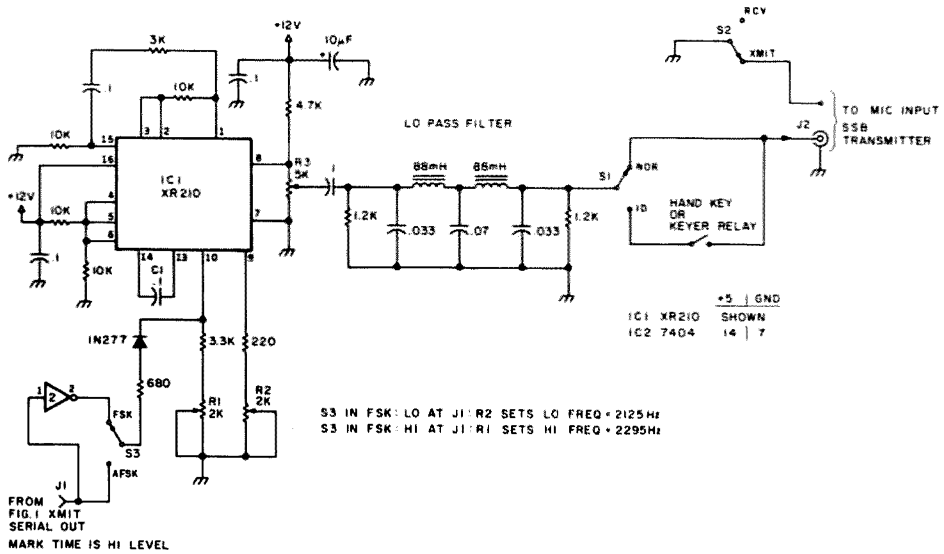

Fig. 3. Modulator. Output in FSK: mark time = 2295 Hz; space = 2125 Hz. Output in AFSK (tones are reversed): mark time = 2125 Hz; space = 2295 Hz.

Program listing.

```
Data Table
Ø8ØØ  AØ  Blank
Ø8Ø1  C5  E
Ø8Ø2  8A  Line Feed
Ø8Ø3  C1  A
Ø8Ø4  AØ  Space
Ø8Ø5  D3  S
Ø8Ø6  C9  I
Ø8Ø7  D5  U
Ø8Ø8  8D  Carriage Return
Ø8Ø9  C4  D
Ø8ØA  D2  R
Ø8ØB  CA  J
Ø8ØC  CE  N
Ø8ØD  C6  F
Ø8ØE  C3  C
Ø8ØF  CB  K
Ø81Ø  D4  T
Ø811  DA  Z
Ø812  CC  L
Ø813  D7  W
Ø814  C8  H
Ø815  D9  Y
Ø816  DØ  P
Ø817  D1  Q
Ø818  CF  O
Ø819  C2  B
Ø81A  C7  G
Ø81B  AA  *
Ø81C  CD  M
Ø81D  D8  X
Ø81E  D6  V
Ø81F  AA  *
Ø82Ø  AØ  Blank
Ø821  B3  3
Ø822  8A  Line Feed
Ø823  AD  -
Ø824  AØ  Space
Ø825  87  Bell
Ø826  B8  8
Ø827  B7  7
Ø828  8D  Carriage Return
Ø829  A4  $
Ø82A  B4  4
Ø82B  A7  '
Ø82C  AC  ,
Ø82D  A1  !
Ø82E  BA  :
Ø82F  A8  (
Ø83Ø  B5  5
Ø831  A2  "
Ø832  A9  )
Ø833  B2  2
Ø834  A3  #
Ø835  B6  6
Ø836  BØ  Ø
Ø837  B1  1
Ø838  B9  9
Ø839  BF  ?
Ø83A  A6  &
Ø83B  AA  *
Ø83C  AE  .
Ø83D  AF  /
Ø83E  BB  ;
Ø83F  AA  *

Ø88Ø  AA  *
Ø881  AA  *
Ø882  AA  *
Ø883  AA  *
Ø884  AA  *
Ø885  AA  *
Ø886  AA  *
Ø887  C5  Bell  (CTRL G)
Ø888  42  Line Feed
Ø889  AA  *
Ø88A  AA  *
Ø88B  AA  *
Ø88C  AA  *
Ø88D  48  Carriage Return
Ø88E  AA  *
Ø88F  AA  *
Ø89Ø  AA  *
Ø891  AA  *
Ø892  AA  *
Ø893  AA  *
Ø894  AA  *
Ø895  AA  *
Ø896  AA  *
Ø897  AA  *
Ø898  AA  *
Ø899  AA  *
Ø89A  AA  *
Ø89B  AA  *
Ø89C  AA  *
Ø89D  AA  *
Ø89E  AA  *
Ø89F  AA  *
Ø8AØ  44  Space
Ø8A1  CD  !
Ø8A2  D1  "
Ø8A3  D4  #
Ø8A4  C9  $
Ø8A5  AA  *
Ø8A6  DA  &
Ø8A7  CB  '
Ø8A8  CF  (
Ø8A9  D2  )
Ø8AA  AA  *
Ø8AB  AA  *
Ø8AC  CC  ,
Ø8AD  C3  -
Ø8AE  DC  .
Ø8AF  DD  /
Ø8BØ  D6  Ø
Ø8B1  D7  1
Ø8B2  D3  2
Ø8B3  C1  3
Ø8B4  CA  4
Ø8B5  DØ  5
Ø8B6  D5  6
Ø8B7  C7  7
Ø8B8  C6  8
Ø8B9  D8  9
Ø8BA  CE  :
Ø8BB  DE  ;
Ø8BC  AA  *
Ø8BD  AA  *
Ø8BE  AA  *
Ø8BF  D9  ?
Ø8CØ  AA  *
Ø8C1  43  A
Ø8C2  59  B
Ø8C3  4E  C
Ø8C4  49  
Ø8C5  41  E
Ø8C6  4D  F
Ø8C7  5A  G
Ø8C8  54  H
Ø8C9  46  I
Ø8CA  4B  J
Ø8CB  4F  K
Ø8CC  52  L
Ø8CD  5C  M
Ø8CE  4C  N
Ø8CF  58  O
Ø8DØ  56  P
Ø8D1  57  Q
Ø8D2  4A  R
Ø8D3  45  S
Ø8D4  5Ø  T
Ø8D5  47  U
Ø8D6  5E  V
Ø8D7  53  W
Ø8D8  5D  X
Ø8D9  55  Y
Ø8DA  51  Z
Ø8DB  AA  *
Ø8DC  AA  *
Ø8DD  AA  *
Ø8DE  AA  *
Ø8DF  AA  *
Ø8EØ  No Data.  This address is
      for Figs/Ltrs flag.
Ø8E1  No data.  This address is
      for character counter.
Ø8E2  92  CTRL R
Ø8E3  94  CTRL T
Ø8E4  83  CTRL C
Ø8E5  81  CTRL A
Ø8E6  82  CTRL B
Ø8E7  88  Line Feed
Ø8E8  DF
Ø8E9  4C D5 Ø9  JMP To RCV
Ø8EC  4C 2C ØA  JMP To send CQ
Ø8EF  3 Addresses.  User define.
Ø8F2  3 Addresses.  User define.
Ø8F5  5F  Letters Tmit
Ø8F6  5B  Figures Tmit
Ø8F7  1F  Letters Rcv
Ø8F8  1B  Figures Rcv

Tmit
Ø9ØØ  A9  F5       LDA  Ltrs to A
Ø9Ø2  20  B4  Ø9   JSR  Send Ltrs
Ø9Ø5  A9  ØØ       LDA
Ø9Ø7  8D  EØ  Ø8   STA  Set flag to Ltrs
Ø9ØA  8D  E1  Ø8   STA  Set character counter to ØØ
Ø9ØD  2C  ØØ  CØ   BIT  Is key down?
Ø91Ø  1Ø  FB       BPL  Loop if not
Ø912  AD  ØØ  CØ   LDA  Get key code
Ø915  2C  1Ø  CØ   BIT  Clear keyboard
Ø918  CD  E2  Ø8   CMP  Is it CTRL R?
Ø91B  FØ  CC       BEQ  Yes so go to Ø8E9
Ø91D  CD  E4  Ø8   CMP  Is it CTRL C?
Ø92Ø  FØ  CA       BEQ  Yes so go to Ø8EC
Ø922  CD  E5  Ø8   CMP  Is it CTRL A?
Ø925  FØ  C8       BEQ  Yes so go to Ø8EF
Ø927  CD  E6  Ø8   CMP  Is it CTRL B?
Ø92A  FØ  C6       BEQ  Yes so go to Ø8F2
Ø92C  CD  E7  Ø8   CMP  Is it a linefeed?
Ø92F  DØ  ØB       BNE  Not a linefeed so go to Ø93C
Ø931  2Ø  B4  Ø9   JSR  Send linefeed
Ø934  A9  8A       LDA
Ø936  2Ø  ED  FD   JSR  Print linefeed
Ø939  4C  ØD  Ø9   JMP  Do again
Ø93C  CD  Ø4  Ø8   CMP  Is it a space?
```

If not, the low-pass filter is not working correctly. Both tones at J2 should be the same amplitude within plus or minus 10%.

Now align the demodulator. With no input at J1, hook the frequency counter to test point A at IC1, pin 4. You should be able to adjust R1 to 2200 Hz. If not, something is wrong with R1, R2, or C1. For the next alignment, we are going to use the modulator. Also, you will need a TTL symmetrical square-wave generator at about 50 Hz. The circuit of Fig. 4 gives you some tips on how to make one. Hook the output of your TTL symmetrical square-wave generator to the modulator, J1. Modulator S3 can be in either position. Modulator S1 should be in normal. Open the circuit at demodulator TP B and connect modulator J2 to the input of IC1 at TP B. Now hook the scope to demodulator J2. You should get a square wave. The crossover points will be jittery. This is normal. Now adjust demodulator R1 for a symmetrical square wave. Exactly half the square wave should be low and the other half should be high. Make sure of the following conditions: Ground modulator J1. With modulator S3 in FSK, you should have a low level at demodulator J2. If not, flip demodulator S1 to the other position. Label this position FSK. Label the opposite position AFSK. Now, with demodulator S1 in FSK, connect +5 V to modulator J1. You should get a high level at demodulator J2.

S3 to FSK	J1 grounded	output is 2125 Hz	space
S3 to FSK	J1 to +5 V	output is 2295 Hz	mark
S3 to AFSK	J1 to +5 V	output is 2125 Hz	mark
S3 to AFSK	J1 grounded	output is 2295 Hz	space

Table 1.

Now let's check out your SSB transceiver. For starters, the output of modulator J2 should be about 50 mV. Set R3 for this value. If this is not enough to drive your transmitter, then increase the level as needed. Connect modulator J2 to the mike input. Put modulator S3 to FSK, S1 to normal, +5 V to J1, transceiver mode to SSB, and mike gain off. Throw modulator S2 to XMIT; advance mike gain.

Caution! Use only enough mike gain to run your transmitter at about 40% to 50% of its rated dc plate input power on CW.

Next, you must make sure your transceiver is in USB so that the frequency shift will be downward. A good way to do this is to check transmitter frequency with your counter or listen to it on another receiver tuned to USB.

Example in FSK and USB

Your vfo equals 3620000 Hz + 2295 Hz = 3622295 Hz. This is the mark time frequency. Now connect modulator J1 to ground. Vfo equals 3620000 Hz + 2125 Hz = 3622125 Hz. This is the space frequency. Your transmitter shifted 170 Hz lower.

```
Ø93F  DØ  19        BNE  Not a space so go to Ø95A
Ø941  2Ø  ED  FD    JSR  Print
Ø944  2Ø  B4  Ø9    JSR  Send
Ø947  EE  E1  Ø8    INC  Add 1 to character counter
Ø94A  A9  43        LDA
Ø94C  CD  E1  Ø8    CMP  Is character counter = to 67?
Ø94F  FØ  Ø3        BEQ  Yes so go to Ø954
Ø951  4C  ØD  Ø9    JMP  Counter not 67 yet so do again
Ø954  2Ø  3A  FF    JSR  Ring bell
Ø957  4C  ØD  Ø9    JMP  Do again
Ø95A  CD  Ø8  Ø8    CMP  Is it carriage return?
Ø95D  DØ  ØB        BNE  Not a carriage return so go to Ø96A
Ø95F  2Ø  ED  FD    JSR  Print carriage return
Ø962  2Ø  B4  Ø9    JSR  Send
Ø965  A9  ØØ        LDA
Ø967  2Ø  ØA  Ø9    JMP  Do again
Ø96A  AA            TAX  A to X
Ø96B  BD  ØØ  Ø8    LDA  Get RTTY character
Ø96E  CD  1B  Ø8    CMP  Is it = to AA?
Ø971  DØ  Ø3        BNE  Not AA so go to Ø976
Ø973  4C  36  Ø9    JMP  It is AA so print
Ø976  2D  E8  Ø8    AND  Is it a letter?
Ø979  3Ø  17        BMI  Not a letter so go to Ø992
Ø97B  2C  EØ  Ø8    BIT  Is flag = to letters?
Ø97E  3Ø  Ø4        BMI  Flag not = to letters so go to Ø984
Ø98Ø  8A            TXA  Flag is = to letters so
Ø981  4C  41  Ø9    JMP  Print and send
Ø984  A9  ØØ        LDA
Ø986  8D  EØ  Ø8    STA  Set flag to letters
Ø989  A9  F5        LDA  Address of letters to A
Ø98B  2Ø  B4  Ø9    JSR  Send
Ø98E  8A            TXA  Get character back
Ø98F  4C  41  Ø9    JMP  Print and send
Ø992  2C  EØ  Ø8    BIT  It is a figure so is flag = to figures?
Ø995  1Ø  Ø4        BPL  Flag not = to figures so go to Ø99B
Ø997  8A            TXA  Flag is = to figures so
Ø998  4C  41  Ø9    JMP  Print and send
Ø99B  A9  8Ø        LDA  It is a figure so
Ø99D  8D  EØ  Ø8    STA  Set flag to figures
Ø9AØ  A9  F6        LDA  Address of figures to A
Ø9A2  2Ø  B4  Ø9    JSR  Send figures
Ø9A5  4C  8E  Ø9    JMP  Send character
```

Send subroutine

```
Ø9B4  A8            TAY  A to Y
Ø9B5  AD  BØ  CØ    LDA  Get UART status
Ø9B8  29  2Ø        AND  Is TBMT up?
Ø9BA  FØ  F9        BEQ  No do again
Ø9BC  B9  ØØ  Ø8    LDA  RTTY character to A
Ø9BF  8D  BØ  CØ    STA  Send
Ø9C2  6Ø            RTS  Do again
```

Rcv

```
Ø9C6  4C  ØØ  Ø9    JMP  Go to Tmit
Ø9C9  4C  2C  ØA    JMP  Go to send CQ
Ø9CC  3 Addresses.  User define.
09CF  3 Addresses.  User define.

Ø9D5  A9  ØØ        LDA
Ø9D7  8D  EØ  Ø8    STA  Set flag to letters
Ø9DA  A9  2Ø        LDA
Ø9DC  8D  BØ  CØ    STA  Reset RDA
Ø9DF  2C  ØØ  CØ    BIT  Is key down?
Ø9E2  1Ø  1A        BPL  If not go to Ø9FE
Ø9E4  AD  ØØ  CØ    LDA  Get key code
Ø9E7  2C  1Ø  CØ    BIT  Clear keyboard
Ø9EA  CD  E3  Ø8    CMP  Is it CTRL T?
Ø9ED  FØ  D7        BEQ  Yes so go to Ø9C6
Ø9EF  CD  E4  Ø8    CMP  Is it CTRL C?
Ø9F2  FØ  D5        BEQ  Yes so go to Ø9C9
Ø9F4  CD  E5  Ø8    CMP  Is it CTRL A?
Ø9F7  FØ  D3        BEQ  Yes so go to Ø9CC
Ø9F9  CD  E6  Ø8    CMP  Is it CTRL B?
Ø9FC  FØ  D1        BEQ  Yes so go to Ø9CF
Ø9FE  AD  BØ  CØ    LDA  Get UART status
ØAØ1  AA            TAX
ØAØ2  29  4Ø        AND  Is RDA up?
ØAØ4  FØ  D9        BEQ  No so go to Ø9DF
ØAØ6  8A            TXA  RDA is up so
ØAØ7  29  1F        AND  Get rid of control bits
ØAØ9  CD  F8  Ø8    CMP  Is it figures?
ØAØC  DØ  Ø8        BNE  It is not figures so go to ØA16
ØAØE  A9  2Ø        LDA  Set flag to figures
ØA1Ø  8D  EØ  Ø8    STA
ØA13  4C  DA  Ø9    JMP  Do again
ØA16  CD  F7  Ø8    CMP  Is it letters?
ØA19  DØ  Ø3        BNE  It is not letters so go to ØA1E
ØA1B  4C  D5  Ø9    JMP  Do again
ØA1E  ØD  EØ  Ø8    ORA  Get the address
ØA21  AA            TAX
ØA22  BD  ØØ  Ø8    LDA  Get the character
ØA25  2Ø  ED  FD    JSR  Print
ØA28  4C  DA  Ø9    JMP  Do again
```

Send CQ

```
ØA2C  A2  4Ø        LDX  Start address
ØA2E  BD  ØØ  ØA    LDA  Get character from table
ØA31  C9  AA        CMP  Is it end of table?
ØA33  FØ  Ø7        BEQ  Yes so go to ØA3C
ØA35  2Ø  B4  Ø9    JSR  Send
ØA38  E8            INX
ØA39  4C  2E  ØA    JMP  Do again
ØA3C  4C  D5  Ø9    JMP  To Rcv
```

CQ character table

```
ØA4Ø  F5  F5  C4  C5  AØ  D7  C2  F6  B6
ØA49  F5  CD  C5  DØ  AØ  AØ  C3  D1  AØ
ØA52  C3  D1  AØ  C3  D1  AØ  C3  D1  AØ
ØA5B  C3  D1  AØ  C3  D1  AØ  C4  C5  AØ
ØA64  D7  C2  F6  B6  F5  CD  C5  DØ  AØ
ØA6D  AØ  C3  D1  AØ  C3  D1  AØ  C3  D1
ØA76  AØ  C3  D1  AØ  C3  D1  AØ  C3  D1
ØA7F  AØ  C4  C5  8D  88  D7  C2  F6  B6
ØA88  F5  CD  C5  DØ  AØ  AØ  C3  D1  AØ
ØA91  C3  D1  AØ  C3  D1  AØ  C3  D1  AØ
ØA9A  C3  D1  AØ  C3  D1  AØ  C4  C5  AØ
ØAA3  D7  C2  F6  B6  F5  CD  C5  DØ  AØ
ØAAC  AØ  D7  C2  F6  B6  F5  CD  C5  DØ
ØAB5  AØ  CB  CB  AA
```

Operation

For the program to work as is, you must put the Apple II interface into slot number 3. Operating in transmit is easy. The return key transmits a carriage return. The left arrow key transmits a line feed. Any characters you type on the Apple keyboard that are not compatible with RTTY will print a * and nothing will be sent. You do not have to worry about letters and figures keys. The Apple automatically sends these.

On a standard RTTY printer, 72 characters may be typed before you must type line feed and carriage return. This is hard to keep track of in your head, so the Apple keeps track of how many characters you have typed after the last carriage return, and when the total is 67, the bell rings to let you know you are near the end of a line.

If you are in transmit, you type CTRL R to get to receive. If you are in receive, you type CTRL T to get to transmit. If you want to call CQ, you type CTRL C. Provision is made for special messages or character handling. CTRL A and B are provided in the program for these. Entering the program at $0900 starts you at transmit.

In receive, tune your receiver until you get good copy on the TV screen. The tones will sound high-pitched when you get good copy; with a little practice you can tune this way, but a tuning indicator is better. If you used a low-pass filter in the demodulator, you can hook a scope to J3 and tune by maximum signal on the scope. This will get you very close. The idea is to tune your receiver until the received-signal mark frequency produces a tone of 2295 Hz from your receiver. Then the space tone will be 2125 Hz, if the other fellow is using a shift of 170 Hz—which is the case about 99% of the time.

If you are going to operate on 6 or 2 meters, put all switches in AFSK. AFSK on FM is easier because there is no tuning to do if you are using a synthesized or crystal rig.

When you are trying to tune in a signal, there may be times when you just can't get good print even if the signal is strong. If this happens, try flipping demodulator S1 to the other position. The other fellow may be transmitting upside down.

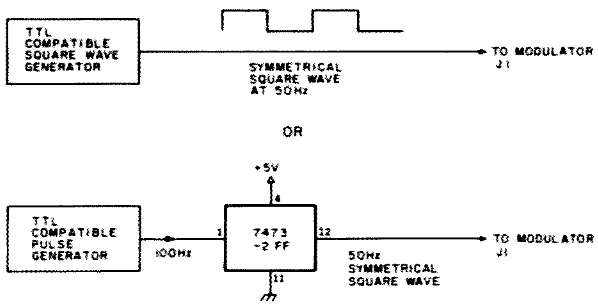

Fig. 4. Square-wave generator.

About the Program

Addresses $0800 through $083F are the characters which will be printed during receive. $0880 through $08F6 are the characters to be transmitted. You can start the program at $0900. In the CQ program data table, starting at $0A40 you use the address of the character you want to send. You get the addresses from the table located at $0880 through $08F6. For example, my call (WB6MEP) is in the program. You must change it to your call. Starting at address 0A40, the following is transmitted during CQ:

0A40	F5	letters
0A41	F5	letters
0A42	C4	D
0A43	C5	E
0A44	A0	Space
0A45	D7	W
0A46	C2	B
0A47	F6	figures
0A48	B6	6
0A49	F5	letters
0A4A	CD	M
0A4B	C5	E
0A4C	D0	P
0A4D	A0	Space
0A4E	A0	Space

Etc.

Only address low is used. The high order (08) is left out.

Any addresses not listed are "don't care," and you may use them for expansion. If you want to use CTRL A or B for special messages or character handling, you must load the starting addresses of your program at $08EF for CTRL A and 08F2 for CTRL B if you are in transmit. The same starting addresses will be at 09CC for CTRL A and 09CF for CTRL B when in receive. ■

References

1. *RTTY Handbook*, Tab Books, No. 597, Edited by Wayne Green.
2. *Specialized Communications Techniques*, ARRL.

Marion D. Kitchens K4GOK
7100 Mercury Ave.
Haymarket VA 22069

Rotator Rescue Mission

—prevents sudden stops

It was not too long after installing the new antenna and the Ham II rotator that it happened: The tribander and two-meter beams were at top rotation speed when my finger slipped off the brake release lever. There was a loud noise that came down the tower, rippled with a chill up and down my backbone, and finally settled in my hip (wallet) pocket. Maybe omitting those torsion bars on the guy wires was a mistake. I had visions of many small broken parts scattered inside the rotator. But the Ham II is pretty well made; it all stayed together without breaking.

Since that day, special care was taken to be sure that the antenna was at a complete stop before releasing the brake lever. Then in the heat of trying to catch that six-meter station in Utah, the wrong lever was released first, again at top rotation speed. Luckily, all stayed together again.

At this point it became obvious that some ham might come along who did not know how to operate this equipment and could cause substantial damage! Protection was needed to prevent release of the brake while the antenna was rotating. If a relay was added that released the brake when either rotate lever was depressed, this same relay could be made to delay release of the brake until the antenna had stopped turning. This approach to the problem was incorporated in a Ham II rotator and is presented here for those who would like to do the same. Note that single-lever (instead of two) operation is achieved with this arrangement.

This addition to the Ham II is a very simple circuit. It uses easy-to-find parts and readily accepts substitutes from your junk box. Normal operation of the rotator is not affected; you can still use the brake and rotate levers as the factory intended. On gusty, windy days, it is convenient to use the manual brake release until the antenna has stopped being blown about. Wait for the direction indicator to show a lull, and then release the brake lever. The brake release time delay can be adjusted to suit your particular antenna installa-

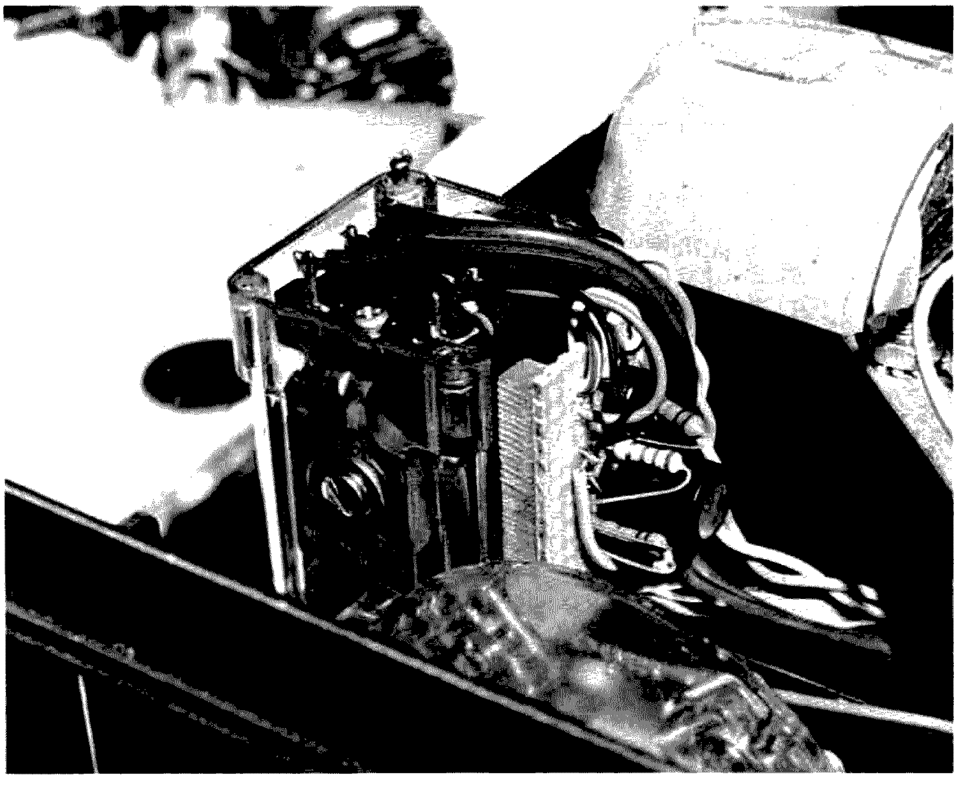

Photo A. Added relay with components on perfboard cemented to case.

tion. A two-color LED can be used to show when the brake is engaged or released, but can be omitted if you want a "no holes" installation. I understand that the Ham III rotator circuit is the same as the Ham II, so this addition should operate that rotator as well.

The Circuit

The circuit uses two microswitches above the rotate-control levers to supply power to the brake-release relay and to a capacitor for the time-delay function. The schematic is shown in Fig. 1. When either of the two microswitches is closed (by depressing a rotation-control lever), power is supplied through the resistor string to the base of the transistor, turning on the relay.

One set of the relay contacts is wired across the existing brake release microswitch. Thus, the brake is released any time a rotation control lever is depressed. Note that closing either one of the two new microswitches also charges the 47-uF capacitor through the 100-Ohm resistor. The resistor limits the charge rate and prevents the direction indicator from changing due to the otherwise sudden heavy current draw

When the microswitch is opened (the rotation control lever is released), the capacitor discharges through the resistor string and base of the transistor, keeping the relay energized until the capacitor discharges. This delay allows the antenna to come to a stop before the brake is re-engaged. The delay time is set by adjusting the 100k pot. A diode across the relay coil suppresses high voltage spikes generated by the relay's inductive kick.

Ac voltage is applied between points A and C. The two diodes across the second set of relay contacts provide positive or negative voltage (depending on the relay position) through the 1k resistor to the two-color LED. The LED is green when the brake is engaged and is red when disengaged. Power for the circuit is taken from the Ham II direction indicator (meter) circuit. Portions of that circuit are shown in Fig. 1 for reference.

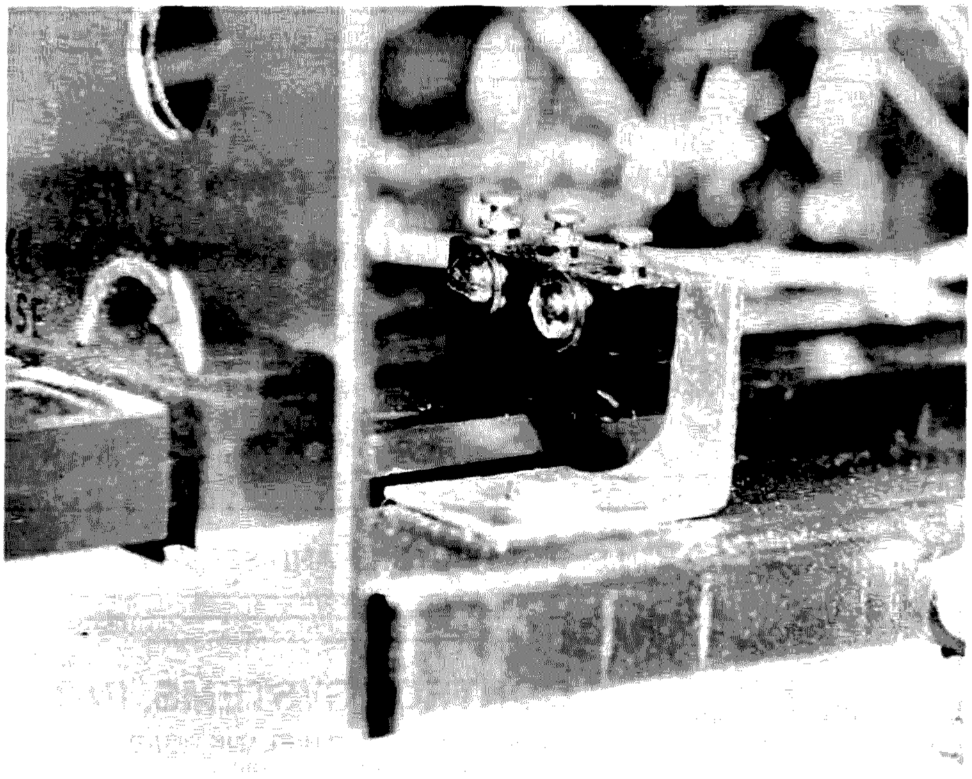

Photo B. Details of microswitch mounting.

Construction

Perfboard is the easiest way to build the circuit because of its simplicity. Point-to-point wiring using component leads is recommended. Fig 2 shows a suggested parts arrangement. The diode for inductive kick suppression is mounted directly on the relay solder lugs. The two diodes and 1k resistor for the two-color LED also are mounted on the relay lugs.

The perfboard should be wired and checked out first; then connect the relay, being sure to observe the correct polarity on the suppressor diode, and substitute a clip lead for the microswitch to test the unit. The relay should close when the clip-lead "switch" is closed and should stay closed for several seconds after the "switch" is opened. The time required for your antenna to stop should be measured and the 100k pot adjusted for that time plus about 1 or 2 seconds more.

My antenna required 2-1/2 seconds to stop after release of the rotation control, so the 100k pot was set to give a 3-1/2- second delay. The 100k pot can be measured and replaced with a fixed resistor as was done on the unit shown in the photos. The perfboard of my unit was then glued to the plastic relay enclosure on 1/8-inch stand-off strips as shown in Photo A.

A standard 1-3/8" × 1-3/8" × 2" plastic-enclosed

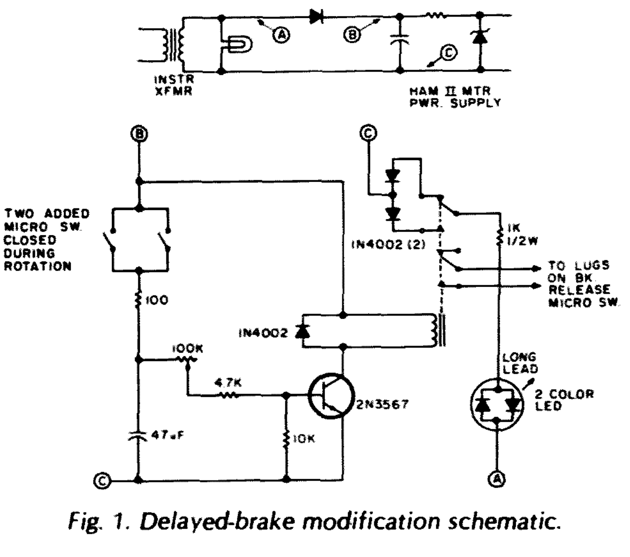

Fig. 1. Delayed-brake modification schematic.

relay will fit underneath the Ham II chassis if desired. Mine was glued to the top of the chassis just behind the meter and next to the large transformer.

The new microswitches should be mounted next. It is easiest if DPDT microswitches are used. They can be mounted above the rotation control levers, otherwise they have to be mounted below the chassis. I found small ones marked E4-111 and mounted them on small brackets as shown in Photo B. Make sure of the clearance around the on-off switch and calibration controls if you mount them on top of the chassis. Check that the new microswitches are operating properly. Add shims between the microswitch and chassis or between the switch and control lever as needed to get proper operation. Check that the original rotation-control microswitches are still operating as they should. This check is easiest to do at lugs 1 and 5 and lugs 2 and 6 of the terminal board with the rotator cable disconnected. The relay contacts should be wired in parallel with the original brake release microswitch: The easiest place to do this is at the microswitch solder lugs. The two-color LED can be installed just above the Brake Release label.

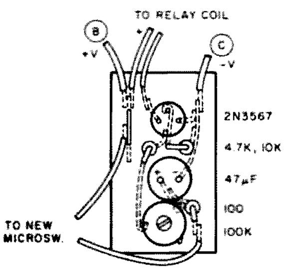

Fig. 2. Typical component arrangement.

The smoke test is next! With the rotator cable disconnected, apply power and check that the relay operates as it should when the control levers are depressed. Check that the time delay is OK and that the LED works correctly. Check that the manual brake release still works OK. Note that the LED does not respond to the manual brake release control. Now connect the rotator cable and you are in business!!

Substitutions

There is nothing critical about the circuit. Resistors of any value near those shown will produce good results. Capacitors in the range of 33 uF to 68 uF should work well. The transistor can be any good-quality NPN type, but it must have a voltage rating of 40 volts or better and reasonably good current gain (i.e., 50 to 100). The relay should be capable of operating on 12 to 20 V dc and its contacts must be able to handle the 110 V ac to the transformer.

My relay was a "hamfest special" marked 20 V dc with a 400-Ohm dc coil resistance. Its contacts looked as though they could handle 5 to 10 Amps; they were about 1/8 inch in diameter. Here is a place to use those relays that do not work very well on 12 V dc.

Diodes should be silicon and have a piv of at least 100 V. The two-color LED can be replaced with two individual ones or a single red one can be used to indicate that the brake is released.

Many thanks to Paul WA2VMS/3 for discussions of ideas about this addition to the Ham II rotator and for describing a similar circuit installed in his Ham III. All of Paul's good ideas were, er,—confiscated (yes, that is the right word!) and used in this article.■

The Racer's Edge

—it was ham communications at Derby days in Akron

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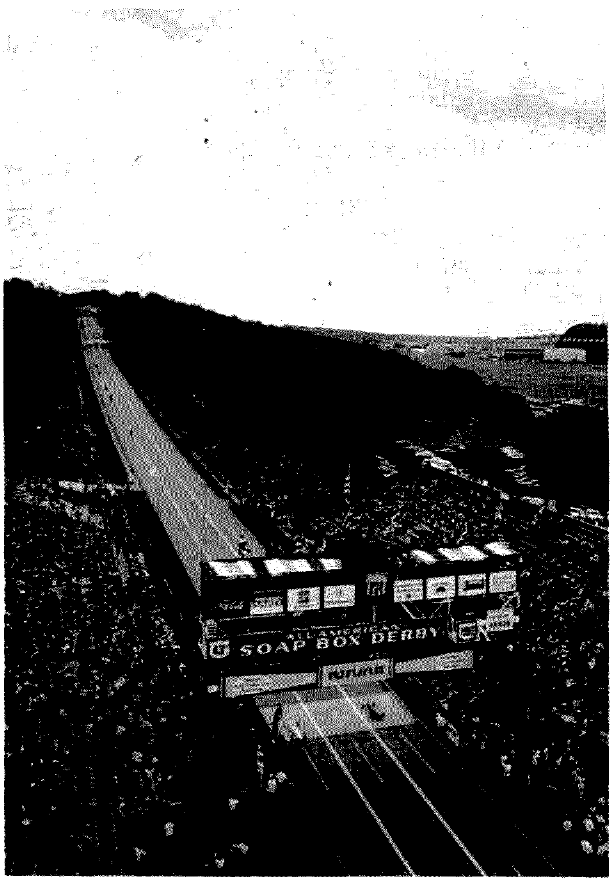
When Dan Purol of Fair Oak, California, crossed the finish line to win the 43rd All-American Soap Box Derby, August 16, in Akron, Ohio, it was doubly appropriate that the checkered flag was waved by Jim Ott.



Derby Downs lies against a natural hill on the eastern edge of Akron Municipal Airport. It has been the scene of the All-American Soap Box Derby for 40 of the event's 43 years.

Given that honor as president of Novar Electronics, the chief sponsor of the All-American Derby, Jim Ott is KB8CT, and he was quick to praise fellow amateur operators who had provided communications for the week-long Derby activities.

"I don't know how we could have run the Derby without the hams. They provided the instant communications which made it possible to deal with any situation quickly," he said.

Wayne Alley, general manager for the All-American Derby, agreed that amateur radio made his job a lot easier.

"We spend 51 weeks preparing for this one week. Without the radio operators, it would be a lot harder. I can be anywhere I'm needed and still have immediate contact with my staff and other officials. That's especially important when I'm traveling between downtown activities and the track."

Alley's "shadow" throughout the week was Gail Wands WB8VNO, who had both 2-meter and 220-MHz handhelds for both simplex and repeater operation. Gail had one of the more active roles since Alley had to handle many questions immediately during Derby week activities and the race.

Assignments for Derby communications were handled by Tim McCleod, operations officer for the Community Amateur Radio Service (CARS) and an Akron school teacher. Communications activity was centered on the CARS .04/.64 repeater which provided excellent coverage throughout the Akron area with the handhelds most operators were using. The club station, WB8DJP, served as net control for Derby activities on the repeater, with routine traffic and rag chewing moving to other repeaters in the Akron area.

Tim's real work began on Monday when the volunteers provided communications for the welcoming of the champs at the Orangerie Plaza in downtown Akron. Since the champs were to assemble at the parking deck of the University of Akron dorms following breakfasts with their families, it was impossible to schedule their arrivals in

WB8YNX assists a parade official during the downtown parade on Friday evening. A second parade was held at Derby Downs immediately preceding the race on Saturday morning.

Workers carefully align each car at the starting line. WD8OCH and his XYL, KA8DRT, provide radio support in the booth in the background.

advance. Eighty-two senior champs had come to the city to try for the college scholarships, totaling $10,000, which went to the top three finishers. The 89 junior division champs were vying for power tools, and the top nine finishers in both classes were to receive trophies. Derby officials wanted to announce the hometown of and to give greetings to each champ on his or her arrival at the plaza. To do this, Tim arranged for operators to be on duty at the pickup point, at strategic corners downtown, and at the plaza to pass on the needed information. Each champ was correctly introduced as he arrived with a police escort.

While Gail WB8VNO was providing communications for the Derby manager, her husband, Ted Wands WD8CVH, was helping with the arrival of the champs. Another husband and wife team, the Musgraves (Scotty K8UCN, and Barb WD8DAI), were working at the pickup point with the champs.

Two other husband and wife teams assisted in the Derby communications effort. Larry Wilson WD8POL and Peggy WD8PZO assisted at "topside," the area where the cars were stored, weighed, inspected, and prepared for their run down the hill. The pair handled the post during the trial run which each contestant had on Wednesday and during the race itself. Carl Hanson WD8OCH and Audrey KA8DRT provided radio contact at the starting line on race day.

These couples were just a few of the amateurs who provided communication between the Derby Hall of Fame in the Convention Center downtown and the track throughout the week as entrants were weighed, took trial runs, and participated in the activities planned for the champs.

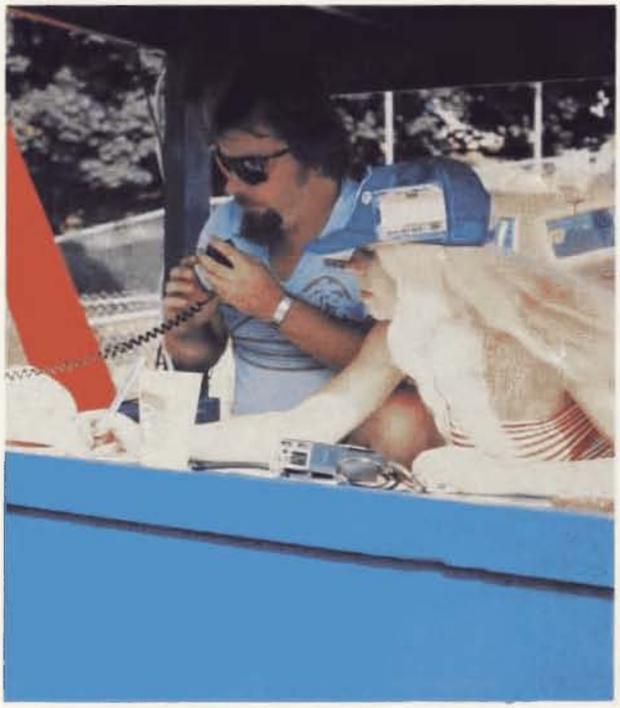
Alley and other officials were particularly impressed with the phone patch capability of the repeater.

"My secretary could find me whenever she needed me no matter where I was, simply by dialing the phone! It made my job easier and saved a lot of time. It helped things run more smoothly," Alley said.

Derby officials were quick to point out the service of Jim McCrory WD8RDW, who was home on vacation from the Ohio State School for the Blind in Columbus. Jim spent most of the week manning 2-meter and 220-MHz rigs in Derby headquarters, located under the grandstands at the track in southeast Akron. Jim, who has his General license, became a ham in 1978; he said he enjoys operating the 2-meter rig he has on loan from the Goodyear Amateur Radio Club and hopes to acquire his own rig when finances permit.

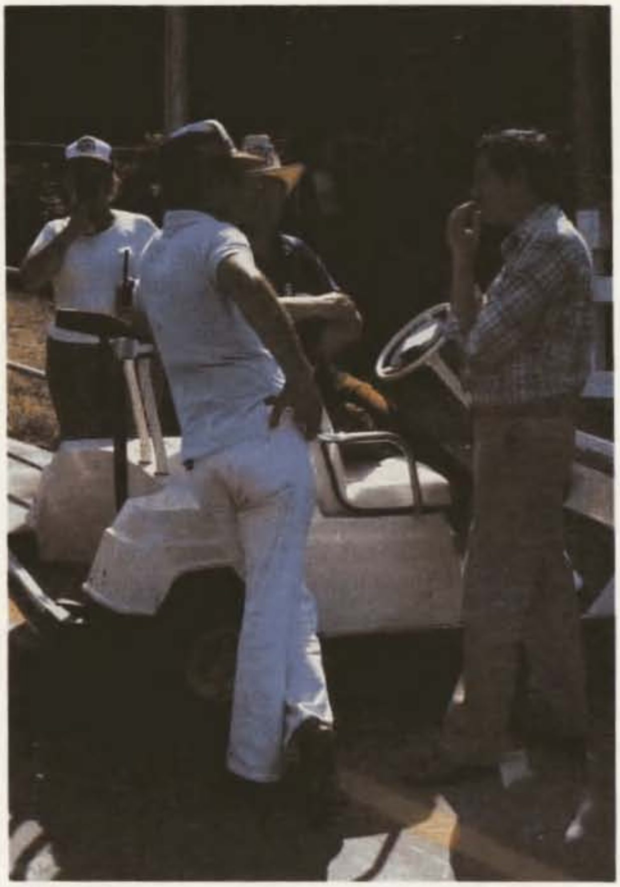
Though the activities which Jim and others helped with during the week were important, they were just more preparation for Derby officals and the communications team for the big day. Saturday, August 16, when a parade down the track, a skydiving exhibition, and 91 heats would all have to take place.

Amateur radio helped to ensure that this year's race went like clockwork. That has not always been the case. Alley recalled one incident which, while it had no serious consequences,



WD8POL and XYL, WD8PZO, work at the topside control booth during Wednesday's trial runs.

WB8VNO provided communication for Derby general manager, Wayne Alley, seen here talking to one of the deputies at the track.



WB8VNO provided communication while Derby officals discussed the race with Kazumi Hotai (right) of Tokyo Television, who taped segments for a special on children of the world.

WB8CBO (left) and WD8CVH operate CARS station WB8DJP on race day from the bridge across the race track.

was embarrassing to the people involved.

Two years ago, a skydiving team was to exit the plane, free fall, and land on the Derby track at the conclusion of the parade. A smoke grenade set off at the tower was to signal the team to jump, and the track announcer was to call the crowd's attention to the team. Unfortunately, a cannon was set off to signal the start of the parade. The smoke from the cannon apparently looked like a smoke grenade from 12,000 feet, and the skydivers arrived considerably ahead of schedule.

Since this year's Derby included another skydiving exhibition, Bruce Bechtol K8VAK flew with the team and provided both 2-meter and 220-MHz communication with Jeff Brown WD8MMN, at trackside. Jeff was to keep Bruce informed about the timing of the jump.

When Bruce arrived at the airport, the jump team and the pilot expressed some concern about the cloud cover and the wind. After a discussion, they decided to see how conditions were higher up and to make the decision then.

The wind and clouds did present a problem, and Bruce was able to inform officials on the ground of the situation. The track announcer was able to point out to the crowd that the team would be jumping from about 5000 feet with no free fall because of the conditions. In addition, radio communication also allowed the announcer to re-

WD8DAI provided radio communication for the VIP booth on race day. Immediately behind her is KB8CT, president of Novar Electronics, chief sponsor of the All-American Soap Box Derby.

WD8POL, his XYL, WD8PZO, and N8AHJ take a break at the control booth during a lull in the heats on race day.

assure the crowd quickly that one skydiver, who had been blown into a fence while landing, was not injured. The team said there would have been confusion on the ground if they had not been able to communicate the change in plans to the announcer.

With the parade and skydiving completed, the race became the important event. There were two classes, junior, for boys and girls 10 to 12, and senior, for entrants 12 to 15. A 12-year-old could choose either division, and this year's senior winner was 12.

For each heat, two or three cars, depending on the pairings, were placed on the starting blocks, the blocks were dropped, and the cars rolled down the 953-foot racing strip to the finish line where the first car across tripped an electronic timer—and a camera shutter, to provide photos for the judges in races which were too close to call with the naked eye.

After crossing the finish line, the cars had a 1,200-foot runout area in which to slow to a stop. Since each car had a brake, most stopped near the stand, about halfway through the runout area. At that point, if a winner had already been declared over the public address system, Derby volunteers consoled the "losers." (The term loser is never heard at the Derby. Officials throughout the day call each entrant, "champ," since each got to Akron by being the champ of some local derby.)

The winner then waited until two other winners were available and the three drew for lanes in the next heat. K8UCN handled the lane assignment chores since enough other volunteers were available for radio duties. After drawing lanes, the winners and the cars were returned topside, where they waited for their next run.

If the Derby were to run smoothly, action had to take place simultaneously at topside, the starting line, the finish line, and the runout area. Safety was the first concern, and an amateur radio operator was stationed at each location. They were coordinated by WB8DJP, operated by WD8CVH and WB8CBO. The control station was located on the second level of the bridge at the finish line and just behind the announcer so that information could be passed on to the crowd quickly.

In addition, a telephone line connected each station, and, leaving nothing to chance, another heat was not run until each point had given the okay. In addition to radio and telephone communications, a system of red and green lights and red and green flags was used. No car could leave the starting line until a verbal go ahead had been given and both the green light and green flag were visible.

Fortunately, this year there was no serious emergency to test communications capabilities. The few entrants who brushed the wall walked away and shed tears more from the agony of defeat than from any injury. The Akron Fire Department Emergency Medical Team and a US Army Reserve medical team careful-

K8VAK, who provided aerial communication for the skydiving exhibition, has his chute adjusted. Bruce used both 2-meter and 220 handhelds.

K8UCN coordinated lane selections as each heat winner arrived in the runout area. In the background is the Goodyear Air Dock, the largest building without interior supports.

WB8YNX and KB8CJ provided radio communication in the runout area.

ly examined the few champs who bumped the wall. The only damages were to the pride of the youngsters, some of whom had traveled many miles to represent their hometowns and countries. The race included champs from Germany, Venezuela, and Canada.

Other hams working Derby day included Clyde Lorenz WB8YNX, Jeff Ruoff N8BFU, and Tom Haynes KB8CJ (who were stationed in the runout area), Paul Banquer WD8MDC, who was at the finish line, and Bob Cronauer N8AHJ, Ken Langford WD8QWD, and WD8DAI, who provided communications for various Derby officials.

Bruce Rodenkirch WB8WFD shadowed the NBC crew which taped segments of the race for use during October on the new series "Games People Play." Bill Hessler W8DXT provided communications for Kazumi Hotai and his Tokyo television crew which was shooting footage for a special program on children of the world.

Ken Slezak N8BYS, who was stationed halfway down the track, had the most uneventful post. His only action was to check on an entrant who had applied his brake and stopped in the middle of the track after a shroud on his car loosened and blocked his vision.

It's not possible to name all the hams who helped during the week with the Derby or who might have helped give directions on Derby day on the other repeaters in the Akron area. Nor is it possible to mention all the clubs which were

represented by the people participating. But it is possible to tell a little more about the ham who helped make it all possible, Jim Ott KB8CT.

In the fall of 1972, Chevrolet officials (who had first sponsored the Derby in 1936) decided to withdraw their sponsorship. The Derby was sponsored by local groups until the fall of 1975 when another national sponsor was found. Novar Electronics of Barberton, an Akron suburb, pledged $165,000 toward the next Derby, and has supported each Derby since.

Ott, who was first licensed in 1962 as K8CAA, founded Novar when he was 17. (Novar stands for Northern Ohio Video and Radio.) Ott had gone to Ohio State University to study electrical engineering. While working with a deaf student there, he developed the Whisperlite, a device which converts sounds into light. When commercial interest in the device developed, Ott quit school and founded his company which, today, is a recognized leader in security systems including a new identification system which uses the vibrations created by the human body.

Though the Novar name is prominent during Derby week, on T-shirts and other Derby promotional materials, Ott does not make commercial use of his sponsorship during the rest of the year.

On race day, he said, "It's fun to be here seeing the kids enjoying themselves. This is a great program and I'm happy to be able to contribute."

Jim said that his work doesn't give him as much time on the air as he would like, but if you do hear KB8CT, jump in and say hello to a ham who helped make August 16 an important day to 91 champs. ■

KB8CT waves home the final heat of the 1980 All-American Soap Box Derby. Dan Purol of California, in the red car, took home a $5000 scholarship and a California Replicar kit in addition to the trophy.

KB8CT presents the senior division All-American Derby trophy to Dan Purol of Fair Oak, California.

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Perfect Parabolas

—use some solar technology on your next dish antenna

I became interested in building an MDS TV converter after reading an article in the August, 1979, issue of *73 Magazine* entitled "You Can Watch Those Secret TV Channels."

After building the converter and coffee-can feedhorn, I was concerned over the number of trees between my location and that of the MDS transmitting station. A line-of-sight path is normally required at the frequencies used for MDS TV and trees greatly attenuate signals. I suspected that I would need an antenna with more gain than that of the "snow-saucer" type.

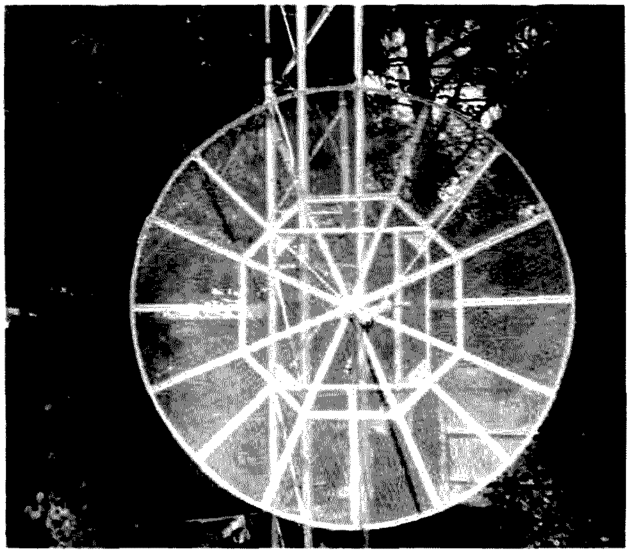

Photo A. Front view of completed four-foot dish showing rib structure.

Whenever UHF or microwave frequencies are mentioned, I form a mental image of a parabolic dish. However, they *are* expensive and I knew nothing about designing or building them. So what do I do now?

Research

After a long and fruitless search through my limited library of radio publications, I was ready to give up when I spotted my *Solar Energy Handbook*. It contains information on collecting light waves with parabolic reflectors. Having read that the properties of high frequency radio waves and light waves are similar, I decided to design and build a parabolic reflector based upon the information in the book. This information is shown in Figs. 1(a), 1(b), and 1(c) and illustrates three approaches that can be used to produce a parabolic curve.

Design materials needed are:

- Several sheets of linear graph paper
- Straightedge or ruler
- Compass for drawing circles
- Pencil
- Piece of wood—1" × 6" × 24"
- Approximately 5' of string
- 4' × 4' piece of plywood or heavy cardboard

Dimensions

Due to my limited knowledge, my choice of dimensions was based upon common sense and convenience. Choosing a diameter of four feet for high gain and a focal length of 26 inches so the feedhorn mounting tube could be short and rigid, I followed the instructions shown in Fig. 1(a). I let each square on the graph paper represent one inch (not shown for purposes of clarity).

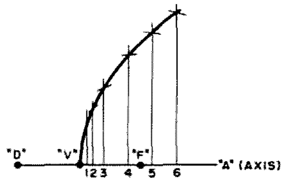

Fig. 1(a). If vertex "V" and focus "F" are given on axis "A", mark point "D" so that "DV" = "VF". Draw lines perpendicular to the axis at any points, 1, 2, 3, 4, 5, etc. Bisect each with an arc drawn from "F", with a radius equal to the distance of the particular point from "D". Thus, bisect line 3 with radius "D3" drawn from "F".

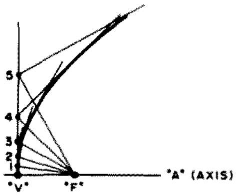

Fig. 1(b). If, as in 1(a), vertex "V" and focus "F" are given on axis "A", draw line from "V" perpendicular to axis. Mark any point on this line (1, 2, 3, etc.) and connect it to "F". Draw a line from each point at right angles to the line to "F". (Thus, from point 5, draw line at right angles to "5F".) Each of these lines will be a tangent of the parabola, which must be drawn inside these tangents, touching each section at its center.

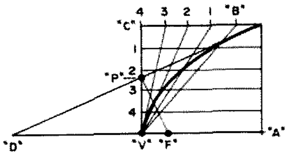

Fig. 1(c). If vertex "V" and axis "VA" are given as well as width "BA", draw "CB" parallel to axis and "CV" perpendicular to axis. Divide both into an equal number of equal sections (1, 2, 3, 4, etc.). Connect "V" to each point of "CB" (radial lines). Intersect each radial line with parallels drawn from corresponding points of "CV". The intersections are points of the parabola. Mark point "D" on extension of the axis so that "DV" = "VA". The line connecting "D" with "B" is a tangent at "B". Where "DB" intersects "CV", mark point "P". Draw line from "P" at right angles to "BD"; this will determine the position of focus, "F", on the axis.

After marking the graph, it is necessary to obtain a full scale graph. This is accomplished by drawing vertical and horizontal lines 1" apart for the full length and width of the 1" × 6" × 24" board. Having done this, observe the markings on your graph paper and mark the corresponding points on the 1" squares on the board. If you draw a line from point to point on the board, you will have a full-scale pattern on the board for forming the ribs of the dish. See Fig. 2.

Attach the 5' length of string to the center of the 4' × 4' plywood and, holding the pencil tightly against the string, draw a four-foot diameter circle on the plywood. This is your "rim" pattern. A complete list of materials is provided in the Construction Materials box.

Construction Details

Cut eight 22½" pieces of "Tee" metal and bend each of these so the flat surface will conform to the pattern on the wood graph. Be accurate because these 8 pieces are the ribs which establish the curvature of the dish. Refer to Fig. 3 for the following assembly steps.

Position the most curved end of the ribs in 1" from the outer edge of the pipe flange. Attach these eight ribs so the flat side will be against the bottom of the flange and will radiate outwardly with equal spacing. This should form a hub with eight spokes.

Keeping the flat side outward, carefully bend a length of the Tee metal around a large round object such as a 55-gallon oil drum and make a four-foot circle to match the circle on the plywood pattern. Using flat strap aluminum as a backing plate, attach the ends of this circle to form a 4' hoop or rim.

Attach the rim to the top of the eight ribs. Measure in 12" from the rim and attach eight pieces of Tee metal braces between the ribs to form an octagon-shaped circle on the rear of the dish. Attach eight more pieces of the Tee metal from the octagon-shaped circle to the rim, centered between each of the main ribs. See Fig. 3(d).

Dish Support

The dish supporting and mounting frame is made by making an 19" × 19" square with Tee metal. See Fig. 4. Each corner is braced with a 16-gauge triangle cut from the 4" × 4" sheet of aluminum. The frame is attached to the rear of the dish with 5" lengths of Tee metal. Additional braces from the frame to the dish are formed with the four 16-gauge 1" × 6" aluminum strips.

The two ½" × 8" aluminum strips are formed around one leg of the tower and will bolt to the rear, flat surface of the frame when the dish is mounted on the tower.

The 7/8" o.d. tubing, 3" long, is slipped over the ¾" × 19" aluminum tubing and the 19" tubing is attached to the upper and lower frame members. The 7/8" U-bolt clamps the 7/8" sleeve to the ½" × 23" aluminum tubing which will form the adjusting arm for the dish. This 23" length of tubing is inserted through a clamping bracket which is attached to another leg of the tower.

Covering the Frame

Using ¼" mesh wire (hardware cloth) or aluminum window screen, cut four pie-shaped wedges and attach them with bare aluminum wire to the ribs of the dish. The "tie wires" are bent into a U shape and inserted through the mesh over the braces. They are spaced at 2" intervals. This causes the mesh to closely follow the curvature of the ribs when the wire is twisted. For a neater appearance, you may wish to spray the entire assembly with aluminum paint as I did.

Testing

After construction came

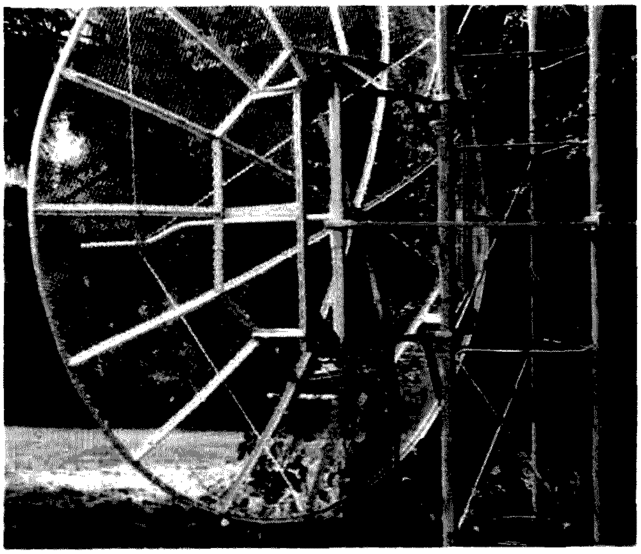

Photo B. Rear view of dish showing mounting details.

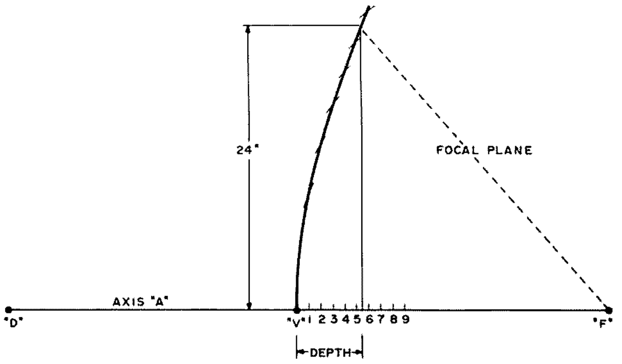

Fig. 2. Details for making full-size construction pattern (top half of the parabola graph).

Construction Materials

½" × ½" × ½" Tee-shaped aluminum strips
Small nuts and bolts or "pop rivets"
3-inch pipe flange
¼" mesh wire (hardware cloth) or aluminum window screen—enough to cover the reflector.
Aluminum tubing, ¾" o.d. × 19" long
Aluminum tubing, 7/8" o.d. (¾" i.d.) × 3" long
Aluminum sheet, 16-gauge, 4" × 4"
Aluminum strips (2), ½" wide × 8" long
Aluminum strips (4), 16-gauge, 1" × 6"
Aluminum strip, 16-gauge, 1" × 2¼"
Aluminum tubing, ½" × 36"
Aluminum tubing, ½" × 23"
1 U-bolt clamp (to fit 7/8" pipe)
1 U-bolt clamp (to fit tower leg)
Several feet of aluminum wire (clothesline wire), small gauge

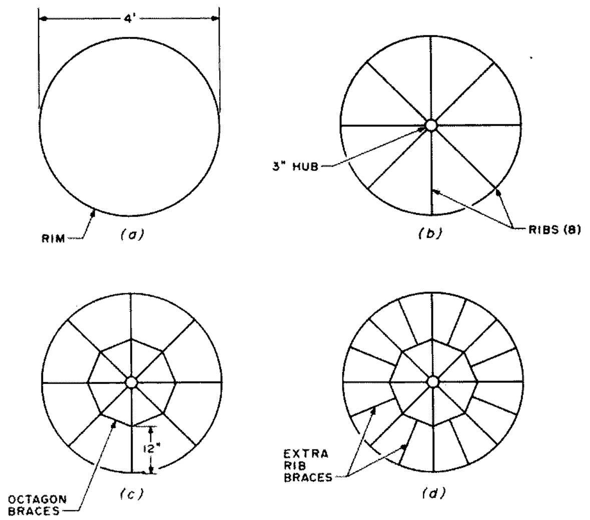

Fig. 3. (a) Rim dimensions. (b) Spoke installation. (c) Octagonal bracing placement. (d) Installation of extra rib braces.

the pleasure of testing something that worked right the first try. I was fortunate enough to have a Gunn diode oscillator operating at 10.5 GHz and the waveguide-horn from an old police radar detector. The Gunn oscillator was set up facing the waveguide detector at a distance of ten feet and the meter reading was noted. The Gunn oscillator was then pointed at the mouth of the dish, and by standing to one side and moving the detector around, I was able to locate the point of highest rf concentration. This point was 26½" from the vertex of the dish, only a half-inch off the design and now the meter read full scale (100 microamperes). This was much greater than the direct reading without the dish, indicating a great deal of gain.

The Gunn oscillator was then moved to a point three feet from the front of the dish and the detector was used at the rear of the dish to check for rf leakage through the mesh cover. None could be detected. This would seem to indicate that spacings greater than ¼" could be used for frequencies below 10.5 GHz.

Miscellaneous

The pipe-flange center hub makes horn attachment easy. You may wish to thread a short pipe nipple into the flange and slide a piece of aluminum tubing or PVC plastic over the nipple to mount the horn. You can clamp the two together with screw-type pipe clamps or hose clamps.

Conclusion

If you should build a parabolic reflector from the solar book information given, I believe that you will be well pleased with the results. I certainly am. I have become so interested in the design of dishes that I have completely dropped the MDS project and I am presently contemplating a 12 footer for satellite reception. Good luck.■

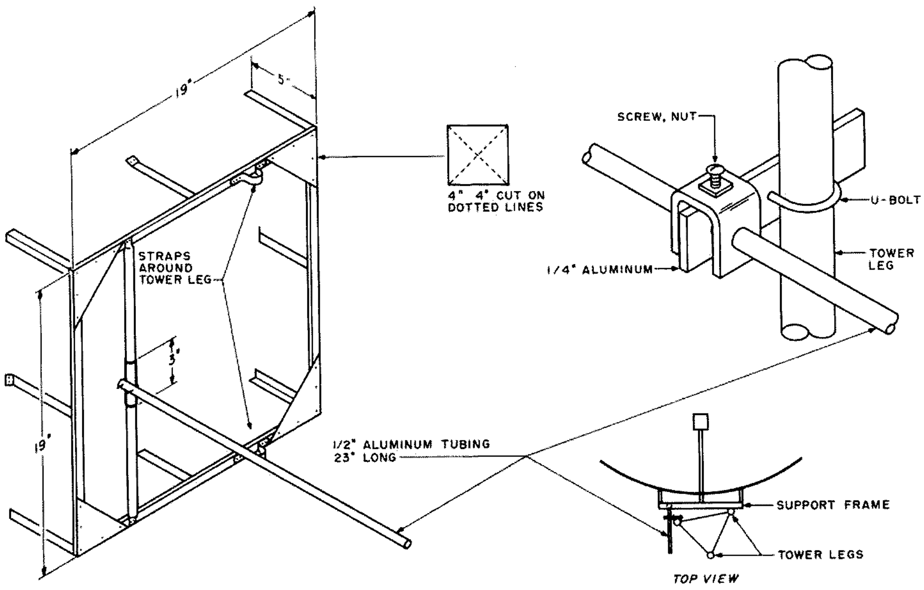

Fig. 4. Supporting and mounting construction details.

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Garden City MI 48135

Help for the HW-2036

—hum mods for Heath-equipped hams

Almost immediately after I put my Heathkit® HW-2036 on the air, two problems cropped up. First, there was a terrible hum on the transmit audio whenever I tried to work through a repeater, and second, the phono plug coax connector kept coming loose. Daunted but not defeated, I put the thing back on the bench and proceeded to dig into the problems with great exuberance.

If you live in an area that doesn't require a Private Line® (PL) for repeater access you may never have noticed the hum. But if you use PL you undoubtedly have been told that you have a noticeable—if not objectionable—hum on your signal. It's not humming because it doesn't know the words, it's humming because the injection level is simply too high. Unfortunately, Heath did not see fit to include a level adjustment. Enter modification #1.

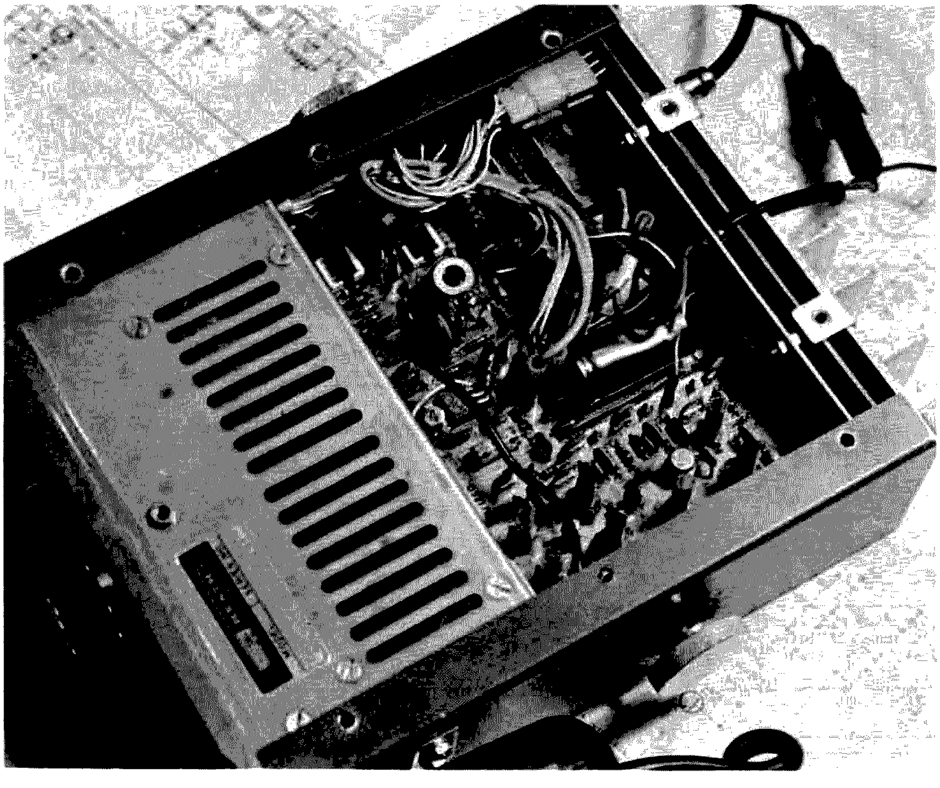

Photo A. This shows the completed modification. The PL adjustment pot is mounted horizontally behind the deviation pot. Note the coax pigtail at the antenna jack.

The square-wave output from the tone generator is fed through several stages of RC filtering to R134, a 470k resistor. (See Fig. 1.) Although R134 is part of the waveshaping network, its actual value does not appear to be critical. Replace it with a pot and you'll have a tone level adjustment.

In my first attempt at this mod, I used a 750k pot—and promptly ran out of adjustment range! A second trip to the junk box produced a 2.5-meg linear PC board pot that worked very well. Actually, any value from 1 to 5 meg will work. The lower the value, the easier it is to adjust—but the more you risk running out of adjustment room.

To prepare the pot, first

solder one end terminal and the arm together. Then solder about 3/4-inch lengths of wire to each end terminal. Bend the leads straight back from the front of the pot and set it aside for a few moments.

Pull the bottom cover off the rig to expose the transmitter circuit board. R134 is located behind the deviation pot. (See Fig. 2.) Snip the resistor in half, crush the carbon and composition from the leads, and bend the leads straight up. Now solder the leads from the pot to the leads protruding from the circuit board. Be careful—not too much heat—you don't want the solder to flow on the foil side of the board.

To adjust the pot, set it for about 500k and get into a QSO on a PL-controlled repeater. Slightly increase the resistance on each transmission. When the other stations report that they can no longer hear the tone, note the position, but continue increasing the resistance until you can no longer hold the machine. Then set the pot midway between those two points. If you find that you can no longer hold the machine while the tone is still audible, check the frequency of the tone.

As long as you have the rig on the bench, you may as well consider one other simple mod. My rig is in and out of the car several times a day. At that rate, it didn't take long for the phono plug coax connector to become loose and intermittent. After taking the rig apart several times to tighten up the connector, it finally dawned on me that there must be a better way.

One way would be to replace the phono jack with a chassis-mount BNC connector. That would require some (slight) mechanical rework of the box, however. Since my mechanical ability is zero—I can't even put the cap on a peanut butter jar without getting it cross-threaded—I began considering alternative solutions. I decided that a short piece of coax and a few connectors could do the trick.

For most practical purposes, the input and output characteristics of a half-wave section of coax are the same. If you were to solder a half-wave section of coax to the output of the rig, you would effectively move the output point to the end of the coax. That is the theory.

To put theory into practice, solder a UG-89/U BNC connector to one end of a piece of solid-dielectric RG-58. On the other end, solder a phono plug. The distance from the open end of the UG-89 to the tip of the phono plug should be 24-1/2 inches.

Now, tack solder the phono plug to the antenna connector on the rig. I emphasize *tack solder*, because you may eventually have to take the rig apart for maintenance, and a completely soldered connection would be a bear to get apart.

Replace the phone plugs in your car or shack, or wherever else you operate, with UG-88/U connectors; you'll be back in business without intermittent coax connectors.

There are several other mods which I would like to describe in future articles. In the meantime, you can enjoy operation without intermittent coax connectors and without the hum.■

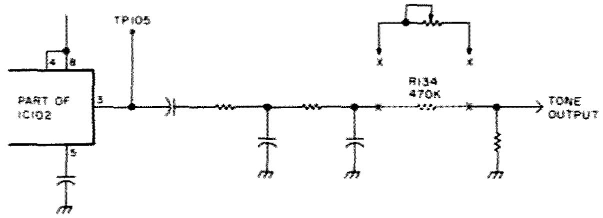

Fig. 1. The tone generator, IC102, and the electrical location of R134 in the output circuit.

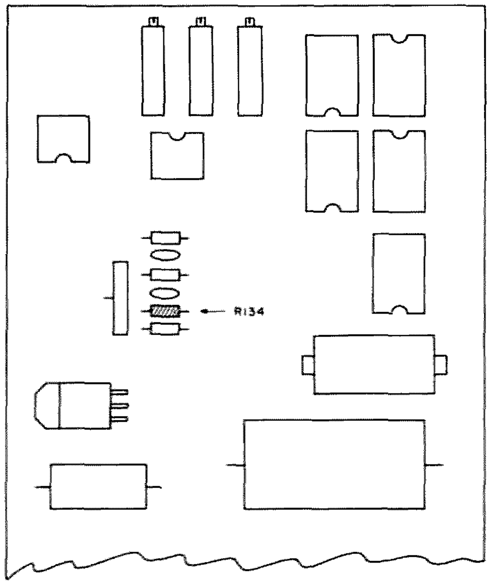

Fig. 2. The physical location of R134 behind the transmitter deviation pot. Most minor components have been omitted for clarity.

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The Honeymoon is Over

—hints and kinks for ham husbands

Let me tell you the tale of K9CNC and how he turned a YL into an X-XYL through the marvels of amateur radio.

A bright and shining boy was he, happy in love with his bride-to-be, and an eager radio amateur, as well. He never thought to tell the love of his life much about his involvement with radio, thinking that, most likely, she wouldn't be all that interested.

Came the wedding day and the honeymoon, and our happy lad drove up in the new family car, now completely outfitted with an Atlas 210X and a Hustler whip antenna. The new Mrs. was taken aback.

"... and what's that thing sticking out of the trunk?" she asked.

He explained with boyish innocence that it is for radio contacts, and that as they drive north on their wedding trip, he should be able to pick up ham operators in parts of the world he could never contact before.

"What's the matter?" she asked somewhat subdued. "Don't you want to talk to me?"

Well, they were off. Somewhere along the Florida turnpike he picked up Australia. As they reached Georgia, British Columbia was 20 over 9.

"Just sitting here with my XYL, driving up to New York City and watching the stars come out," he purred contentedly to a CQer from Pago Pago.

"What's an XYL?" the new bride asked from her forgotten corner of the front seat. You see, she had expected a bit more snuggling and a lot less conversation from parts unknown.

"Oh, that's you ... my ex-young lady," he threw off casually in her direction as he monitored a group of rag-chewers from Maine, Massachusetts, and Guantanamo Bay.

This came as a bit of a shock to the poor girl. Only this morning she was a young lady, and now she found herself over the hill. A doubletake to the bright, gold band and the first shreds of doubt began to bloom: a bride in the morning and a ham widow by dark.

Slowly our little bride came to hate the squawking little black box and to look on with embarrassment and discomfort when the antenna worked itself loose and tangled up traffic, as it frequently did. The honeymoon was over. Quickly.

Moving in to the new QTH only added to our XYL's joys. Where was her OM? Helping to carry the packing crates upstairs, deciding where to put Aunt Mary's lamp, or adjusting the water heater? 'Course not. He was hanging by his heels out their 9th floor apartment window, making the final arrangements on his dipole.

"My heavens," she breathed. She would really be a ham widow if he wasn't more careful. He survived sufficiently, however, to commandeer her best table for his transceiver, meters, and tools, smiling as he placed Aunt Mary's lamp in the perfect position to properly light his log and happily scattering his QSL cards decoratively over her new wallpaper. He got his shack in order long before he tapped the first nail in the wall to hang the wedding pictures.

Life went on for the XYL and her OM. He came home from the office, kissed the little woman hello, and headed for the shack. "K9CNC here on schedule," while the dinner got cold and the XYL began a slow burn. One day she had had enough. She left the ring on his QSL cards, murmured a quick 88, pulled the plug, and QSTed.

How to Keep Your XYL from Becoming an X-XYL

Poor K9CNC was a sorry case, indeed. Radio wasn't the only cause for his problems, but it was a contributing factor. It is an acknowledged fact that a radio operator can appear to be a strange breed of cat, especially to a wife who has no personal involvement with the romance of the airways, except to watch the back of her husband as he hunches over his CW key or ragchews with a DX station she can't hear herself and wonder *why?* You can be certain she would much prefer that he be romancing her ... or at least *talking* to her.

There are a lot of women who have become resigned to being ham widows. They've gotten accustomed

to watching the food get cold on the dinner table while they nag at their microphone-mouthed maniacs, or while they stand by the door, waiting for their Good-Samaritan husbands to finish that last, never-ending phone patch, as the concert starts without them or the shopping center closes for the night.

As an XYL myself, I can vouch that tolerance and understanding did not come easy. It took until I became a radio amateur to come to understand the ties that bind the enthusiastic ham. You don't have to turn your wife into an Extra-class operator to make life more livable, but with a few reminders, you might just be able to turn off (instead of tuning out) her long-suffering sighs, give her a greater appreciation for your hobby, and turn her on to the magic of radio for herself. Be careful, now. Don't be too good at this or you might find yourself a ham widower.

Introduce Her To the Hobby

Don't lecture, but do make it a part of your daily conversations to fit in explanations about simple electronics, history statistics, and/or the motivations that make for a radio amateur. She will become a more understanding part of your world when you share it with her.

Explain It To Her

If you are a serious ham and enjoy spending time with the rig, explain that from the onset. Tell her it is a hobby you enjoy, have long cultivated, and from which you take great pleasure. She'll appreciate the pastime more if she understands what you went through to master the code and pass those exams and sacrificed to construct or purchase the equipment. If she is new to the game, she is going to be doing a lot of wondering, as she sits alone watching TV or reading a book, as to why you have so much to say to strangers and nothing to say to her.

Explain the Lingo

Don't offhandedly throw out an explanation (as K9CNC did) that XYL means ex-young lady, without cushioning the blow. When you know nothing about the jargon, a young lady is one thing, while an ex-young lady is something else again. Don't rattle off abbreviations she couldn't possibly have any background knowledge about, as you spin your dials and rotate your antenna. Take the time to *stop*, give her your full attention, and answer her questions, no matter how simple or how complex. She'll retain information presented this way, believe me. It seems one of the great complaints from non-hams is their failure to understand what is being said. It turns them right off.

Don't Be Condescending

If you are going to try to make your hobby understandable to a wife who has difficulty plugging in the toaster or setting the clock, don't lecture as if you didn't expect her to understand. Again: Answer her questions. Explain a point as many times as it takes, if she is interested . . . but *don't* get angry at her if she still doesn't understand. After all, it is not her hobby: It's yours. She might pleasantly surprise you someday with her knowledge, as she proudly shows off your shack and finds she can speak intelligently about the operation of your Yaesu, Kenwood, or Swan.

Never Put Your Shack Before the Needs of the Household

Even the most unmathematical of wives can quickly calculate the difference between the time it takes for you to run down to Radio Shack when you need a new connector or a piece of 75-Ohm coax and how long it takes for you to take out the trash, get around to mowing the lawn, or to bring home a new stopper for the sink.

Make the Shack a Welcome Place

Just because the little woman is not an electronic wizard, she *can* be trusted within 10 feet of your equipment. If she moves your dials or misarranges your meters or tools, don't jump at her. Instead, use the incident as a way to continue your introductory course in electronics. Make the shack and your equipment comfortable, interesting, and familiar to be around. Turn the shack into a place where she can come and *talk* to you as well as a place where you go to talk to your fellow aficionados. When she brings you that needed cup of coffee, occasionally ask her to pour one for herself and join you. Show her the same courtesies you show to your fellow hams on the air.

Don't Let the Hobby Get Out of Hand

Don't turn every available space like the backyard, garage, or spare room into a graveyard for electronic equipment. It's easy to become a collector, but keep it within reason, and keep it neat.

Encourage Her Interest in Radio

If your XYL gets bitten by the radio bug, become her teacher, or point her in the right direction toward a course of study. You'll have a partner in the shack, a worthwhile experience to share, and a little woman who can appreciate your true meanings when you tell your fellow amateurs you've got an XYL that's 40 over 9. That's some Young Lady. ■

Rx for a Bad Day

Is it one of those dull gloomy days when even the birds are walking, and it's not a fit day to go out and put up that new sloper or inverted vee antenna you wanted to try? DX isn't coming through yet because the MUF isn't right, some jerk squirrel keeps kerchunking the repeater or plays tunes on the Touchtone™ so that two meters isn't fun. Maybe the wind played havoc with your beam last night and now it looks like a limp pretzel or some modern art object, or maybe your rig blew up in the middle of a QSO or just before that sked with a rare station in some far off land.

Any fool knows all these things aren't going to happen to you at once. But if it is 'one of those days' maybe you can just forget the whole mess and brighten your and someone else's day a little by taking some time to think of a fellow ham you admire and respect to nominate for Dayton's "Amateur of the Year Award" for 1981. No, it's not too early to think about it. It does take a little time and effort to nominate some one for "Amateur of the Year."

What is the stature of this individual that we seek for recognition each year at Dayton?

First, he or she will be a well-respected person in the community; a leader, not only in amateur radio activity, but in civic activity as well. He will probably be licensed for at least 10 years or more for it is long term overall excellence in amateur radio that we are looking for.

His contribution to amateur radio may be in any of the hobby related areas. Possibly his greatest contribution is in the engineering field of our hobby, or his expertise may be in antenna design, some new type of modulation or an improvement to existing design, etc. Maybe he has contributed greatly to improvement of amateur regulations or possibly his contribution is the legal field of our hobby, a very important one these days. Get the idea? In short, an outstanding individual and amateur.

In 1974, another award was established, the "Special Achievement Award." This award is just what it would seem to be — an award for one-time special event or specialized activity by an amateur or group of amateurs. This activity may be in the engineering field — QRP — DXpeditions —net activity — emergency work or any one-time outstanding activity related to the amateur radio hobby.

Nominees for both of these awards may be from anywhere in the world, not just the U.S.A.

So! Don't just sit back and say, "Gee!, somebody ought to nominate that guy for "Amateur of the Year." Don't wait for George to do it. Give us all the details you can gather, especially activities that are directly attributable to him or her.

All nominations are carefully reviewed and are saved from one year to the next for future consideration and to allow some nominees to develop to their full potential. All nominations are considered for both awards, and the awards will be presented at the 1981 HAMVENTION Banquet.

So, have you nominated some one in the past? You may want to renominate him with update on recent activities or just send in update information on his latest accomplishments.

Do it now! Besides you may win a set of free tickets to the "HAMVENTION" for your nominee and yourself.

For more information or nomination blanks (not mandatory) write to the address below:

HAMVENTION
P.O. Box 44
Dayton, Ohio 45401
Attention: Awards Committee

or

Bob Roettele, W8UNV
Awards Chairman
1299 Hanes Road
Xenia, Ohio 45385

Roger Grant
PO Box 638
W. Yarmouth MA 02673

CB to 10

—part XXX: the Midland 13-866

The basic applications of this conversion will apply to most CB chassis using the 23-MHz series of crystals. The chief difficulty with this radio, which uses no crystal trimmers, is to figure the pF load for the crystals needed. The load of the circuit is about 58-60 pF, but since the crystals are third-overtone cut, the load to request is about 22 pF cut for third overtone operation. There are two methods of approaching this chassis, but changing the 23-MHz crystals is recommended. The formula is simple: Just add 2 MHz to the existing crystals.

The crystals required are: 25.290, 25.340, 25.390, 25.440, 25.490, 25.540.

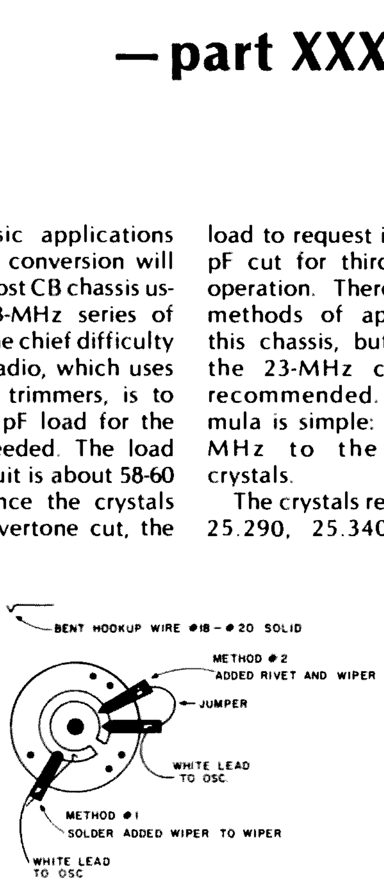

Fig. 1. Two methods of activating position 24 on the channel selector.

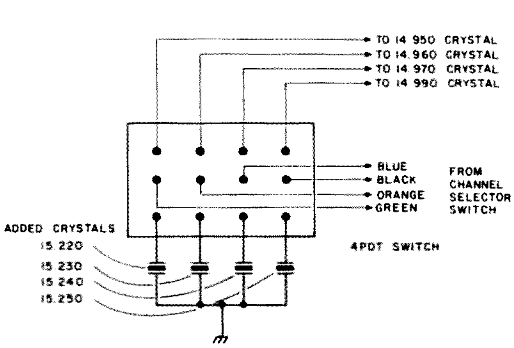

Fig. 2. Adding 24 extra channels to the Midland 13-866.

Changing these crystals is simpler on an initial conversion because their fundamental range is only 8 MHz, and they are far easier to work with than fundamental 16 MHz crystals. In addition, it is possible to add 24 more channels to the synthesizer circuit by use of a 4PDT switch and four more crystals. Frequencies needed are: 15.220, 15.230, 15.240, and 15.250 MHz, which are stock items at most crystal houses, and range in price from $3.50 to $6.00 each (so shop around).

Activating the channel 24 position can be accomplished by locating the white wire coming from the selector switch and going to TR6. Using a piece of hookup wire, as diagramed, or a spare wiper from an old rotary switch, solder it to this terminal in such a way that it makes contact with the switch when the defeat cut in the switch meets the normal wiper. (Refer to Fig. 1.)

Install the new 25-MHz crystals in place of the ones removed from the circuit board. Apply power to the set, and with a frequency counter check for oscillation at the collector of TR6. If the oscillator is not functioning, back out the slug on T6 until the circuit fires. With TR6 oscillating, you now can proceed with the tune-up procedure.

Connect a signal generator through a .01-uF capacitor to the base of TR17. Ground the generator to chassis ground, not the case. With the set on channel 13, (23 if you are installing the 15-MHz crystals as well), inject a 29.115-MHz signal with 1000 Hz, 30% modulation (29.255 MHz for channel 23). Adjust T12, T13, T14, and T15 for maximum receiver output.

Key the transmitter into a dummy load with a wattmeter connected and tune T1 through T9 for maximum rf output. The relative output function of the S-meter may be used for this initial tune-up. Then peak C24 and L5 for maximum power output. At this point, you should have about 2- to 2.5-Watts output. The value of the tank coils in these sets varies greatly, and it may be found that maximum power output occurs when the L5 slug is all the way out. If this is the case, replace C22 (150-pF capacitor) with a 100-pF ceramic disc. This will allow the coil to tune over its mid-range and increase power output to about 5 to 6 Watts. Modula-

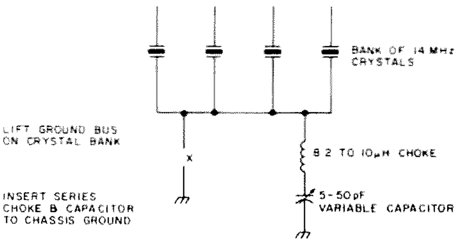

Fig. 3. VXO operation with the Midland 13-866.

tion can be increased by removing TR8 from the circuit.

Adding additional channels by using a 4PDT switch is accomplished by removing the green, orange, blue, and black leads going from the selector switch to the 14-MHz crystals on the chassis. Connect these wires as diagramed in Fig. 2. With the switch down, the 24 low channels will be obtained. With the switch in the up position, the upper range can be used.

For frequencies other than, or in addition to, the normal *73* band plan, the basic conversion has a usable range of about 800 kHz without retuning.

VXO operation with this radio can be obtained by lifting the ground bus of the 14-MHz crystals and inserting a 10-uH choke and a 5-50-pF variable capacitor in series with the crystal bus to chassis ground, as in Fig. 3. This trick will work with any fundamental crystals up to about 16 MHz. Do not attempt to use it on crystals operating in the overtone mode because severe instability will result. ■

The Nicad Conditioner

—help your nicads lose their memories

Mitchel Katz W2KPE
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Quite a few nicad battery-charger circuits have appeared in print lately. However, as none of the circuits would fill my requirements, considerable research and planning was done before starting on this project. Most of the chargers described in articles were for the preferred constant-current method. Others used the constant-potential system. Still others used a combination of both. Each of the articles detailed the advantages of its method, but neglected to mention the disadvantages. Let us look briefly into each of the systems mentioned.

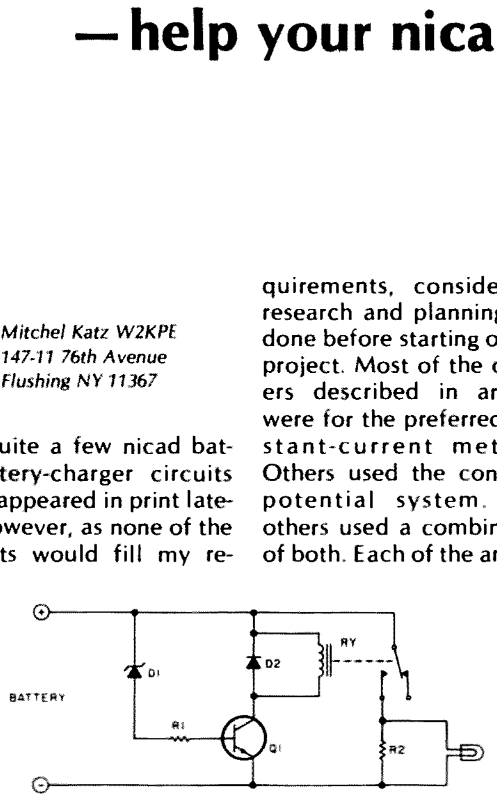


Fig. 1. Conditioner circuit.

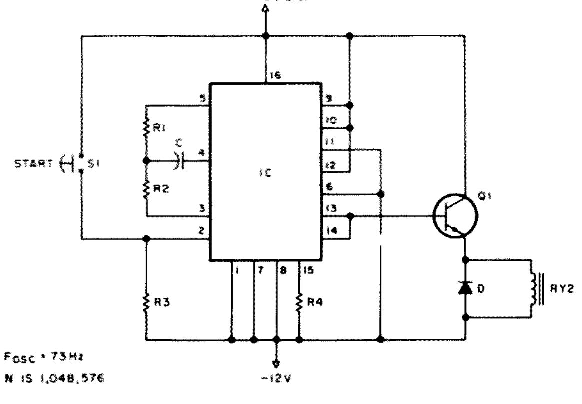


Fig. 2. Timer circuit.

Constant-current charging is usually done at the 10-hour or .1C rate (C is the rated capacity of the battery). This is fine, except that it takes from 14 to 16 hours for a full charge—an awful long time to be without your HT! Some of the newer chargers use constant-current charging at the .3C rate so that full charge can be obtained in as little as four hours. Remember that we must replace between 130% to 150% of the battery capacity due to inefficiencies in charging. This is a step in the right direction, but we must be careful about overheating as this can ruin the cells.

Constant-potential charging is definitely not recommended. With this method, the charge would start out at quite a high level, resulting in some heat being generated within the cells. As we approach the overcharge condition, additional heat will start to build up. As the battery heats up, the cell voltages will decrease somewhat, leading to even more overcharge current and greater heat buildup. This is called thermal runaway, which will eventually destroy the cells. Because of this problem, constant-potential charging is generally not recommended. The voltage cannot be set low enough to prevent thermal runaway and still fully charge the cells.

Combinations of constant-current and constant-potential systems have also been described. These systems charge the battery at perhaps the .3C or an even higher rate. A voltage sensor is provided so that when the battery reaches some predetermined level, the constant-potential method will take over. The voltage here can be set to hold additional charging current to a suitable value. One drawback to this system, however, is that cell voltages can vary with repetitive charges. It can also vary with ambient temperature. Then, of course, suppose the battery develops a shorted

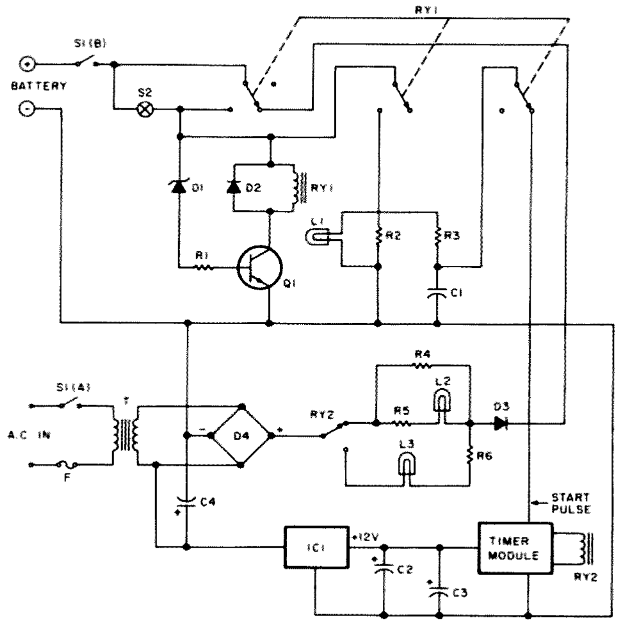


Fig. 3. Circuit for complete conditioner/charger.

cell. All of these problems mentioned will prevent the battery from reaching the sensor cutoff, so that high-rate charging can continue, eventually damaging the battery.

At this point, let me digress. Some experimenters and suppliers of chargers believe that the charge should be terminated after replacing 130% to 150% of the battery capacity. This is to prevent losing electrolyte within the cells. Others prefer the battery to remain on a trickle charge which may be as low as .01C of the battery capacity. General Electric Company's *Nickel Cadmium Battery Handbook* recommends that nicad batteries be charged at a fairly high rate, but that at completion of the normal charging period they be kept on a .1C-rate topping charge. As all cells in the battery may not have identical characteristics, the topping charge will permit the weaker cells to get a full charge without harming the other cells. G.E. goes on to say that most nicads may be left on the .1C charge rate for extended periods of time without harm.

Another item worth mentioning here is the memory effect of nicads, but since we are all probably aware of this condition by now, no discussion should be necessary.

Evolution of the Conditioner/Charger

Very few chargers described in magazine articles or that are available from the HT manufacturers take into consideration the state of charge remaining in the nicad battery. If the battery is not depleted when put into the charger, this can lead toward developing the memory effect just mentioned. To prevent this from happening, the conditioner shown in Fig. 1 was developed. This can be built as a stand-alone unit or may be incorporated into a complete charger system. Before the battery is placed on charge, it is put into the conditioner. It will immediately go into discharge at the 1C rate. When the battery voltage drops to the 1-volt-per-cell cutoff point, the relay will drop out, thereby terminating any further discharge. This procedure will not harm the battery and it will erase any memory effects.

Parts List for Fig. 1

D1—Zener diode (1 V per cells in battery)
D2—Silicon diode
R1—1000 Ohms, ½ Watt
R2—75 Ohms, 10 Watts
RY—Coil rated at less than battery voltage
Q1—Motorola HEP S0038
Lamp is type 387 in suitable holder.

Parts List for Fig. 2

IC—HEP C4058P programmable timer
Q1—HEP S0038 transistor
D—Silicon diode
RY—12-volt relay with dc coil resistance greater than 250 Ohms
R1—2700 Ohms, ¼ W
R2—6200 Ohms, ¼ W
R3—1 megohm, ¼ W
R4—10k, ¼ W
S1—Momentary contact push-button switch
C—2.2 uF, 35 V

Parts List for Fig. 3

T—Stancor P 6469, 25.2 V@1 A
F—1-A fuse
D1—Zener diode (1 V per cells in battery)
D2, 3—Silicon diodes
D4—1-A bridge rectifier
R1—1000 Ohms, ½ W
R2—75 Ohms, 10 W
R3—1000 Ohms, ½ W
R4—250 Ohms, 10 W
R5—430 Ohms, ½ W
R6—620 Ohms, ½ W
RY1—4PDT 12-volt coil (Allied Control TF 154C-C) (P and B KHU 17D11)
RY2—SPST 12-volt coil (greater than 250 Ohms)
S1—DPST toggle switch
S2—Momentary contact push-button-type switch
L1, 2, 3—Type 387 lamps in appropriate holders
C1—10 uF, 25 V
C2—4.7 uF, 35 V
C3—.47 uF, 35 V
C4—50 uF, 50 V
Q1, 2—Motorola HEP S0038
IC1—7812 regulator

Another advantage gained by this conditioning is more operating time per charge. In Fig. 1, the relay used should operate on a low current and have a coil rating somewhat lower than the battery voltage. Resistor R is chosen so that the total current drain on the battery, including the pilot light and relay, should total the Ampere-hour rating of your battery.

To describe the operation of the conditioner: When a battery which is not fully discharged and has greater than 1 volt per cell is connected, current will flow through the zener diode. This will place a positive bias on the base of the transistor, causing it to conduct. The relay is pulled in and the discharge cycle starts. When the battery voltage drops to the 1-volt-per-cell level, the zener diode stops conducting, cutting off the transistor. This causes the relay to drop out, terminating any further discharge.

The next consideration in the design of the charger was the method to be used. I wanted a constant current to charge at a fairly high rate. As it is necessary to replace about 130% of the battery capacity for a full charge, I decided to charge at the .5C rate for approximately two hours to replace 100% of the capacity. At the end of this time the charger should switch

automatically to the 1C rate to complete the charge, or for battery-topping.

Consideration was given to the control device. Some rapid-charge batteries have a thermistor built in. As the battery approaches full charge, the resistance of the thermistor will change, triggering the control device to reduce the charge rate. I found that the thermistor resistance would sometimes change. Then again, different manufacturers would use different thermistors. Sometimes they were different from battery to battery. This method, then, was discarded.

What was finally decided upon was a timer method of control. The Motorola 4058 Programmable Timer proved ideal, as it can be set for any time period desired. The circuit of the timer is shown in Fig. 2. Once the timer is triggered, the countdown begins. At the end of two hours, my timer operates, pulling in the relay for a low charge rate. This system has proven itself most reliable, with none of the defects listed for other charge-control methods. A copy of the 4058 application bulletin may be obtained by writing to Motorola, or I will send you a copy upon request and an SASE.

Fig. 3 shows the circuit of the complete conditioner/charger. Although the parts listed apply for use with my Motorola HT 220 Slimline using a 225-mAh rapid-charge battery, the same circuit can be applied to any other battery. Only a few resistors may have to be changed to vary the charging rates. The length of the high-rate charge time can be changed very easily by changing two or three jumper wires.

Several refinements were added, such as pilot lights to indicate the charger/conditioner status, discharge, high-rate charge, and low-rate charge. The power switch has been connected as a safety switch to prevent accidental battery discharge. A self-testing feature is also included. Before inserting the battery, turn on the power switch and press the start button. The discharge light and the high-rate charge indicator lamps should come on. Release the start button and both lamps will go out. If you press the start switch and the low-charge lamp comes on, shut off the power switch and then turn it on again.

Operation of the unit is extremely simple. Once you've checked the charger as described, connect it to the battery. The high-rate lamp should come on. Press the start button and the discharge lamp should come on. When the battery is down to 1 volt per cell, the high-rate charge lamp should come on again. This will now indicate that the battery is receiving its charge.

As soon as the battery goes into the charge mode, a pulse is sent to the timer to initiate the countdown. At the end of the scheduled period, the timer will pull in relay 2, shifting the charge to the low rate. High-rate charging was purposely limited to 100% return rather than 130% to prevent overheating of the cells.

This charger has now been in use for over a year, and it performs flawlessly. A fully automatic system at last! ■

References

1. *Nickel Cadmium Battery Handbook* GET 3148A, General Electric Co., Battery Business Dept., PO Box 861, Gainesville FL 32602
2. Motorola Semiconductor Products, Inc., HEP/MRO Operations, PO Box 20902, Phoenix AZ 85036. (Application bulletin HEP HN 102.)

HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time away from other duties to decipher cryptic notes scrawled illegibly on dog-eared post cards and odd-sized scraps of paper. Please type or print (neatly!), double spaced, your request on an 8½" x 11" sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a "1" look like a "1," not an "l," which could be an "el" or an "eye," and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.

I am looking for instruction books or diagrams for Navy receivers R-516/URR-27 (VHF) and CNA-46188A/RBH-3, and for GE mobile (accent) 450-MHz model EG48ST8. Can anyone tell me how to extend the receiver frequency range of the KDK-2015A to cover more of the 140-to-150-MHz spectrum? I will pay reasonable prices.

Joel Jones W4JQB/7
PO Box 745
Airway Heights WA 99011

I need a schematic for an Eico model 427 oscilloscope. I will be glad to pay any copying costs.

Steve Stout KA5CRI/9
1537 Winslowe Dr. #1-B
Palatine IL 60067

Does anyone have an owner's manual for a Drake TR33-C 2m transceiver? If you do, I would like to copy it or pay you for a copy.

John Vercellino WB9OVV
4636 Pershing
Downers Grove IL 60515

Old-timer desperately needs service and operating manual with schematics for a Phasemaster II-B transmitter manufactured by Lakeshore Industries, Manitowoc, Wisconsin.

This old tube-type transmitter covers 160-10 meters and is capable of CW, PM, AM/DSB, or SSB emission. It has a vfo, a 1626 final amplifier, and utilizes a "tuning eye" tube as tuning indicator.

Will pay copying and mailing costs or will purchase manuals outright. Thank you.

Jaff Giesar KA7HHQ
19309 Winesap Road
Bothell WA 98011

I need a schematic and instruction manual for a Hallicrafters SR-46 6-meter transceiver. I will pay for these items (or for copies) or I can reproduce these documents and return originals. Thank you.

Theodore J. Cohen N4XX
8603 Conover Place
Alexandria VA 22308

I'm looking for an instruction manual and schematic for a Heathkit® IB-2 impedance bridge. I would like to copy and return but will pay copying costs. Thanks.

Gene Smarte WB6TOV
Nubanusit Road
Hancock NH 03449

I have an old military transmitter (World War II era), model BC-696A. It was part of the SCR-274N Command Set. I would like to get this rig working, but I'm in need of necessary info. If you have any manuals and schematics, I would deeply appreciate your help, and will pay any return postage.

Angelo Pepe
2330 Voorhies Ave., Apt. 6H
Brooklyn NY 11235

I need a schematic and/or operation manual for a Trio 2200-G 2m transceiver. I will pay for copy or copy and return original. Thanks.

Daniel H. Soares PY2TTP
PO Box 12113
Sao Paulo SP 01000
Brazil

I would like to contact anyone with technical information concerning the Regency Model ACT-W10 Whamo scanner receiver. This is the one with the "combs" for frequency selection. I need the theory of operation and alignment data. I will pay for postage, copy work, or information.

Wilbur T. Golson W5CD
1324 Marque Ann Dr.
Baton Rouge LA 70815

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received two months prior to the month in which the event takes place. They should be sent directly to Editorial Offices, 73 Magazine, Pine Street, Peterborough NH 03458, Attn: Social Events.

MUSKEGON MI
APR 3-4

The Michigan Area Amateur Radio Council will sponsor the ARRL Michigan State Convention and Hamfest on April 3-4, 1981, at Muskegon Community College. On Friday evening, April 3rd, the "Ham Hospitality" room will be open to all at the Muskegon Holiday Inn. At 10:00 pm there will be a presentation and at midnight, an initiation. On Saturday, April 4th, doors and registration will open at 8:00 am at the college. An interesting ladies' program will be presented as well as many other events. Saturday tickets are $3.00 each, with no advance or mail ticket sales. Swap and shop table space may also be purchased on Saturday. Advanced registrations are required for the Saturday dinner program. Overnight reservations should be made directly. For additional information, write to MAARC, PO Box 691, Muskegon MI 49443, or contact Mr. Clarke Cooper K8BP, Convention Chairman, at (616)-865-6198.

ROCHESTER MN
APR 4

The Rochester Amateur Radio Club and the Rochester Repeater Society will sponsor the Rochester Area Hamfest on Saturday, April 4, 1981, at a new location, John Adams Junior High, 1525 NW 31 Street, Rochester MN. Doors will open at 8:30 am. There will be a large indoor flea market for radio and electronics items, prize raffles, refreshments, and plenty of free parking. Talk-in on 146.22/.82 (WRØAFT). For further information, contact RARC, WBØYEE, 2253 Nordic Ct. NW, Rochester MN 55901.

UPPER SADDLE RIVER NJ
APR 4

The Chestnut Ridge Radio Club will hold a ham radio and computer flea market on April 4, 1981, from 9:00 am to 3:00 pm at the Education Building, Saddle River Reformed Church, East Saddle River Road at Weiss Road, Upper Saddle River NJ. Tables will be available for $10; tailgating, $5. There is no admission fee. Food and drink will be available. For further information, contact Jack Meagher W2EHD, (201)-768-8360, or Nell Abitabilo WA2EZN, (201)-767-3575.

COLUMBIA MO
APR 4

The Central Missouri RA will present Columbia Hamfest '81 on April 4, 1981, at the Columbia Ramada Inn, Columbia MO. Admission will be $3.00 at the door and advance tickets are available for $3.00 each or 4 for $10.00. Prizes to be awarded include an Icom IC-2AT and a Kenwood TS-130S. Many commercial exhibitors will be present and a large, hard-surfaced tailgate area is available. Forums, association meetings, and XYL activities will round out the day. A banquet on Friday, April 3rd, at 7:30 pm at the Ramada Inn will feature a talk and question and answer period conducted by Mr. James Dalley, FCC Engineer-in-Charge, Midwest Region. An Icom IC-2AT will be given away at this banquet. Banquet reservations must be made in advance and the cost will be $14.00. Special group rates for overnighters will be made by the Ramada Inn. Talk-in on 146.76/.16 and 223.34/224.94. For tickets, information on reservations, available indoor flea-market space, etc., write to Columbia Hamfest '81, PO Box 283, Columbia MO 65201.

GOTEBORG SWEDEN
APR 4-5

The Goteborg Transmitting Amateurs invite all interested hams to an international ham meeting In the Swedish Trade Fair Centre, Goteborg, Sweden, on April 4-5, 1981. Featured will be a thematic stamp exhibition; lectures on VHF, UHF, and SHF; and meetings for YLs, award-hunters, and DXers. Other programs to be announced are fox-hunting, a mobile-radio contest, and a CW speed contest. A hamfest will be held on Saturday night.

PADUCAH KY
APR 5

The Paducah ARES Club will hold its 2nd annual ham/swapfest on Sunday, April 5, 1981, from 8:00 am to 5:00 pm, at the National Guard Armory, Paducah KY. There will be hourly as well as grand prize drawings. Dealers will be on hand. Talk-in on 147.66/.06 and 146.52. For additional information, contact Larry Reid AI4T, Chairman, 220 Longview Drive, Paducah KY 42001.

ST. CLAIR SHORES MI
APR 5

The South Eastern Michigan Amateur Radio Association will hold its Swap & Shop on April 5, 1981, at South Lake High School, St. Clair Shores MI. There will be a grand prize as well as hourly prizes. Ample parking will be available. For table space, write Robert Boudreau WD8RPQ, 27117 Shelbourne, Warren MI 48093, or phone (313)-754-1793.

PARAMUS NJ
APR 5

The Bergen ARA will hold a Ham Swap 'N Sell on April 5, 1981, at Bergen Community College, Paramus NJ. There are thousands of spaces available for tailgating only. Buyers are admitted free. Sellers must pay $3.00 and bring their own tables. For more information, contact Jim Greer KB2EI, 444 Berkshire Road, Ridgewood NJ 07450, or phone (201)-445-2855.

WEYMOUTH MA
APR 11

The South Shore Repeater Association will hold its fifth annual ham auction on April 11, 1981, at Central Junior High School, Broad Street, Weymouth MA. Check-in begins at 8:00 am and the auction starts at 12:00 noon. There will be a raffle with a Yaesu FT-207R HT as the grand prize, as well as many other small prizes during the auction. The winner need not be present to receive the grand prize. Minimum bids of 15% are allowed. Talk-in on 147.90/.30.

KANSAS CITY MO
APR 11-12

The PHD Amateur Radio Assn., Inc., will sponsor the 12th annual Northwest Missouri Hamfest and Missouri State ARRL Convention on Saturday and Sunday, April 11-12, 1981, at the Kansas City Trade Mart, Kansas City MO, from 9:30 am to 5:30 pm. The 1981 directory of all amateurs in the 20-county metropolitan Kansas City, Missouri/Kansas area will be on sale at the hamfest. Display booth spaces are available at a minimal cost of $40.00 for a single 10 × 12 booth, which includes 4 passes, security, electric hookups if needed, tables, chairs, and free parking. For an additional fee of $20.00, extra space (10 × 12) is available. Displays may be set up from

8:00 pm to 10:00 pm on Friday, April 10th, and from 7:00 am on Saturday, April 11th. For further information, contact L. Charles Miller WA0KUH, 7000 NE 120th, Kansas City MO 64166, (816)-781-7313, or Thomas L. Bishop K0TLM, 4936 N. Kansas, Kansas City MO 64119, (913)-342-4939.

FRAMINGHAM MA
APR 12

The Framingham Amateur Radio Association will hold its annual spring flea market on Sunday, April 12, 1981, at the Framingham Police Station drill shed, Framingham MA. Doors will open at 9:00 am and admission is $1.00. Sellers' tables are $7.00 in advance and $8.00 at the door. Talk-in on .75/.15 and .52. For more information or seller pre-registration, contact Ron Egalka K1YHM, 3 Driscoll Drive, Framingham MA 01701, or phone (617)-877-4520.

RALEIGH NC
APR 12

The Raleigh Amateur Radio Society is sponsoring its ninth annual hamfest on Sunday, April 12, 1981, at the Crabtree Valley Mall, US 70 West, Raleigh NC. Activities begin at 9:00 am. General admission is $3.50. There will be many prizes, including a first-prize choice of a Kenwood TS-130S HF transceiver and PS-30 12-volt power supply or an IC-251A multi-mode 2-meter transceiver with Mirage B-108 80-Watt amplifier. Second prize is a triband beam; third prize is a heavy-duty CDE rotor. The drawings will be held all day Sunday. A covered flea market will also be featured. There will be a hospitality room from 7:00 pm to 11:00 pm on Saturday. Talk-in on WR4ACF 146.04/146.64 and WR4AOE 146.28/146.88. For additional information or reservations, write to RARS Hamfest, PO Box 17124, Raleigh NC 27619.

WELLESLEY MA
APR 18

The Wellesley Amateur Radio Society will hold its annual auction on Saturday, April 18, 1981, beginning at 11:00 am, at the Wellesley High School Cafeteria, Rice Street, Wellesley MA. Doors will open at 10:00 am. Talk-in on .60/.03, .04/.64, and .52. For further information, contact Kevin P. Kelly WA1YHV, 7 Lawnwood Place, Charlestown MA 02129.

WAUKEGAN IL
APR 18

The Civil Air Patrol, Waukegan Squadron, will hold its first annual Spring Hamfest on April 18, 1981, from 0700 to 1700, at the Lake County Fairgrounds, IL Rte. 20 and US Rte. 45, Waukegan IL. The donation is $2.00 and tables are $1.50 on a first-come basis. Features will include a large indoor flea market, refreshments, and free parking. Talk-in on 146.94. For more information, call (312)-244-2134, or send an SASE to W9NXR, 637 Emerald, Mundelein IL 60060.

DAYTON OH
APR 24

The 12th annual B•A•S•H will be held on Friday night of the Dayton Hamvention, April 24, 1981, at the convention center, Main and Fifth Streets, Dayton OH. Parking is available in adjacent city garage. Admission is free to all. Sandwiches, snacks, and a COD bar will be available. Live entertainment will be provided. Awards include a new synthesized HT. For further information, contact the Miami Valley FM Association, PO Box 263, Dayton OH 45401.

SPOKANE WA
APR 25

The Inland Empire Amateur Clubs will sponsor a swapfest at the Floral Building at the Spokane Interstate Fairgrounds, Spokane WA, on Saturday, April 25, 1981, beginning at 9:00 am.

✓ Reader Service—see page 82

Admission and exhibit space are free. Flea market tables are \$5.00 per 4' × 8' table. Features include an auction, contests, raffles, old and new gear, a YL's corner, a snack bar, a Dixieland band, and commercial and non-commercial displays. Talk-in on 146.34/.94 and 146.52. For reservations for tables, exhibit space, and/or a free RV site (without electrical hookup), write Swap Fest, c/o Jan Thiemann KA7DDU, 7803 E. Mission, Spokane WA 99206.

MOUNT PLEASANT TX
APR 25

The Mount Pleasant High School Amateur Radio Club will sponsor an indoor swapfest on April 25, 1981, at the Mount Pleasant High School campus, Mount Pleasant TX. Doors will be open from 7:00 am to 3:00 pm. Admission is free and table space is \$3.00. Door prizes will be awarded. Talk-in on 146.34/.94. For further information, contact Scott Redfearn N5BQG, Box 105, Mount Pleasant TX 75455.

AMBOY IL
APR 26

The Rock River Amateur Radio Club will hold its 15th annual hamfest on April 26, 1981, at the Lee County 4H Center in Amboy IL, one mile east of the junction of Rtes. 52 and 30, 10 miles south of Dixon IL. There will be free coffee and donuts starting at 8:00 am. Camping space will be available at a nominal charge. Six-foot display tables are \$5.00 each and tickets are \$1.50 in advance, \$2.00 at the gate. Talk-in on .37/.97 and .52. For full details, contact Charles (Chuck) Randall W9LDU, 1414 Ann Avenue, Dixon IL 61021, or phone (815)-284-6380.

NEWTON MA
APR 26

The Middlesex Amateur Radio Club will hold its first annual indoor flea market on Sunday, April 26, 1981, at the Wayland High School Commons building, located on Rte. 126, between Rtes. 30 and 20, Wayland MA, from 10:00 am to 4:00 pm. Admission is \$1.00 at the door and ample off-street parking is available. Advance reservations for tables are \$6.00 each and at the door \$7.50 each on a first-come-first-served basis. The doors will open at 9:00 am for setups. Talk-in on 147.96/.36 and 146.52. For table reservations, contact Irving Geiler WA1CDW, Apt. 8422A, 1450 Worcester Road, Framingham MA 01701.

JACKSON MS
APR 26-27

The Jackson Amateur Radio Club will host the ARRL Mississippi State Convention from 12:00 noon to 5:00 pm on April 26, 1981, and from 8:00 am to 2:00 pm on April 27, 1981, at the Raymond Road National Guard Armory, off Interstate 20, Jackson MS. Activities will include dealers, forums, a flea market, prizes, and YL prizes. Admission is free. Swap tables will be \$5.00 each day. Talk-in on 146.16/.76, 146.52, and 3987.5. Food will be available at the site on both days. A banquet will be held Saturday night at the Holiday Inn-Southwest. Please make reservations for both the swap tables and the banquet in advance. For more information, contact Nita Stone N5AGV, Rte. 1, Box 157, Brandon MS 39042, (601)-825-2060.

WOODBRIDGE NJ
MAY 2

The DeVry Technical Institute Amateur Radio Club (WA2MDT) will hold its fifth annual amateur radio and computer flea market on May 2, 1981, at DeVry Technical institute, 479 Green Street, Woodbridge NJ. The flea market will begin at 9:00 am and for those who wish to set up tables, a fee of \$3.00 will be charged. Talk-in on 146.520 beginning at 8:00 am. For further information, call Frank Koempel WB2JKU at 634-3460 or Steve Hajducek KA2IFX at 727-5962.

MEADVILLE PA
MAY 2

The seventh annual Northwestern Pennsylvania Hamfest will be held on May 2, 1981, at the Crawford County Fairgrounds, Meadville PA. The gates will open at 8:00 am. Admission is \$3.00; children under 12 will be admitted free. Indoor table spaces are \$5.00 per space and outdoor car spaces are \$2.00. Bring your own tables. Refreshments will be available. Commercial displays are welcome. Talk-in on .04/.64, .81/.21, and .63/.03. For information, write CARS, PO Box 653, Meadville PA 16335, Attention: Hamfest Committee.

GRAY TN
MAY 2-3

The Bristol Amateur Radio Club, the Johnson City Amateur Radio Association, and the Kingsport Amateur Radio Club will hold their first annual Tri-Cities Hamfest on May 2-3, 1981, at the Appalachian Fairgrounds, north of Johnson City (off Highway 137), Gray TN, from 9:00 am to 5:00 pm on Saturday and from 8:00 am to 4:00 pm on Sunday. The dealer space charge at the door is \$30.00 for the weekend for a 10 × 12 space. The advance reservation charge is \$25.00 and must be received by April 1, 1981. The dealer charge also includes security and admission for five employees. There are approximately 40 RV spaces with complete hookups renting for \$5.00 per night inside the fairgrounds. Motels are available nearby. Dealers can set up anytime after Friday noon or after 6:00 am Saturday and Sunday. Advance reservations or further information can be obtained by writing Mary S. Biggs KA4EXP, Secretary-Treasurer, Tri-Cities Hamfest, PO Box 3682 CRS, Johnson City TN 37601, or phoning either (615)-928-1818 or (615)-282-1711-x380.

GREENVILLE SC
MAY 2-3

The Blue Ridge Amateur Radio Society will hold its annual hamfest on May 2-3, 1981, at the American Legion Fairgrounds, Highway 25 bypass, Greenville SC. On Saturday, FCC exams will be given at Greenville Tech from 10:00 am till 3:00 pm. Other features will include dealer exhibits, inside flea markets, chicken/pork plates, prizes, overnight RV parking, and motel rooms available at the Ramada Inn (1-800-228-2000).

PENNS PARK PA
MAY 3

The Warminster Amateur Radio Club will hold the 7th annual Ham-Mart on Sunday, May 3, 1981, from 9:00 am to 4:00 pm (rain or shine) at a new location, Middleton Grange Fairgrounds, just minutes from I-95 or the Pennsylvania Turnpike on Penns Park Road, Penns Park PA. Featured will be door prizes, plus a grand prize to be drawn at 3:00 pm, a flea market, a free FM Clinic, and an auction. There will be refreshments, rest rooms, and shelter available. Registration is \$3.00 per person, which includes one ticket for door prizes. YLs, XYLs, and children under 14 will be admitted free. Seller (tailgater) spaces are \$2.00 (with tables available). Talk-in on 146.52 or WARC 147.69/.09. For additional information, write WARC, PO Box 113, Warminster PA 18974, or call Mark Hinkel WA3QVU at (215)-657-7295.

HAM HELP

I'm looking for any information about a typewriter, a Singer Flexowriter type 2309, manufactured by the Business Machines Division in the mid 60s. The typewriter has tape punch and tabulate options.

I need especially information on how to interface the typewriter to a Z-80-based microprocessor system, electrical and logical diagrams of the typewriter, or the postal address of the Singer Company. I'm ready to bear the expenses for copies and for mailing. Thank you very much for any help.

Dominikus Maisl DF6TQ
Wehrstrasse 37
7320 Goeppingen
Federal Republic of Germany

I am in need of a schematic diagram and operating manual for an Eico model 425 oscilloscope, produced in the 1950s. I'll be glad to pay copying costs. Thank you.

Ed Danielczyk K9SXU
9 Lloyd St.
Cary IL 60013

I'm looking for information on the replacement of the 7360 balanced modulator in a Yaesu FTDX-560 with solid-state unit. This is due to the current price here of \$26 (Australian) for the tube. Thank you.

David B. Simpson VK4VHR
PO Box 2311
Mount Isa 4825
Queensland, Australia

CONTESTS

from page 14

only once for each team. When DX/WK partners contact each other it counts as a double multiplier. Final score is the sum of QSO points times the total multiplier.

AWARDS:

Extraordinary certificates will be issued to the highest individual score, DX/WK teams, YL/OM teams, and score for highest single operator category. Regular certificates to the highest state, country, and Canadian province winners.

ENTRIES:

Logs must show date/time (GMT), RS, SSBer number, partner's call, mode of operation, a band, and period of rest time. Summary sheets show number of states, Canadian provinces, countries, YL/OM teams, DX/WK teams, and partner contacts. All entries must be postmarked by May 15th.

Any member desiring to enter the DX/WK team category should immediately send request to: Lyle F. Shaw KC4LF, 6329 Fairway Blvd., Apollo Beach FL 33570. For record purposes, requests should be made in writing. In the week preceding the QSO party, members wishing a partner may request one through system controls on SSBers daily systems. No team assignments will be made after the party begins.

YL/OM teams are self-evident in their operation and need not file. Single-operator category members are eligible unless entered with teams. Non-members enter single op *only!* DX/WK teams consists of a DX and WK member. The team score is the sum of both partners. Score to be determined when both logs are received. When only one log is received, credit will be given as a single operator. YL/OM teams consist of one YL member and one OM member who are related: husband/wife, father/daughter, mother/son, brother/sister. Operation must be from the same QTH, using the rig with his/her own call.

HELVETIA CONTEST
1500 GMT April 25 to 1500 GMT April 26

Use all bands, 1.8 to 28 MHz, on CW or phone. Each station can be worked once per band regardless of mode.

EXCHANGE:

RS(T) plus three-figure serial number starting at 001. Swiss stations will also give their canton.

SCORING:

Each contact with an HB station counts 3 points. The multiplier is the sum of Swiss cantons worked on each band, 26 maximum per band. Final score is sum of QSO points multiplied by the sum of cantons worked on each band.

ENTRIES AND AWARDS:

Certificates will be given to the highest scorer in each country. USA and Canadian call areas are considered as separate countries. Logs must be postmarked not later than 30 days after the contest and sent to: TM USKA K. Bindschedler HB9MX, Strahleggweg 28, 8400 Winterthur, Switzerland.

Canton abbreviations are: ZH, BE, LU, UR, SZ, OW, NW, GL, ZG, FR, SO, BS, BL, SH, AR, AI, SG, GR, AG, TG, TI, VD, VS, NE, GE, and JU.

H26 Award—for contacts made after January 1, 1979: Send a list and QSL for each of the 26 cantons worked on CW and/or phone, RTTY, and SSTV to: Walter Blattner, Postbox 450, Locarno 6601 Switzerland.

RESULTS

1980 SARTG WORLDWIDE RTTY CONTEST

Single Operator—Class A

I3FUE	350,900
I7FKO	278,780
SM8ASD	215,670
W3FV	215,040
G3HJC	195,500

Multi Operator—Class B

I5MYL	324,360
OE9ERI	244,720
G3UUP	210,540
OK3KFF	137,550
OH2ZY	128,040

Shortwave Listeners—Class C

G8IZD	227,525
H. Ballenberger	184,755
Y2-2814/M	140,400
G8CDW	96,960
K. Wustner	86,790

RESULTS

1980 CAN-AM CONTEST

Trophy Winners

Canadian Combined Champion: John Sluymer CZ6OU
American Combined Champion: David Hachadorian K6LL/7
Canadian Phone Trophy: Doug Freestone XJ5UF
American Phone Trophy: Jack Webb W5JW
Canadian CW Trophy: Graham Williams VE2WA
American CW Trophy: Trey Garlough WN4KKZ
Canadian Multi-Op Champion: Prince George CC VE7ZZZ
American Multi-Op Champion: Stan Griffiths W7NI
Club Competition: The Other Club (Wash., B.C.)

HAM HELP

Three years ago, you published a letter from us asking for hospitality on our visit to California. Thanks to you, we made many new friends and had a marvelous time.

We plan another visit to the U.S. this August and want to spend a few days in Washington DC, where we don't know anyone. If any family can offer hospitality for 3 to 4 days, we would be glad to reciprocate and offer our home for a visit.

We are an easygoing, adaptable couple in our mid-thirties who enjoy meeting people and dislike formal hotels. Michael is an electronics engineer, a ham, and a pilot. I am a children's nurse.

We live in a beautiful and historic part of England, about 2 hours from Edinburgh and the Lakes District, and about 3 hours by train from London. We love visitors and meeting people, so I am sure this vacation will be as great as our last.

Pat and Michael Stott
"Wellview"
12 Castle View, Ovingham
England NE42 6AT

I heard from a friend that there was a Dungeons and Dragons net on 20 or 40 meters and I would appreciate any info on this. Thanks.

Al Fogleson KA8HFS
1654 Dyson
Muskegon MI 49442

I'm searching for a Collins 32S1 transmitter in any condition that is not being used and is cheap. State condition and price.

H.F. Schnur
115 Intercept Ave.
North Charleston SC 29405

I'm looking for a Collins KWM-2-to-KWM-2A conversion kit, Collins main tuning knob (553-5787-003), and quad antenna spreaders.

Hobie Steele
Rte. 3, Box 273
Cambridge MD 21613
(301)-228-7595

FUN!

from page 34

6) Soviet jamming stations, intent on keeping "undesirable" broadcasts from being received in their country, legally identify themselves on CW.
7) Radio Berlin International operates from West Berlin.
8) The Voice of America is prohibited by Congress from broadcasting in any language but English.
9) There is a shortwave broadcast band allocated at 11 meters.
10) Radio Peace and Progress is a Soviet shortwave station.
11) "Suomen Yleisradio" broadcasts from Samoa.
12) SINPO is an acronym for the Special InterNational Programming Organization.
13) "The Graveyard" is the SWL's nickname for 40-meters.
14) In many countries, you have to be an SWL before you can become a ham.
15) The *International Frequency List* is a publication listing in five volumes *all* of the world's radio stations.
16) The "Worldwide TV-FM DX Association" is an organization specializing in VHF-UHF SWLing.
17) Some countries require SWLs to license their receivers.
18) WCC in Chatham MA, broadcasts news reports, in CW, on 6.376 MHz.
19) Many ship stations have the same type of four-letter callsigns as broadcast stations, e.g., KXXX.
The U.S. AM broadcast band has only 23 channels.

ELEMENT 5—HAM ACROSTIC

Guess the words defined and write them over the numbered dashes. Next, place each letter in the correct square in the puzzle. The black squares show word endings. The completed puzzle will form a statement relating to shortwave listening. (Illustration 2)

A) Medium-wave antenna....... 28 50 42 51

B) "The East is Red"........... 65 9 41 2 67

C) A shortwave station's "tongue".................. 5 13 36 8 48 16 17 46

D) Jammers produce this....... 59 18 4 15 31

E) Old-style receiver component. 62 58 60 12

F) Effect of Radio Moscow report about Soviet farming on listeners.................... 19 27 32 64

G) Element missing from Radio Moscow's news programs.... 10 14 1 33 63

H) Famous army radio station... 53 35 49

I) Woodpecker's alleged purpose..................... 55 24 25 39 38

J) SWLs throw this when a rare station is QRMed........... 43 66 3

K) Engineering society......... 29 54 6 45

L) What Germans call East Germany..................... 37 40 57

M) Spanish "I"................ 61 20

N) Iraq amateur prefix.......... 11 26

O) Number of megahertz in SWL 90-meter band.............. 21 22 23 56 47

P) RTTY press station's test letters...................... 44 34

Q) Your author's former call suffix 7 30 52

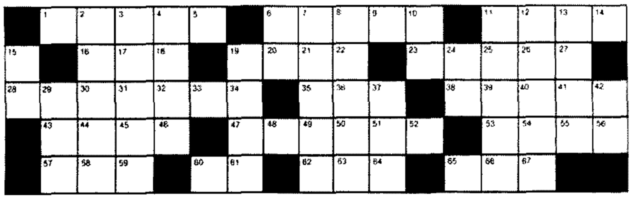


Illustration 2.

THE ANSWERS

Element 1:
See Illustration 1A.

Element 2:
1-J, 2-S, 3-P, 4-F, 5-M, 6-I, 7-U, 8-R, 9-A, 10-T, 11-N, 12-B, 13-O, 14-D, 15-L, 16-G, 17-Q, 18-C, 19-E, 20-H.

Element 3:
(Reading from left to right) utilities, broadcast, tropicals, clandestine; band, domestic, program, listen; music, religious, interval, language; government, propaganda, engineer, overseas; calibrate, foreign, relay, static.

R	A	D	I	O	M	O	S	C	O	W	S
A	M		T		E		W		C		O
D		S	A	I	D		A	N	T		U
I	N	T	L		I	O	N	O			T
O			Y	O	U			W	R	T	H
L	O	S	S		M		S		P		A
I		R			W	A	T	E	R		M
B	C	I		C	A		A				E
E			W	W	V		T	O	W	E	R
R	X		O		E		I	B	A		I
T		G	R			C	O		N		C
Y	A	N	K	E	E		N	E	T		A

Illustration 1A.

Element 4:
1) True—In a series of experimental transmissions during November, 1980. More SSTV broadcasts may take place this year.
2) True—Aren't they thoughtful!
3) False—WYFR and KGEI, among others, are privately owned.
4) False—They're commercial stations transmitting business or safety traffic.
5) True—Radio energy from the giant planet can be detected at those frequencies with the proper receiving gear.
6) True—Ironic, isn't it?
7) False—East Berlin.
8) False—Like most international broadcasters, the VOA transmits in dozens of languages.
9) True—25.600-26.100 MHz. Just below you-know-what.
10) True—Peacefully progressing toward what?
11) False—It's Finnish for Radio Finland.
12) False—It's a reception report form, similar to the amateur RST system. The letters stand for: Signal, Interference, Noise, Propagation, and Overall merit.
13) False—It's the term applied to the upper end of the U.S. AM broadcast band where many low-powered stations are grouped.
14) True—This is especially true in many eastern European countries where SWLs must obtain a certain number of amateur QSLs before they're allowed to transmit. So answer those SWL QSLs!
15) False—Amateur, maritime, experimental, and a few other types of stations aren't listed, but just about everyone else is. The ITU publishes it.
16) True—You can write them at PO Box 97, Calumet City IL 60409.
17) True—As a matter of fact, most countries slap a fee on radios and TVs—a way of raising revenues to subsidize government broadcasting.
18) True—Great code practice.
19) True—Confusing, isn't it?
20) False—One hundred and seven channels, but more are on the way as soon as the FCC can add more by pushing existing stations closer together.

Element 5:
See Illustration 2A.

	U	N	T	I	L		E	I	G	H	T		Y	E	A	R
S		A	G	O		B	O	T	H		R	A	D	I	O	
L	I	B	E	R	T	Y		A	N	D		R	A	D	I	O
	F	R	E	E		E	U	R	O	P	E		W	E	R	E
	R	U	N		B	Y		T	H	E		C	I	A		

Illustration 2A.

SCORING

Element 1:
Twenty points for the completed puzzle, or 1/2 point for each question correctly answered.
Element 2:
One point for each station you matched to its QTH.
Element 3:
One point for each word unscrambled.
Element 4:
One point for each correct answer.
Element 5:
One point for each correct definition. Give yourself 10 extra points if you deciphered the message.

Rate your SWL skills as follows:

1-20 —You listen to shortwave on a radio purchased from a sidewalk vendor. Can sometimes hear Radio Moscow.
21-40 —You write weekly letters to "DX Mailbag" and are deeply thrilled when you hear your name announced on the air.
41-60 —You monitor Radio Warsaw while working Novices on 40.
61-80 —You log countries by the dozen and are the object of extreme envy from your peers.
80-100 + —A real pro. You're probably interviewed by Dan Rather for your interpretation of foreign broadcasts during world crises.

Next month: ARRL

HAM HELP

I am trying to locate Icom 22As, 215s, or similar radios—in working condition—that can operate just above and just below 2 meters (for MARS and similar applications).

Jim McCallum WB6INJ
10051 Perdido St.
Anaheim CA 92804

I need some help learning to speak Nynorsk, the "other language" spoken in Norway. I have some books and can get along fairly well in Riksmaal, and now it's time to learn Nynorsk.

Perhaps there are amateurs living in the USA who speak this language or one of its dialects. I would like to arrange a weekly sked on 75 or 40 SSB to help get this pronunciation straight—not to mention the grammar. Drop me a line and we'll work up a sked.

Tusin takk og paa gjensyn!

Nils R. Bull Young WB8IJN
920 Greenheart Drive
New Carlisle OH 45344

I need the manuals for and any details on converting the Heathkit HW-29A and Lafayette HE45a 6m rigs to FM. I would also like to convert a Gonset IV to FM. I will pay for all expense of copying and mailing.

Richard McCubbin
535 Church St.
Portland MI 48875

My hobby is listening to shortwave radio and DXing. I need help because I recently purchased a used Hallicrafters model SX-110 receiver, but have been unable to obtain an operator's manual. If anyone has an operator's manual, please contact me. Thank you.

Edward L. Gafford
221 Royer Court
Louisville KY 40206

I am interested in hearing from Field Day 2 owners about what kind of results the unit gives with less than perfect code, sloppy code, QSB, QRM, etc.

Berand Kirschner WB9YCQ
4439 Jupiter Drive
Riverside CA 92505

I am looking for a crystal-controlled CB rig which has 4 to 6 or more channels and separate crystals for transmit and receive, in LA or Orange counties.

Al Gordon
1726 Sprockels Lane
Redondo Beach CA 90278
(213)-372-8560

I need information and a service manual for the Heathkit® DX-100 transmitter, and would also like to know of any modifications done on the rig. I'll pay for copying. Thanks.

John S. Lee KA4EPR
17401 NW 20 Ave.
Miami FL 33055

I'm looking for information on a Northern Radio Company, Inc., F.S. diversity converter, circa 1956. It is a type 174, model 1, serial 180. I believe that this is a terminal unit for RTTY, has a variable frequency shift, and was used in the Air Force. I would really appreciate any help on this.

Gary L. Young N3ALL
Box 129
Wise's Grove Road
New Brighton PA 15066

Does anyone have any information on building test and calibration equipment for the 2-4 and 3.7-4.2-GHz ranges? Also, what would be the lowest possible cost?

Lamar Evans II
Rte. 1, Box 87C
Anacoco LA 71403

LEAKY LINES

from page 18

proper examination. Why propose quantitative growth while running the real risk of a reduction in quality?

Why should the back door be opened for unqualified persons to slip through and get amateur privileges? No one stops anybody from becoming an amateur. Why should a special route be opened for those who are unwilling to exert enough effort to earn the privilege?

And although the ARRL appears to be viewing the matter from the position that it will act in accordance with the wishes of the membership, it is very clear that in raising uncertainty about it at all, instead of opposing it from the outset, it is placing ham radio in possible jeopardy. By expressing unqualified opposition at once, the League would have served notice that it believes the Commission grievously wrong. And it is about time that someone stood up to the FCC for a change. Many FCC proposals in recent years have shown rather clearly that the Commission is not overly impressed with the necessity of safeguarding the continued existence of amateur radio, at least not as we have known it.

I believe that the digital licensing proposal is one of the most dangerous ever made, and I exhort all amateurs to ponder well what it can mean in terms of the survival of our hobby. It must be resoundingly opposed, and ARRL directors must be made aware that their constituents are solidly against it. Our League must take a position consistent with the wishes of its membership, for if it fails to do this, it no longer deserves to be considered the leading representative body in ham radio.

AWARDS

from page 44

tor Service, and radio communications throughout Australia in general. Today, thanks largely to the efforts of John Flynn, every cattle station and settlement in the Australian outback has radio communications.

Flynn spent his whole working life in the outback helping others, no matter what nationality or color. Last year was the 100th year since the birth of John Flynn, and the Alice Springs Community College Radio Club had 2,000 certificates printed in memory of this great man.

Amateur operators worldwide are encouraged to participate in recognizing the achievements of such a radio pioneer.

To qualify, all VK stations must make three contacts with Alice Springs club members; all other stations of the world must log at least two contacts with Alice Springs club members. The award is also available to SWL stations who can log at least 3 station contacts heard. There are no band or mode restrictions for the award. Listen for VK8s.

To apply, have your contacts with the VK8s of the Alice Springs club verified by at least two radio amateurs or a local club secretary. Keep in mind that the same station may be worked more than once if the contacts are separated by 24 hours.

Enclose your application along with a donation of $3.00 to the Awards Manager. All funds generated by this award will be given to charity. Send your application to: ASCCRC Awards Manager, PO Box 2953, Alice Springs, Northern Territory, Australia 5750.

VK8 OUTBACK AUSTRALIAN AWARD

My thanks goes to Laurie Day VK8LD for forwarding the latest details about the very popular VK8 Outback Australian Award.

To qualify for the award, applicants must make contacts with members of the Alice Springs Community College Radio Club. VK stations and SWLs must contact at least 6 club members; all others must make a minimum of 3 club member contacts. To be valid, all contacts must have been made after December 1, 1979. There are no band or mode restrictions.

A list of club members can be obtained by sending your request with 3 IRCs or $1.00. Fees for the award are: $2.00 for VKs; $2.50 for DX stations. Forward your list of contacts, verified by two fellow amateurs, to The Awards Manager, VK8 Outback Australian Award, PO Box 2953, Alice Springs, Northern Territory, Australia 5750.

HAMVENTION STATION

WD8EOL and W8ILC have informed us that special-event station W8BI will be operating from the Dayton Amateur Radio Association's communications van on Hamvention days, April 24, 25, and 26, 1981. Special Dayton Hamvention certificates will be sent to anyone contacting W8BI who sends a large stamped envelope. Send QSL to W8BI (special event station), P.O. Box 44, Dayton OH 45401. Frequencies: 14.295, 7.230, and 7.125 (CW). Times: Friday, April 24, 1800—2200 UTC; Saturday, April 25, 1400—2200 UTC; and Sunday, April 26, 1400—1800 UTC.

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 8

Like anything else, if you are going to make money at gambling you should know more than the information you get in *Reader's Digest*. The fact is that there are a number of very good books on the subject of gambling... and on how to win. The further fact is that if you know how to gamble and have some experience, you can win consistently. I'm not just talking about counting the cards at 21, which is old hat by now... I'm talking about craps.

Not having done my homework... and not really having much time... I avoided the gambling this trip.

CES has nothing whatever for the ham business. It is mostly involved with things like hi-fi, car stereo, calculators, digital watches, radar detectors, television sets, VTRs, and dirty-movie video cassettes. They had one whole room devoted to porno cassettes!

There were a few microcomputer exhibits... such as the new H-P personal computer system, the new color Commodore system, T.I., Atari, Mattel, Bally, NEC, Casio, Panasonic, Quasar, APF... etc. Apple wasn't there, but I did run into Steve Jobs, who recently became a multimillionaire when the Apple stock went on the market. Every

DXPEDITION CALENDAR

To better serve our readers we are considering beginning a DXpedition Calendar. If you are interested in having your operation included in this listing, please include locations, dates, callsigns, frequencies, operating hours, QSL info, etc., along with the name of a person to contact if there are any questions about the operation.

Please send your DXpedition info to Editorial Offices, *73 Magazine*, Pine Street, Peterborough NH 03458, attention: DX Calendar.

NET OPERATIONS

We would like to accumulate a list of active nets and their purposes for a possible directory. If you are interested in having your net operation listed, type or print (neatly) its particulars (purpose, dates, frequencies, etc.) along with the name of someone to contact should there be any questions. Depending on the response, a very comprehensive special-interest directory could result.

If you would like to participate, write to Editorial Offices, *73 Magazine*, Pine Street, Peterborough NH 03458, attention: Net Operations.

HAM LICENSE CLASSES

If you or your club are giving or planning to give code and theory classes, please let us know. Include dates of each session, license classes taught, and the name of someone to contact for complete information. With this, we can perhaps direct an aspiring amateur to a nearby class. More than one ham has been asked about helping a beginner or a ham who wishes to upgrade and was unaware that the club across town was having classes.

If you would like to have your classes listed, please write to Editorial Offices, *73 Magazine*, Pine Street, Peterborough NH 03458, attention: License Classes.

time the Apple stock drops one point he loses about $5 million...how'd you like to be in that position?

A lot of the consumer electronics magazines were there. I got to see a recent issue of *S-9* ...now shrunk to 72 pages, with just 12 pages of advertising ...even thinner than *onComputing*, with its 15 pages of ads. *CB Magazine* is really looking good, with its increased ham orientation...thus encouraging CBers to move on into hamming. Gordon West, the *CB* editor, has rebounded well after his experience with the ARRL. Apparently the shafting was discussed at length at SAROC.

WEST QUESTIONS

Since a lot of amateurs get all bent out of shape at any mention of the League, let's steer clear of that organization entirely. Besides, I'm really sick of hearing the old saw that I am anti-League. I'm anti the bad guys, no matter where they are ...in Washington, Newington, or Oregon.

Now, to cases. Gordon West, the editor of *CB Magazine*, recently ran for office in a national club and was refused the right at the last moment to have his votes counted by that club's general manager. Attempts at getting a rational explanation of this weird and seemingly dictatorial move have so far been frustrated. Please then consider this a general call: If anyone in the readership of this magazine knows the real reason for this move, please write it up so it can be published. Please send this information to all ham magazines and let's see which have the guts to print the facts.

HAM HELP

I am in need of a service manual on military transmitter T368D/URT. I will copy and return or possibly purchase outright. Thank you.

A. K. Seput KA2AYS
258 Hillside Avenue
Palisades Park NJ 07650
(201)-461-9169 after 7:00 pm

Can anyone help me locate information on a Harrison Laboratories model 510 regulated power supply (0-36 V, 10 A)? A manual or schematic would help and I will gladly pay for reproduction costs. Many Thanks.

James O. Dickinson W4LLF
1408 Monmouth Court West
Richmond VA 23233

I need a manual for an Elco capacitance meter, model 955. I'll pay for photocopying or will copy and pay postage both ways. I also need a power transformer and/or schematic showing power transformer for a Hallicrafters SX-9 receiver. State cost of transformer in first letter, please. All letters or calls answered. Call collect.

Ernest C. Wankowski KB5OJ
5510B Follett Road
Fort Sill OK 73503
(405)-248-6630 after 1800 CST

I need a copy of the manual for the National NCX-3—an original or photocopy would be fine. I'll pay costs.

W. Dennis W1WA
Box 1103
Marblehead MA 01945

All Armenian amateur radio operators interested in getting together on the ARARAT Net, please contact me for sked and information.

Stefan Karadian N8BGD
7127 Brookridge Drive
West Bloomfield MI 48033

Wanted are any of the Collins speakers, models 312A-1, 312B-1, or 270G-3, along with a Collins gear-reduction knob like that used on the 75A series of receivers and KWS-1 transmitters. Also desperately wanted is a copy of the instruction and/or service manual for a Roberts 770X tape recorder. Will pay cash to have manual copied or would take a used book with all pages. Many thanks.

Clano R. E. Strachan C6ANI
PO Box N4106
Nassau NP, Bahamas

I need operating manual number TM11-5820-358-10 for the R390A military receiver. I will pay for copies or pay postage both ways. Thank you very much.

Harold Sherven KA9BPS
951 Christina Court
Plainfield IN 46168

I need information and a schematic for a Golden Falcon model 150 power amplifier. I need to know frequency ranges and any other information.

E. L. Sandefur N6DSZ
17711 Van Buren St., #E
Huntington Beach CA 92647

Is there anyone out there who can lend or copy the circuit diagram and other info for a model 830 oscilloscope-wobbulator made by Triumph Manufacturing Co., Chicago, Illinois (1950 or earlier)? Thanks.

Ladd Sajor W2KGV
767 Lomas Street
Port St. Lucie FL 33452

I am looking for schematic diagrams for the following radios: E.F. Johnson Viking Ranger (maroon and grey case), Navy type CRI-43044 (TBY-6), RT-70, and AM-65 (Mil.)

I am also looking for someone with at least a General class license who is willing to give the Novice test to 6 or 7 people. I and a few other club members do not have licenses and we have been waiting to take our tests for a long time. The school is located in lower Manhattan near 14th St. Thank you.

Timothy O'Neill, President
Xavier High School ARC
1753 Ryder St.
Brooklyn NY 11234

I am looking for RIT mods for the Heath HW-8 CW transceiver and the Heath HW-32 20m Single Bander. I would also be interested in other mods. Thanks.

Bill Graham N8BMK
Box A223A, Rt. 5
Paris KY 40361

Any amateur who is a current or former member of the United States Army Signal Corps who has served with, or been attached to, Royal Signals is invited to become a member of the Royal Signals Amateur Radio Society. Those who wish to apply for membership should write to me for application forms and further details.

Capt. J. Cooper G3DPS
Vice-President, RSARS
"Belmfels", Old Odiham Road
Alton, Hants
GU34 4BP, England

I need meter and maintenance instructions with parts list for a TS-375A/U vacuum-tube voltmeter. I also need an oven (Ref. S-105) with or without 5-MHz crystal for a TS-186D/UP frequency meter.

Elmer H. Melvin WA8DJY
5050 New Market Rd.
Hillsboro OH 45133

NEW PRODUCTS

from page 38

paddles and it's ready to go with automatic and programmable memories. It has iambic operation and dot-dash memory.

Five-level Baudot is transmitted at 60 wpm. RTTY and CW ID are provided via the ID button and message A. Carriage return, line feed, and letters are sent automatically on the first space after 63 characters on a line. All up and down shift is done automatically. A down shift occurs on every space to quickly clear any garbles in reception. The Baudot mode also includes all applicable features of the CW mode.

In the ASCII mode, transmission speed is 110 baud. Both upper and lower case are generated, and all the features of the Baudot mode are included here also.

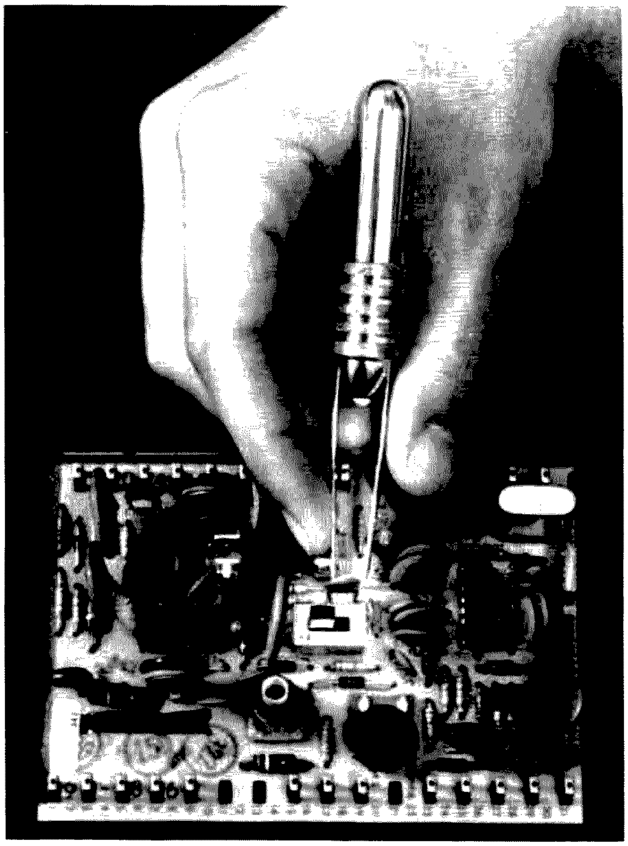
Controls and keys on the 494 are positioned logically and labelled clearly; pots are used for speed, volume, tone, and weight because they are easier to use than keystroke sequences and they remember your settings even if power is lost or turned off.

The MFJ-494 operates on 9-12 V dc or 110 V ac with optional ac adapter. The same keying circuit used in all MFJ keyers is used in the MFJ-494.

Available options for the keyboard include the MFJ-53 and the MFJ-54. The 53 is an AFSK plug-in module. The output of the module plugs into the mic or phone patch jack for FSK with SSB rigs and AFSK with FM or AM rigs.

The MFJ-54 loop-keying, plug-in module is a 300-V, 60-mA, loop-keying circuit that will drive your RTTY printer.

For more information, contact *MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762; (601)-323-5869.* Reader Service number 480.



Desco Industries' precision tweezer.

ELECTRICAL POLLUTION CONTROL

Electrical pollution drives microprocessors bananas! Power line electrical noise, hash, and spikes often cause erratic operation. In addition, severe spikes from lightning or heavy machinery may damage expensive hardware.

Electronic Specialists recently announced the Super Isolator, designed to control electrical pollution. Incorporating heavy-duty spike/surge suppression, the Super Isolator features 3 individually dual-pi-filtered ac sockets. Equipment interactions are eliminated and disruptive/damaging power-line pollution is controlled. The Super Isolator will control pollution for an 1875-Watt load. Each socket can handle a 1000-Watt load.

For more information, contact *Electronic Specialists, Inc., 171 South Main Street, Natick MA 01760; (617)-655-1532.* Reader Service number 486.

PRECISION TWEEZER HAS BUILT-IN LIGHT

Desco Industries has added three models of battery-powered lighted tweezers to its line of electronic assembly aids. These tweezers all have stainless steel blades and are powered by a single AAA battery.

A low-cost, plastic-case model is available for working in poorly-lighted field situations. Two stainless-steel-case models are available, one with a straight tip and one with an angle tip.

For more information, contact *Desco Industries, Inc., 351 F Oak Place, Brea CA 92621; (714)-990-3005.* Reader Service number 482.

YAESU FT-902DM

Yaesu has announced an improved version of the FT-901DM, the FT-902DM. While the 902 retains most of the features of its predecessor, several important changes have been made.

The 902 covers all present and proposed HF amateur bands, including the new WARC bands. The digital frequency readout has been improved to eliminate the need for recalibration when changing modes or bands. The built-in keyer features both dot and dash memories, and the receiver's dynamic range has been improved. Last, but not least, the vfo knob now tunes in the right direction!

For more information, contact *Yaesu Electronics Corp., 6851 Walthall Way, Paramount CA 90723.* Reader Service number 485.

TEMPO S-4

Tempo, a pioneering manufacturer in the field of synthesized hand-held radios, has announced a new 440-MHz FM hand-held. The new S-4 is nearly identical to the other Tempo hand-helds which are offered for the 2-meter and 220-MHz bands.

Available accessories include 12- or 16-button touchtone™ pads, CTCSS tone encoder, and a leather carrying case.

For more information, contact *Henry Radio, 2050 S. Bundy Dr., Los Angeles CA 90025.* Reader Service number 481.

NEW MFJ HF WATTMETER

The new MFJ-814 HF wattmeter/swr meter has a frequency range of 1.8-30 MHz. It reads forward and reflected power on two scales (2 kW and 200 Watts) on a 2-1/2" wide × 1-1/2" high lighted meter (light

The MFJ-814 HF swr wattmeter.

requires 12 volts).

This power meter also reads swr directly and is calibrated up to 6 to 1 swr. Three push-button switches let you switch between power and swr, high and low power, and forward and reflected power.

Eggshell white with black top and sides, the meter measures 6-1/4" × 3-1/2" × 3-1/2".

For more information, contact *MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762; (601)-323-5869.* Reader Service number 484.

NEW MODEL FROM ALUMA TOWER

Designed especially with the ham operator in mind, Aluma Tower's new extra-heavy-duty aluminum tower meets our special needs. All uprights and cross braces are 1" seamless drawn-aluminum tubing with stainless steel aircraft cable connecting the telescoping sections. The mast is 2" diameter × 8' long and is supplied bolted in place.

Aluma Tower's telescoping construction and tilt-up style enable it to withstand any weather conditions.

For more information, contact *Aluma Tower Company, 1639 Old Dixie Highway, Vero Beach FL 32960.* Reader Service number 479.

HY-GAIN ADDS THREE NEW PRODUCTS TO TOWER LINE

Telex Communications, Inc., has announced the addition of three new products to its Telex/Hy-Gain tower line. The HG-70HD, a new 70-foot (21.3 m), self-supporting crank-up tower, is the tallest of seven towers now offered by Telex/Hy-Gain. The tower is all steel, has four sections, and features an improved guide system providing rigid, close-tolerance structural support while leaving the tube ends open for complete surface galvanizing and unrestricted moisture drainage. This heavy-duty tower was designed for antenna loads of up to 16 square feet (1.5 sq. m) in winds of up to 60 mph (96.6 kmph). The top section is pre-drilled for thrust bearing bolts, and a rotor mounting plate is included.

Hy-Gain has also developed a new electric winch system, model HG-EW, that fits the new HG-70HD as well as the existing 54-foot (16.5 m) HG-54HD and the 52-foot (15.8 m) HG-52SS. The winch control box can be locked, which allows the tower to be secure in either the extended or retracted position. It has a limit switch which prevents a possible overload at the upper stop position. A manual crank is supplied also in the event of an electrical power failure. The HG-EW is equipped with an automatic brake which is always in positive engagement when the winch is not operating.

This winch system can be converted at any time to remote-control operation by adding the new Hy-Gain tower control (HG-EWRC) which has been specifically designed as a modular addition to the HG-EW winch. This remote-control unit allows the operator to raise and lower the tower from a remote location such as a ham shack. The control displays upper and lower limit positions, up or down operating direction, and also provides a fail-safe sensor and indicator which automatically shuts off the winch should extreme side loads affect tower telescoping. Both the winch and the remote control are available for 110- and 220-volt operation.

For more information, contact *Hy-Gain, 9600 Aldrich Ave. South, Minneapolis MN 55420; (612)-884-4051.* Reader Service number 483.

LETTERS

from page 24

Peking, and the street next to it was full of shops. One large department store had a department selling only radio parts such as resistors, capacitors, tubes, transistors, etc., for people who wanted to repair their own radios.

They also had a black and white TV on sale for about $1000 US.

I saw two fairly large telegraph keys but I could not find anyone who spoke English to find out what they were used for.

There was also a shop nearby which sold only TVs. Incidentally, mine in the hotel did not work.

Fred Barnes WA8PCT
Parma OH

ITS UGLY HEAD

It was interesting to read the letter in the July *73* sent to Dr. Zbigniew Brzezinski by Dave Clark K8MPF regarding his proposal to boycott stations in the USSR using the special Olympic prefixes. In the letter, Dave states, "Normal communications with the Soviet U prefixes should be encouraged since amateur radio does provide a system of direct communication to all parts of the world regardless of political relations."

I should like to point out to your readers that in the case of the Soviet Union this is not entirely true. Since June, 1967, the Soviet authorities have forbidden their hams to communicate with Israeli amateur stations using the 4X or 4Z prefix. Although to my knowledge there has never been an official press release to this effect on the part of the USSR, it is common knowledge here, and a call to a U or an R station or what have you is almost always ignored except for the occasional station who will say "sorry, can't work you," or "no contact." For the Israeli DXer or contest fanatic, this is a serious handicap as this makes it virtually impossible to contact or confirm 19 Soviet Republics (countries) and four zones.

What is interesting is that in the last few years, amateurs visiting Israel from other countries and operating here with their own calls with a slant 4X tacked on the end find themselves besieged in pileups of Russian amateurs calling them. This indicates that the Russians have relaxed their boycott of amateur radio in Israel to the extent of allowing contacts *only with non-Israelis operating here*. The reason for this is not clear, but it could likely be to avoid bad public relations with American and European hams visiting here.

After much deliberation on the problem, the Israel Amateur Radio Club has asked amateurs operating here with foreign callsigns to avoid contacting Soviet stations until the Soviet Union rescinds its ban on contacts with Israeli stations, and to make this clear to the Soviet stations calling them.

It sure is a pity that politics raises its ugly head in this area. It should be added, however, that we have no problems contacting the other eastern European countries, but the USSR countries are all missing in the tallies of hams here who have been DXing since 1967. We are still hopeful that one day this condition will be reversed.

Hams visiting Israel are invited to use our 2-meter repeaters and meet the boys (and girls, hi) here. We use the European band plan here, and the repeaters are as follows: HAIFA—R0—145.000 in, 145.600 out (1800 Hz tone access); SAFED (upper Galilee)—R3—145.075 in, 145.675 out; BEERSHEBA—R5—145.125 in, 145.725 out; TEL AVIV—R7—145.175 in, 145.775 out, and JERUSALEM—R9—145.225 in, 145.825 out. Only the Haifa machine requires a tone burst; all the rest are straight carrier access.

Ron Gang 4Z4MK
Kibbutz Urim, Israel

VHF CONTESTING

A short note to express my interest in the January article, "VHF Contesting." The appetizer was delicious; now when do you begin the meal? You provided a few details on equipment, antennas, spacings, and just enough to evoke, "yes, yes, go on." So. . . let's have more of the detail so that more of us can learn more and successfully give it a go.

Bob Munsey K6PIU
Canoga Park CA

WORK THE WOODPECKER

The January issue of *73* has a couple of items on which I would like to comment.

First is the Woodpecker. When it first came on the air, the DX fraternity on 15 and 20 had a lot of ideas of what might be done to chase it off the ham bands. The "H5H" sequence was one of them, but not very practical for those of us who

don't have keys as part of our ham station or who are essentially lazy. We don't have the power to compete with Radio Moscow to QRM them, but radar depends on receiving an echo for its results and that echo can't possibly be a match for a ham kW beamed in the right direction with a similar signal. All one has to do is tape record a few minutes of the woodpecker and play it back at them!

If all the "tuner uppers" and "pileup" participants would get together on a "Woodpecker's Sunday" and send out the taped signal all over the band at the same time, perhaps they might get the message.

The other is your story, "Over the Hump" and the references to AC4YN. Of course, before the war AC4YN was the legendary contact that you had to work to get Zone 23. Your article mentions Reggie Fox as AC4YN, but I have reason to believe that it was a British Army group operations and that there were others that used the call either before or after Reggie.

I served in Italy during WWII at AFHQ Italy in a combined US Signal Corps/Royal Signals operation, which has made me eligible for membership in the Royal Signals Amateur Radio Society. Currently, there are about ten U.S. hams who belong to RSARS. I got a life membership back when the pound was worth $1.80. I get a lot of mileage out of that connection with QSOs with "G" stations. At the time I joined, one of the officers was Sir Evan Neppan G5YN. There was quite a story on Sir Evan in the Society publication, *Mercury*. He was a career officer in the British Army, had operated from exotic spots all over the world, and had been knighted by the Queen. It appears that one of the calls he had held was AC4YN, so you figure that out! I had a nice letter from him when I joined and have worked him on the air.

Col. Edson B. Snow, AUS Ret.
Pompano Beach FL

REVIEW

from page 30

ed a measure of additional gain.

Our basic downconverters soon acquired an elaborate "look" which reminded us of a mini-TVRO setup, and we somehow felt we had set new DX records for solid MDS reception in this heavily wooded and mountainous area of the United States. One aspect has definitely proven true: Signal paths which are not line of sight are difficult to predict and use. Raising antenna height to acquire line of sight is often the only logical alternative.

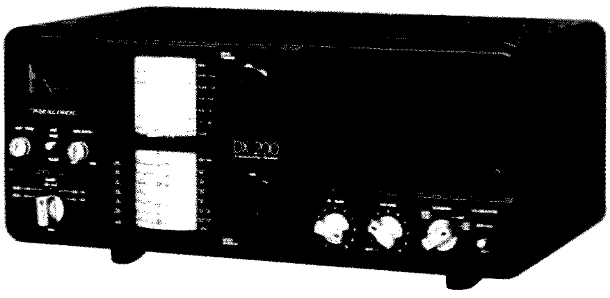
Some additional members of our group decided to construct competitive and more expensive downconverters, reasoning that complexity and cost should provide better results. Unfortunately, we did not find that true and had to work like heck to get marginally acceptable results from those units. Our previously acquired knowledge of microwave construction techniques was also required to supplant marginal instructions used with these units.

Fortunately, however, we all came out winners at the end and except for me, everyone is presently enjoying watching special TV programs. My particular converter works great, but I'm 20 miles, two mountains, and one dense forest from the MDS transmitter. Plans include wrestling a 3.5-foot parabolic dish/downconverter setup to the top of an 80-foot pine tree and adding a second TV tuner between the converter and the television for additional gain. We're not giving up yet!

In conclusion, the Universal Communications downconverter kits have proven their worth and are very reliable units. If you would like to get your feet wet in microwave, MDS, or weather satellite reception, these units are a good starting point. At the present time, I'm also considering the feasibility of modifying a unit for TV satellite reception. A number of additional items also will be required, but a working system for under $400 looks very promising.

The original downconverter board described here is available from *Universal Communications, Box 6302, Arlington TX 76011.*

Dave Ingram K4TWJ
Birmingham AL



Realistic DX-200 communication receiver.

DX-200 RECEIVER

The DX-200, sold by Radio Shack, is a general-coverage receiver. It tunes five bands: 150 kHz to 400 kHz, 520 kHz to 1.6 MHz, 1.55 MHz to 4.5 MHz, 4.5 MHz to 13 MHz, and 13 MHz to 30 MHz. It is designed for the reception of the three most-used forms of amplitude-modulated signals, which are double sideband with carrier (AM, or 6A3), single sideband without carrier (SSB, or 3A3j), and make-and-break radiotelegraphy (CW, or 0.1A1). The basic design is the classic single-conversion superheterodyne with an intermediate frequency (i-f) of 455 kHz. The circuit provides one stage of preselection before the frequency conversion.

To evaluate this receiver, it was compared with two others, each of recognized performance capability but of other design and in a higher cost bracket. A coaxial switch was used to switch the reference antenna among the three receivers, thereby ensuring a comparable signal to each. In addition to off-the-air signals, a URM-25D signal generator was used to make measurements of sensitivity and of image rejection.

One of the comparison receivers was a Yaesu Model FRG-7, which uses the Wadley Loop system. This involves triple conversion, with a first i-f of 55 MHz, to ensure almost total freedom from images. The other was the receiver section of a Kenwood TS-120S. This is a single-conversion receiver with an i-f of 8.8 MHz. Unless otherwise stated, off-the-air signals were obtained from an 80-meter trapped dipole antenna mounted 50 feet above ground.

Initially, the DX-200 was tuned to the AM broadcast band. Here it performed very well indeed. Both selectivity and sensitivity were excellent, and the stability adequate. I rated it on a par with the FRG-7 with but one exception. With the rf gain control turned fully on, the set broke into oscillation, causing severe distortion. Backing off slightly on the gain control stopped the distortion. With a short indoor antenna, the rf gain could be advanced fully without distortion.

The second check was on the longwave band. The DX-200 did quite well. It is one of the very few longwave receivers I've heard that doesn't bring in local broadcast band stations almost as loudly as LF stations! There was some slight spillover but not enough to be troublesome.

In the high-frequency range, the receiver displayed varying degrees of performance. For the reception of shortwave BC stations, it did quite well over the whole spectrum, fully equaling the FRG-7 in all respects save one: Image rejection above 5 or 6 MHz is very poor. The selectivity and sensitivity were fully adequate for SWLing and I didn't notice any frequency drift. Even the sponginess of the bandspread dial was not too objectionable.

For the reception of HF SSB stations, the level of performance dropped. In the MF 160-meter band and in the HF 80- and 40-meter bands, signals could be demodulated with ac-

ceptable intelligibility. As I went higher, the signal quality became much worse. On 11 and 10 meters the clarity approached zero! It appears that there is enough instability in either the HF oscillator or the beat frequency oscillator (I suspect the former) to introduce severe fuzziness. These signals were, of course, also checked on both the FRG-7 and the TS-120S to make sure that the difficulty originated in the DX-200 and not in the transmitter or in some propagation abnormality.

CW reception is a bit better than that of SSB in that one can read a T5 note with no difficulty. In fact, there are operators who prefer modulated notes over that of a pure sine wave! The sponginess of the bandspread dial makes tuning in a CW signal a bit of a job, but it can be done with practice and patience. It's a wee bit more tedious than the FRG-7; the TS-120S, of course, presents no tuning difficulties.

The next job tackled was attempting to improve the image rejection for frequencies above 5 or 6 MHz. Two passive preselectors (shown in Fig. 1) were tested. One is of a type designed to match a random-length endfed antenna to a low impedance input to a receiver. The other is for low-Z to low-Z; it was used with the trapped dipole.

Both preselectors performed about the same. They helped to attenuate images in the 5- to 10-MHz range, but above 10 MHz their selectivity curves were so broad that they provided insufficient attenuation to the image. And, of course, this is the region that most needs additional image attenuation! Scratch the idea of a passive device.

An active preselector, a leftover from the day when I had a DX-150 receiver, was excavated from my junk box. Its circuit is shown in Fig. 2. In addition to providing preselection, it supplies an appreciable amount of gain. Now the DX-200 had plenty of gain, but I noticed that it performed somewhat better with its rf gain control backed off a bit from fully clockwise. From that standpoint, the additional gain from the active preselector is valuable.

Its image rejection ability was evaluated with signals from the antenna and signals from the URM-25D signal generator. For the latter, a signal was injected into the receiver at a level which caused a predetermined deflection of the receiver's S-meter. Both that deflection and the URM-25D's microvoltmeter indication were noted. The DX-200 was carefully tuned to the signal's image and its S-meter reading noted. Next, the URM-25D's output was advanced until the referenced S-meter deflection was again reached. Reading the new value from the microvoltmeter provided an indication of the receiver's image rejection capability. Then the active preselector was introduced into the circuit. It was tuned to the URM-25D's output frequency and the whole series was repeated. The additional increase in signal generator output to return the S-meter to its referenced value gave a comparative indication of the effectiveness of the preselector. No attempt was made to tabulate absolute values; only comparisons were desired.

The results showed that neither the FRG-7 nor the TS-120S had enough image response to be recorded. Also, the active device was significantly better than either of the two passive preselectors. Above about 16 MHz, however, even the active circuit's image rejection became marginal. It added useful gain, however.

My conclusion is that it is not feasible to attempt to make significant improvement in the image rejection capability of a receiver having an i-f of 455 kHz for reception of signals above 16 MHz unless one is prepared to use at least two and probably three additional tuned circuits.

The lack of good image rejection on the higher frequency ranges does not mean that the DX-200 is not a good receiver. It is highly sensitive and is as selective as one might want for reception of AM voice and music broadcasts. It is stable enough to require no retuning once you've centered on a station. For many decades radio listeners used receivers having the same basic circuit as the DX-200 and found such receivers quite satisfactory. The average SWL will find that the DX-200 fulfills his requirements in a satisfactory manner.

I found many things to like about the DX-200. Its bandspread is very good, the quality of the internal speaker is better than average, and there's a ¼" headphone jack on the front panel. The external speaker jack on the rear is of the miniature type. Inspection of the schematic wiring diagram reveals that there's a resistor in series with the internal speaker and also one in series with the headphone jack, but none in series with the external speaker jack. Evidently, the audio output is higher than the internal speaker can handle, yet this speaker provides room-filling volume.

The wiring diagram makes an interesting study. The receiver's designers came up with some neat tricks—too many to comment on. They have one practice I cannot admire, though. That is designing the receiver to have its power supply activated at all times when the 117-volt power plug is inserted into the wall socket.

Still on the subject of the wiring diagram, it would appear that the set's overly-optimistic S-meter might be made more nearly realistic by adjusting resistor VR202. If its 1k range is insufficient, the addition of a series resistor might do the job. If not, you always can tame an overly-active S-meter with a shunt resistor.

The DX-200 has an owner's manual that's really outstanding. In addition to information on the receiver, it has many excellent tips on using it. I did find four items in it that irked me; all related to nomenclature. The manual calls all random-length endfed antennas "long wires," which is incorrect, as a long-wire antenna is one many wavelengths long! The other three were in the list of radio terms, which showed "73s" instead of 73, "88s" instead of 88, and XYL instead of YF. But those four glitches do not seriously detract from the overall excellence of the manual.

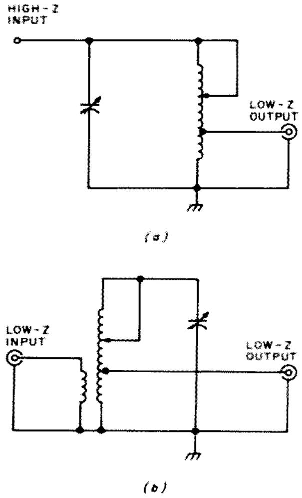


Fig. 1. Passive preselector circuits for the DX-200. (a) For random-length endfed antennas. (b) For low-impedance antennas.

To sum up, the DX-200 is as good a receiver of its design as you're likely to find for the price. Its design, the classic single-conversion with an I-f of 455 kHz, has inherent limitations. Within these limitations, the DX-200 rates highly, with just two exceptions: the lack of spectral purity in the oscillator and the rubbery feeling of the bandspread tuning dial. If these were corrected, Radio Shack would have a receiver that would be difficult to fault.

For further information, contact *Radio Shack, a division of*

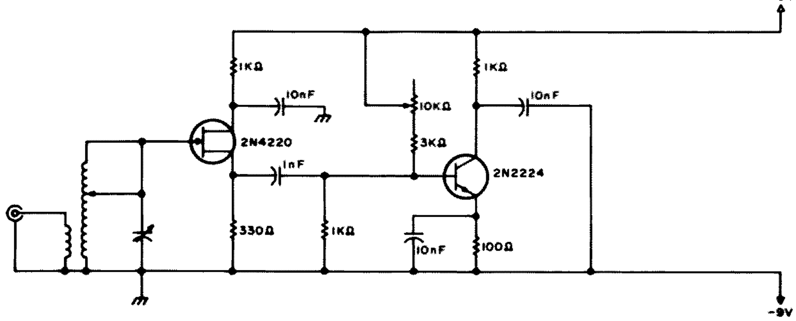


Fig. 2. Active preselector and preamplifier.

Tandy Corporation, 1300 One Tandy Center, Ft. Worth TX 76102. Reader Service number 477.

Carl Drumeller W5JJ
Warr Acres OK

THE BECKMAN 3010/TECH 310: A USER REPORT

Pssst...pssst. Yeah, you. Stop leafing through these pages for a second, I want to ask you a question.

Well...OK, but don't try to sell me anything—I get enough of that from TV.

I promise—no sales pitch today. I would like to know, of all your workbench equipment, which instrument is essential to your testing needs?

That's easy: my ohmmeter.

I agree, the multimeter is the foundation for most of our diagnostic procedures. What is the reason for its wide popularity? Why do we depend on it so much? Many test instruments have proven invaluable as troubleshooting aids, yet they enjoy little of the multimeter's success. I think that a prime factor for the analog's success is its tradition of combining versatile service with a low price tag. Today's new digital multimeters continue to carry out this fine tradition, perhaps improving upon it. One of the better of these is the Beckman Superswinger.

Hold it! Are you sure you got the name right? I've been shopping for a DMM, and I have never heard of this Superswinger.

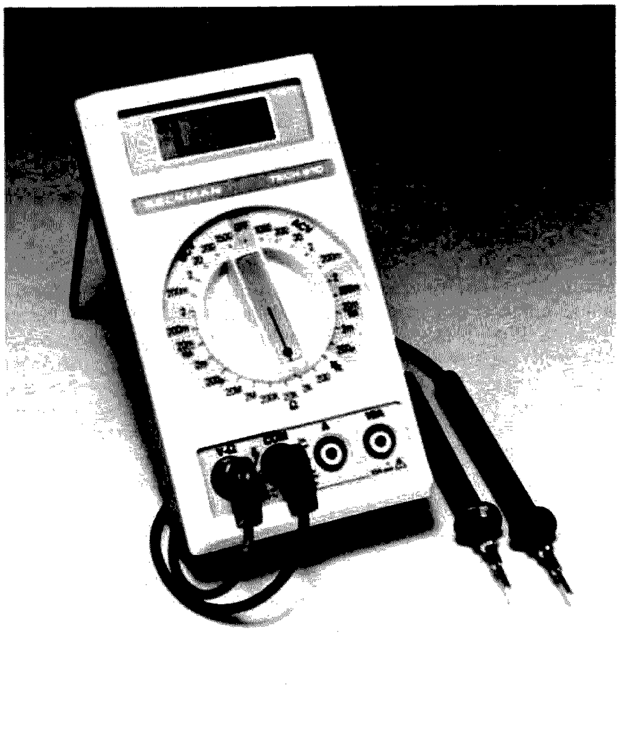
I'm positive! You see, I made up the name.

Boy, that's all I need! As if it weren't enough trouble keeping track of all the real meters, now some joker invents his own.

If you will be patient a moment, I hope to clarify the situation. I devised this designation to represent two *real* Beckman models, the Tech 310 and the 3010. A sound reason exists for merging the two: they're identical. Identical, that is, if you discount the 3010's blue case and the 310's tan-colored one. Selling the same product in different boxes is strange in itself; stranger still is asking the same price.

Strange? It sounds dumb to me. Why go to all the trouble and expense in the first place?

A very good question. The answer lies within the mystical realm known as marketing. Beckman, with logic only a marketing analyst could love, elected to attack the formidable meter market with two entirely separate sales forces. The first, with the 3000 series, focuses its efforts on the large industrial user, while the 300 team tackles the end-user market. I am told that this dual-meter, dual-designation approach is invaluable for accurately gauging market penetration. While on the subject of dual designations, unless clarification is needed, I shall confine my comments solely to the 3010.



Beckman Tech 310 digital multimeter.

One fact stands out through all of marketing's dust and confusion: Beckman makes an incredibly good meter.

Ha! I've heard that one before. Prove it.

I will substantiate my claim with some cold, hard facts: Beckman's unadulterated specifications for the 3000 series. This information applies equally to the members of the 300 group, but there is an additional meter not shown in the specs—the Tech 300. It has the 3010's specifications except that the dc voltage accuracy is reduced from 0.25% to 0.50%. In addition, both the 10-A current range and the Insta-Ohms™ function are absent.

I like the specs, but how much would it syphon from my bleak-looking bank account?

I'm glad you're pleased with the 3010's numbers. Nevertheless, as you must already know from examining today's market, most DMMs have attractive-looking figures. What earns the Beckman its $140 price tag is its superior performance in the real world.

$140! My wife would kill me.

I realize that the price tag seems a bit heavy, but the excellent quality of the 3010 with its easy, dependable, and versatile operation makes it a great buy. Take operator ease. Many users are momentarily dumbfounded when confronted by some DMMs and their rows of push-buttons or multiple switches. With the Beckman, you will never have this problem. There is positively no confusion or ambiguity in using the 3010's solitary, large, analog-styled selector switch.

I admit the 3010 looks easy to use, but why should I buy it, when I can get a cheaper DMM that is just as good?

Purchasing a less expensive digital multimeter is by no means a difficult task. Matching Beckman's craftsmanship is another story. To be fair, let's make a quick comparison of the two meters. I think you'll agree that ruggedness is a desirable attribute in test equipment, and essential for all portable instruments. Multimeters are no exception and must endure a multitude of sins in the form of knocks, bumps, and scrapes. Some of these can be nastier than others; a fall could be fatal. If you were to accidentally knock your bargain meter off the top of your workbench, would it survive?

Ouch! I hope so. Although I do remember dropping my VOM once; it never worked the same again.

I'm afraid your bargain-basement friend will share much the same fate: dead on arrival. If you owned a 3010 in this situation, you may suffer heart failure, but the meter will remain healthy. Meeting military shock and vibration standards, the 3010 is capable of withstanding the abuse from a six-foot fall without blinking a digit. This ruggedness stems in part from the fire-retardant, high-impact ABS plastic case, but, to a larger extent, it is due to Beckman's careful engineering. This attention to detail is evident when you examine the outside. All vulnerable areas, including the 3½-digit liquid-crystal display, function switch, and test jacks, are recessed out of harm's way. Venturing inside, we find the explanation for the 3010's great strength—an unbelievable low number of parts. The credit for the fewer than forty active components goes to a custom-designed CMOS LSI multiprocessor. Helped by a CD4069 hex inverter, this LSI chip performs all the active DMM functions, which results in a small, compact, and extremely reliable digital multimeter.

Ruggedness is only a start; Beckman goes much further to ensure a reliable meter with a long and healthy life. Living in the "northwets," I appreciate the extra effort that has gone into sealing the 3010. It is well-suited for this climate, offering no easy pathways for the liquid sunshine, dirt, or other contaminants. On most multimeters, the test jacks are open gateways into the interior. Beckman closes the gate by physically dead-ending these. While an O-ring protects the selector switch, a large gasket seals the LCD display area. I have been told that the 3010 is so well sealed that it will float. You need not take your DMM swimming to avail your-

self of this added protection. A recent graphic demonstration from a skeptical friend pointed this out. He watched in helpless horror as a glass of iced tea, liberally laced with sugar, dispatched his three-month-old DMM to silicon heaven.

Beckman enhances the reliability of the 3010 further by giving each meter a 100% burn-in, followed by a complete test of each function and every range. All of this results in a digital multimeter that is trouble-free and backed by a one-year warranty under which Beckman agrees that:

If the instrument fails for any reason whatsoever, except abuse, Beckman will (at its election) repair or replace the multimeter with a new or reconditioned unit of equivalent quality.

That sounds too good. Service must take forever!

Wrong. There is only one word that can describe Beckman's service: phenomenal! You will get no excuses or interminable delays when you have an ailing meter. Instead, within one working day from the receipt of the meter at a service center, a new or reconditioned unit will be *air* shipped to you.

The 3010 certainly seems well built. Yet, that price still scares me a little.

Your reservations will fade after getting to know some of the 3010's features better. The same custom CMOS chip that helps make the 3010 so tough also contributes other useful traits. The CMOS construction in conjunction with the low-power LCD display ensures a long battery life. A 9-volt alkaline battery supplies 2000 hours of *continuous* operation. Under normal operating conditions you can expect two years of service from a single battery. That's ten times longer than other hand-held 3½-digit meters provide. Couple this longevity with a low-battery warning that signals for the last 200 hours of operation and you have erased any excuse for a dead battery. This low power drain also frees the user from external power sources, adapters, and chargers which add unnecessary weight. The 3010 weighs in at a modest 16 ounces.

In the world of micro-electronics, where minute voltages and infinitesimal currents are precariously balanced, outside disturbance from low-impedance sources can be disastrous. The 3010's high input impedance of 22 megohms babies delicate circuitry with less than half the loading of the conventional DMM's 10-megohm impedance. In fact, this meter's load factor is far lower than most VOMs.

A baby around delicate equipment, the 3010 does not play nursery games when it comes to life's crueler realities—destructive overloads. The meter will tolerate transgression as high as 1500 V dc/1000 V rms on the voltage inputs, and the resistance area is protected to 300 V dc/rms. Both can ward off evil transients up to 6000 volts in size. The 2-A current range is fused against overloads, but the 10-A range is vulnerable. Making use of an internal, 0.001-Ohm resistor, this 10-A function is totally defenseless, lacking the most paltry of fuses. A glaring omission on Beckman's part? In a way, yes, because this does open the door to operator abuse. On the other hand, by being aware of the potential danger and by observing a 30-second time limit, one can extend the upper current boundary to 20 Amps. I have successfully made measurements in excess of 17 Amperes with no ill effects. However, I cannot stress strongly enough the need to strictly adhere to the 30-second limitation!

Another feature worth mentioning is the in-circuit diode/transistor test function. One aspect of the 3010 is that all the resistance ranges are low powered, and as such cannot forward-bias a semiconductor. This necessitates that a separate test function be added to the meter. As usual, Beckman goes first class by employing a dedicated constant-current source, which, when in operation, shows the actual voltage dropped across a semiconductor junction, eliminating all guess work. The test, if performed in-circuit with a parallel resistance greater than 200 Ohms, is completely transparent.

I like all of the 3010's fine features, but my favorite is Insta-Ohms, Beckman's fast, versatile continuity indicator. At the moment of continuity detection, an Ohm symbol is displayed in the upper left-hand corner of the LCD display. With its virtually instantaneous operation, Insta-Ohms has created a wealth of tests never before feasible on a purely digital multimeter, including those with audible indicators. Prompt detection (less than 100 milliseconds) allows the 3010 to accomplish analog-style tests such as checking a capacitor's ability to accept and hold a charge. In this case, the analog needle is replaced by the Insta-Ohms symbol, which appears quickly as the test begins. The charging capacitor's apparent resistance falls within twice the maximum of the selected range.

A readout of the resistance follows almost immediately. The cap's steadily building charge swings the reading upward toward infinity, until a point is reached where one of two things will happen. Depending on the selected resistance range, either the readout and Insta-Ohms will overflow, or a final breakdown value for the capacitor will be found. The necessity for fast electronics in this test becomes obvious when you involve small value caps with their short time constants. The Insta-Ohms speed is such that I have had no problem checking 2.2-uF and smaller tantalums.

Insta-Ohms has several important advantages over ohmmeters and audible continuity indicators. First, with the overload protection of 300 V dc/rms, you don't have to worry about a damaged meter movement or bent and broken needles. Second, as part of the liquid-crystal display, the indicator uses little power, contributing greatly to the meter's two-year battery life. Finally, because it isn't limited to one or two resistance ranges, Insta-Ohms is useful in tracking down high-impedance "shorts." You also have the blessing of not having to use an override switch on large jobs to kill the incessant buzz that drives fellow workers up the wall.

I'm impressed. I think I'll spend the extra bucks.

In that case, you should be glad to hear that the 3010 comes ready to use, having a battery, spare fuse, safety test leads, and operator manual. Beckman's attention to detail and quality carries into their excellent accessories. The awkward-looking test probes are actually comfortable to use. So much so that I never gave them much thought. Nonetheless, they exerted an influence on me, however subtle. This influence became evident when I had the occasion to use a regular pair of test leads on a 240-volt power supply. I was distinctly apprehensive at the time, and the reason why eluded me. I now know the reason: Subconsciously, I missed the added security imparted by the knobby node end of Beckman's safety test leads.

This brings us to the 3010's operator manual. It is one of the best I've seen. Unlike the scant, inept papers some manufacturers try to pawn off as manuals, the Beckman manual is an in-depth, comprehensive guide to the understanding and use of the 3010. Although faulted as being too long, a premise I do not share, the manual is worth the reading effort.

OK, OK, I'm convinced. Well, almost. There has got to be a zinger—you haven't mentioned one bad word about the meter!

Zinger? I don't know if you could classify them as such, but there are a couple of items that I'm a little less than thrilled about. One, and the brunt of my dissatisfaction must fall upon it, is the 3010's built-in tilt-bail. Conceived as a dual-purpose hanger/bench support, the wire bail is all too flimsy for hanging the meter. Its most unforgivable sin of sins is the metal construction which makes it a great conductor and, thus, dangerous.

The only other fault with the 3010 is that you cannot zero the resistance function. This becomes a factor only when using the lowest range, and the resistance of the test probes is displayed. Less than 0.2 of an Ohm in value, my objection centers on the fact that no means of zeroing this reading is provided.

You've made a sale! I can contend with those easily.

Fine—my sentiment exactly. If you want to hunt exotic nonsinusoidal waveforms like triangles and ramps, look into Beckman's RMS 3030—currently the only hand-held DMM with true-rms measurement capability.

For more information, contact *Advanced Electro-Products Division, Beckman Instruments, Inc., 2500 Harbor Blvd., Fullerton CA 92634; (714)-871-4848, ext. 3651.* Reader Service number 476.

John Clawson
Tillamook OR

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Your company name and message can contain up to 25 words for as little as $150 yearly (prepaid), or $15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the June issue must be in our hands by April 1st. Mail to 73 Magazine, Peterborough NH 03458. ATTN: Nancy Ciampa.

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ARGENTINA	21	14A	14	14	7	7	14	21	21A	21A	21A	21
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HAWAII	21A	14	14	7	7	7	7	14	14	21	21A	21A
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U. S. S. R.	7B	7	7	7	7	7B	14	14	21	21	14	7B
WEST COAST	21	14	14	7	7	7	7	14	21	21	21A	21A

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EAST COAST	21	14	14	7	7	7	7	14	21	21	21A	21A

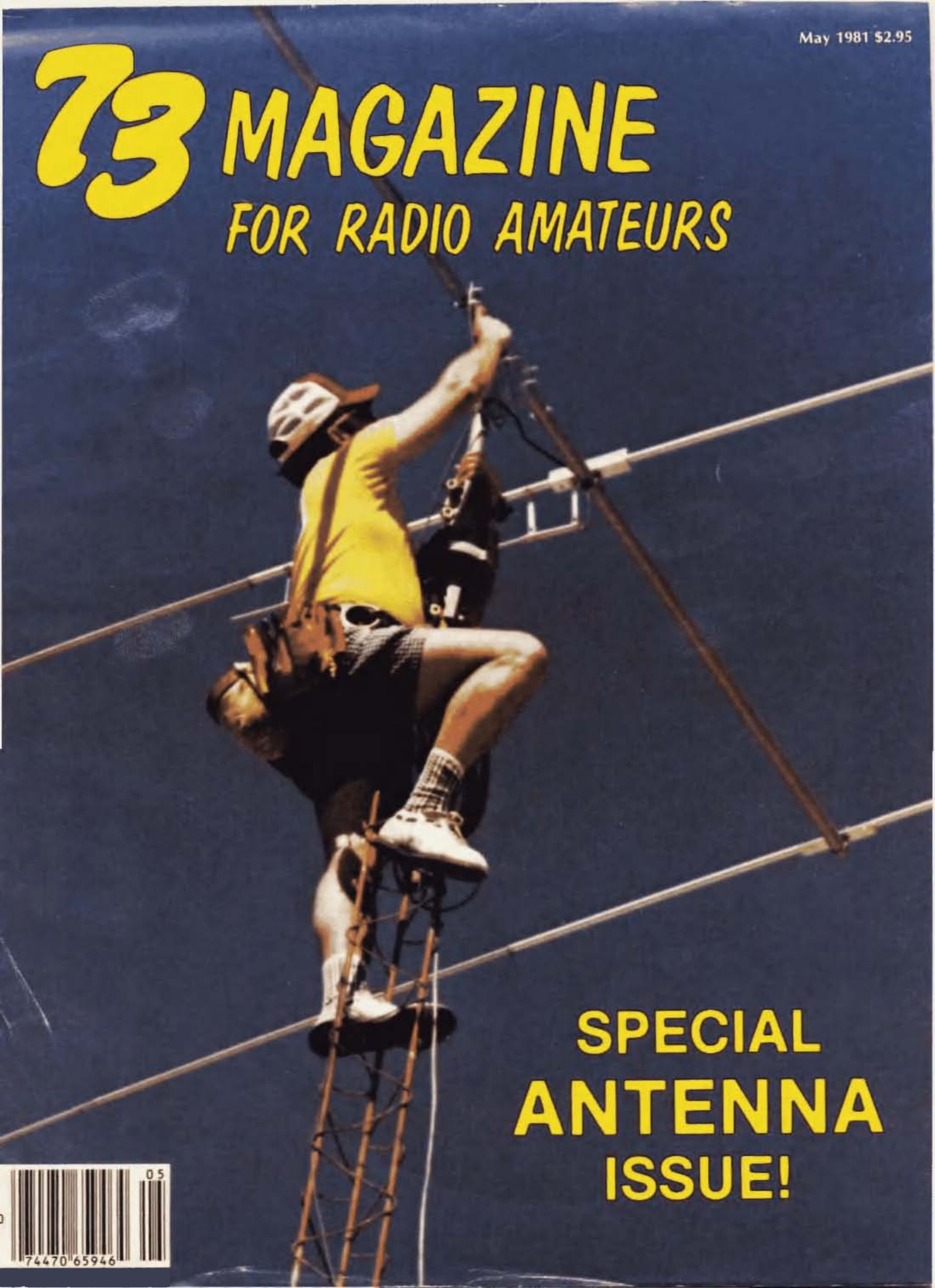
A = Next higher frequency may also be useful
B = Difficult circuit this period
F = Fair G = Good P = Poor
SF = Chance of solar flares

april

sun	mon	tue	wed	thu	fri	sat
			1 G	2 F	3 G	4 G
5 G	6 G	7 F	8 G	9 G	10 F/SF	11 F
12 F	13 F	14 G	15 G	16 F	17 G	18 G
19 P/SF	20 F	21 G	22 G	23 G	24 G	25 G
26 G	27 F	28 F/SF	29 F	30 F		

May 1981 $2.95

73 MAGAZINE
FOR RADIO AMATEURS



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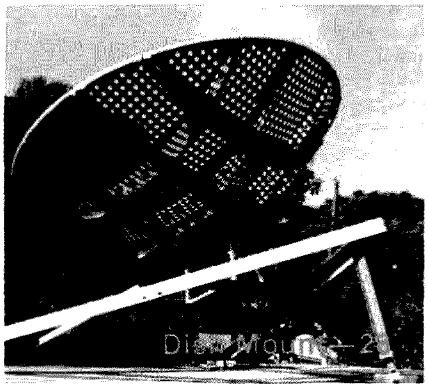
73 MAGAZINE may 81



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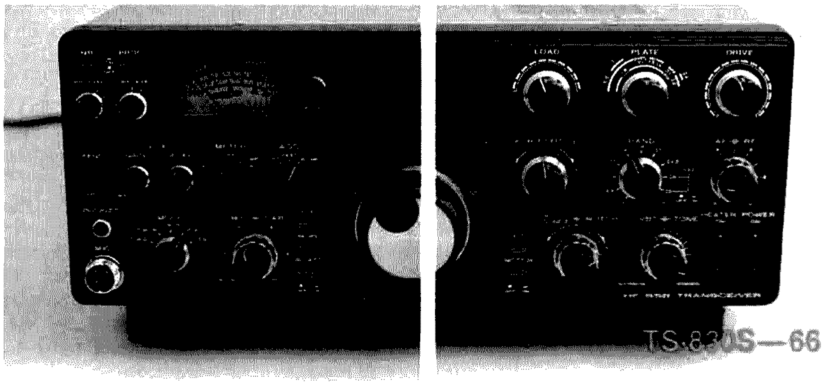

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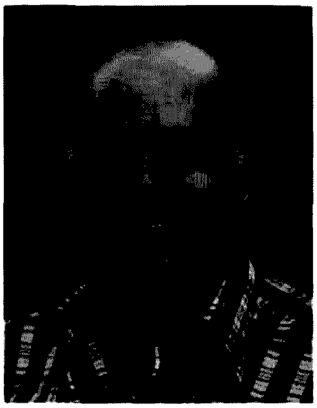
NEVER SAY DIE
editorial by Wayne Green



MAGAZINE PERSPECTIVE

With much of the ham industry hurting badly for sales, the need for new hams and perhaps for some new interests in amateur radio is apparent. Dealers have been dropping like the fall leaves and manufacturers have been retrenching . . . or going to the SBA for additional loans to tide them over. Over into what is problematical.

In these days of confusion, how are the ham magazines doing? We publishers sit around counting the pages of ads, the pages of articles, the number of articles, and all that sort of thing. That's part of the publishing biz. You may be interested in the counts.

First, looking at 1980, we find that *73* had 290 feature articles to *QST*'s 132. Over twice as many. *73* had 871 pages of articles to *QST*'s 416, again over twice as many. Presumably it is the articles which are of major long-term importance to you rather than club activities and contests. In advertising, *73* averaged 94.8 pages per issue and *QST* 94.9. *HR* came in third with 38.7 pages, then *CQ* with 35.4 pages, and HRH with 22.0 pages, which may help you understand its demise.

Looking at the 1981 January issues of the four remaining ham magazines, we find that the ad count is almost exactly the same as 1980 January . . . which is odd, if the recession in ham sales is true. *73* had 87 pages of ads, *QST* 101 pages, *HR/HRH* 53 pages, and *CQ* 46. *CQ* is up two pages this year, *QST* the same, and *73* down four pages (we have cancelled several pages of ads for slow payments and poor customer service).

Where are things as far as articles are concerned this year? That's what you are buying for the most part . . . not club news and ads. *73* had 25 articles against nine each for *QST* and *HR*, with 8 for *CQ*. In pages of articles, *73* ran 73 pages, *QST* 28, *HR* 44 and *CQ* 18. That does not include monthly columns. Interesting that *73* should run more pages of articles . . . and more articles . . . than *HR* and *QST* combined. It might even make someone think . . . though I doubt it.

PROPINQUITY

If you let your daughter go out with creeps . . . she will marry a creep. And if you have a son and let him date a punk rock weirdo girl, you stand a good chance at having to adjust to this cretin as a daughter-in-law. It all has to do with the not-very-well-understood concept of love.

You've heard about love being blind. Well, you'll believe it when it hits you through one of your children. Of course, how it hits you has a lot to do with how much you control your teenager . . . and control in this sense has to do not so much with trying to stop him or her from dating nerds as preventing the propinquity which gets all of this started. Propinquity is being together . . . nearness . . . such as a being in the same class in school or belonging to the same club. Much as a baby duck will pick whatever it first sees moving as its mother, teenagers, when struck with the right hormones, fall madly in love with almost the first thing they see of the opposite sex.

So, if you have your teenagers in a school full of losers, you might as well start adjusting yourself to accept that whatever they have in class with them is going to get dragged into your life.

I bring this up not to get you to move to Peterborough or to rush your pre-teens to a better class private school, but to make a point about amateur radio. In the love affair a lot of us have with hamming, propinquity is *all*. A basic fact is that before you are going to have many more hams, you are going to have to see that you get a lot of teenagers near to it.

One lousy exposure in a mall on a Sunday is not potent enough in the propinquity department. If you or your club are going to sell amateur radio in this day, you are going to have to bring teenagers into contact with it as much as you can. Remember, you're up against a lot of other interests such as Boy Scouts, roller skating, after school games like baseball . . . things like that. It is most fortunate for us that the amateur radio susceptibility hormone does not hit after puberty, otherwise we'd have no hobby. Luckily for us, this period of impressionability hits hardest at around 13 and 14, before girls start to really look good.

Another nasty competitor for teenage affections is the microcomputer, so you have your work cut out for you. Remember that more and more high schools are getting computers right into class . . . and darned few (if any) are getting ham rigs into class. You are up against a mighty foe in the computer, so you'd better reckon with it and get your act together. It appears that the same faulty brain circuitry which tends a teen to become a ham also can flip him into computers.

We can win this battle only if we are aware of the enemy and play every trick we can to ensnare our share of teenagers . . . or even more than our share. It is time to be greedy and pull our hobby out of the slump it is in.

The key to how to do all this lies in that word, propinquity. It is up to *you* to see that teenagers are exposed repeatedly to amateur radio. Their natural immunity will finally be beaten down and we'll have 'em . . . trapped for a lifetime, for the most part. Insidious hobby we have, when you think about it.

NEWSLETTER CONTEST

To encourage publication of club and group newsletters which, in turn, help spread ham radio interest around the world, *73* is initiating a newsletter competition. So, make sure that *73* is on your mailing list.

Our judges will evaluate each one and pick a monthly winner to be announced in *73*. Each winner will receive our Novice Class Study Guide and theory tapes *or* their choice of three books from the Radio Bookshop. Please address newsletters to *73 Magazine*, Pine Street, Peterborough NH 03458, Attention: Newsletter Contest.

A FREE BOOK FOR YOUR QSL?

That's right. Send us your QSL and we'll enter you in *73*'s QSL of the Month Contest. If yours is selected, it will appear in *73* and you'll be given your choice of a book from our Radio Bookshop. We're looking for clever, colorful, beautiful, neat, interesting, etc., QSLs. Please address your entry to *73 Magazine*, Pine Street, Peterborough NH 03458, Attention: QSL of the Month.

Despite parents' efforts to deprogram our converts, most teenagers go right on to fruitless careers in electronics and communications.

So you get a demo station into your local high school and run it for a few weeks, handing out seductive literature to anyone foolish enough to get sucked into watching. Then you figure out some small bribe to get 'em into your club license classes. You charge 'em enough for the set of classes so their natural stinginess (part of the ham ethic) will prevent them from dropping out. Salt your classes with references to the incredible fun they are going to have once they get their ticket. They're *yours*.

The mall demo won't hurt... and the exercise is good for club members. It's fun to be the center of attention in a mass setting like that... and you'll be able to get a few more into your classes. This will also give you a second flanking attack on the teens, if you have some fast-food stores in the mall. Teens tend to be attracted to fast-food purveyors. Maybe we should approach McDonald's about demo ham stations? I prefer Wendy's myself... it's the salad bar, not the greasy (juicy, they call it) hamburgers.

If you can get teenagers near ham stations enough, we'll have plenty of 'em getting licenses and perhaps amateur radio will get back into a growth mode again.

WAR COLLEGE

Definitely flattering... and tough to turn down. The invitation was to join a group of 70 noted civilians for five days of workshops with the Air War College. This is a group of high-ranking Air Force officers who have gone back to school to bone up on the latest in military hardware, tactics, intelligence, and so on. At the end of the course they have five days of discussions with selected civilians.

The problem was the five days. I don't *have* five days. Of course, not having been to one of these affairs, I don't know how much interest there is in getting ideas from the civilians and how much is brainwash from the military. All of my visits to the Pentagon so far have given me the impression that none of the military services wants input... they just want to lay propaganda on the media for their own benefit.

If they do have any interest in getting some of their problems solved, I think I have some ideas for them which will go a long way. For instance, it is no secret that all of the military services are hurting for technical people. Well, getting 'em

Continued on page 139

Well... I Can Dream, Can't I? by Bandel Linn K4PP

"I understand there's a big ham radio contest going on this weekend! I suggest you take a week off—with double pay—to rest and get ready for it!"

Robert Glorioso W1IS
47 Edgehill Road
Stow MA 01775

Two-Meter Antennas: Facts and Fables

—the truth about omnidirectional antennas on two

Vertical antennas, especially for VHF, come in a wide variety of shapes, sizes, specifications, and price. Manufacturers' gain claims have created such confusion that one of the popular magazines does not allow an antenna manufacturer to publish gains in their ads, and magazine reviews rarely say more than "the antenna worked great." This only exacerbates the problem because we, the users/consumers, have no way of getting reasonable relative performance information short of listening to someone tell us how wonderful his great new XY-999**!* antenna is, or through the grapevine of information formed by our "oral tradition." This is where the fable part comes in. We all know how well a joke gets passed around a room when one person whispers it into the ear of the next. It usually is unrecognizable after passing through as few as a half-dozen people. This is the same way we get our information on antennas, and often the quality of that information resembles a joke!

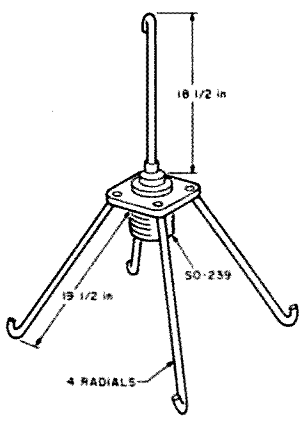


Fig. 1. Simple 1/4λ 2-meter ground-plane antenna.

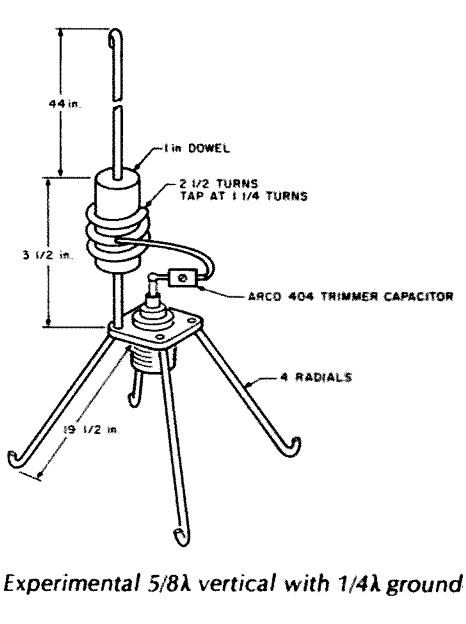


Fig. 2. Experimental 5/8λ vertical with 1/4λ ground plane.

I realized this recently when I was selling an old 2-meter rig to a friend and I wanted to make up a simple antenna so that he could use it right away. I have used the makeshift 1/4λ ground-plane antenna shown in Fig. 1 several times (it costs one SO-239 plus a few cents worth of old house wiring) and I was about to make one for him when I remembered something "we all know"—a 5/8λ antenna has 3 dB gain over a 1/4λ ground plane. Now, having purchased one of those more years ago than I

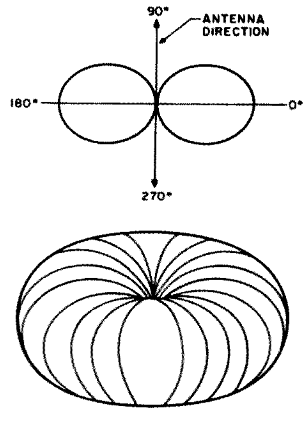


Fig. 3. Radiation pattern representations of 1/2λ dipole antenna. Top—typical plot, cutaway; bottom—three dimensional sketch of toroidal radiation pattern.

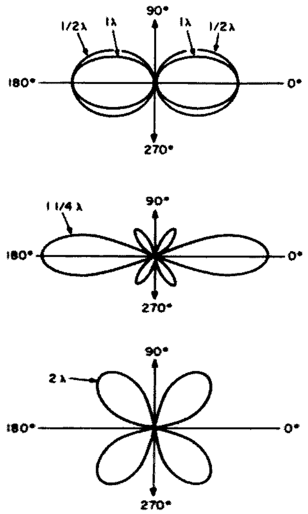


Fig. 4. Radiation patterns for vertical dipole antennas of different lengths. The narrower major lobes of the 1λ and 1-1/4λ antennas imply gain over the 1/2λ antenna.

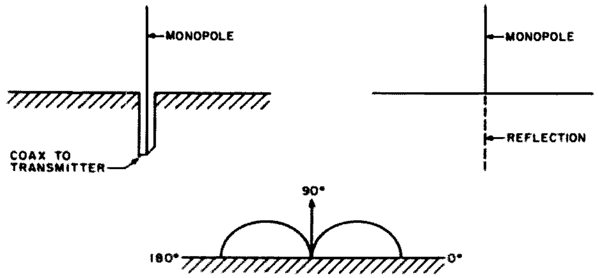


Fig. 5. Ideal vertical and its radiation pattern. Left—vertical monopole over infinite perfectly-conducting ground. Note that the coax shield is in electrical contact with the ground. Right—electrical equivalent is a virtual dipole whose other half is a reflection in the mirror formed by the ground. Bottom—theoretical radiation pattern for 1/4λ vertical monopole over ideal ground plane.

like to admit, I noted that it had four 1/4λ radials, a matching section, and a 5/8λ radiator, so I built the antenna shown in Fig. 2. It tuned up to 1:1 swr so quickly that I was sure it was working great. I put it on the air, and sure enough I was getting out. But, since I live on a fair-sized hill not all that far from repeater alley in the Boston area, I had no way of knowing for sure whether this antenna was really better than the 1/4λ ground plane.

Of course, everyone knows that the 5/8λ is better than a 1/4λ—even some of the antenna manufacturers' literature says so—but isn't that part of our fable? Anyway, I decided to perform a simple experiment by comparing the two antennas in exactly the same place using the signals from the various repeaters and the meter on my KDK 2016A to measure the relative performance. (I later discovered that this is called reciprocal testing: using a distant signal source and the antenna under test in the receive mode.)

The results of this test were baffling—the 1/4λ outperformed the 5/8λ in every direction! Surely something was wrong with my test, so I asked some of the guys in the area to give me signal reports with the two antennas. I used the same feedline and mount for each, so I had to run out and physically remove one antenna and install the other to do the comparison. The results were the same; reciprocity was proved again! (The reciprocity principle states that the relative performance of an antenna as a transmitting antenna and as a receiving antenna is identical.) Was our oral tradition wrong? Something surely was, so I dug into manuals and textbooks to find out the answer. Here is some of what I discovered.

The Applicable Antenna Theory

First, consider the question: How can an antenna have gain? In order to answer this one must also ask: What is our reference for measuring an antenna's gain? Two references are used as a base for measuring an antenna's gain. The first, an abstract notion used in theoretical computations of antenna performance, is the so-called isotropic radiator. This is a hypothetical device which radiates energy equally in all directions simultaneously with a spherical pattern. However, to make real measurements with real antennas, the usual reference is a half-wave dipole in free space.

The free-space dipole has a figure 8 radiation pattern in the plane perpendicular to the antenna and a circular pattern of equal radiation in all directions radial to the axis of the dipole as shown in Fig. 3. Now, the gain of an antenna is defined as the ratio of the magnitude of the maximum radiation to average radiation from the antenna in all directions if the losses in the antenna are negligible. The maximum lobe for gain measurement is independent of the direction of that lobe. The gain is diminished by the amount of losses in the antenna. (G = maximum radiation intensity divided by average radiation intensity.)

Note that the average radiation in all directions is the same as that from an isotropic radiator, which is why it makes such a good conceptual reference. The dipole has a theoretical gain of 2.15 dB as defined above, so we can say that a dipole has 2.15 dB gain over an isotropic radiator. (An isotropic radiator is only a theoretical notion and cannot be built anyway.) Now, when we use a dipole as a reference when studying some other antenna, we only need to add 2.15 dB to our measurements to reference our subject antenna's performance to an isotropic radiator. The gain or loss in decibels of a reference antenna with respect to a dipole is often written as dBD.

Before we consider verticals specifically, let's look at the radiation patterns generated by dipoles whose lengths are greater than 1/2λ as shown in Fig. 4. Note that the pattern radial to the axis of the antenna is symmetrical. The longer the antenna gets up to 1-1/4λ the narrower the major lobes get, which means higher gain. Beyond 1-1/4λ there are four major lobes which point more towards the ends of the antenna than perpendicular to it.

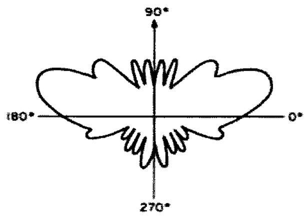


Fig. 6. Radiation pattern of a monopole approximately 1/4λ long over a 6λ circular ground plane. Note that the major lobe is above the horizon.

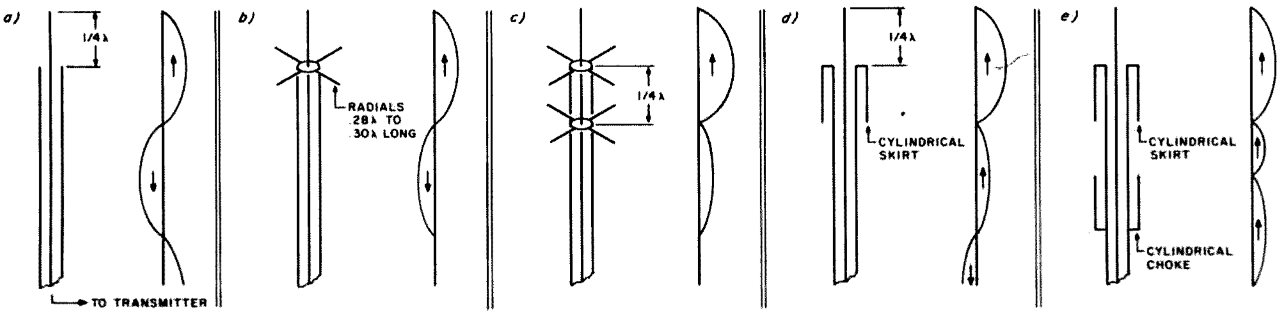


Fig. 7. Configurations and current distributions for several different vertical antennas. (a) Without ground plane. Outer conductor of coax provides radiating return path for rf. (b) With 1/4λ ground plane. Note current 1/4λ below ground plane is mostly in image. (c) With two ground planes, one 1/4λ below the other, providing excellent isolation of feedline radiation. (d) Coaxial 1/2λ dipole. (e) Coaxial 1/2λ dipole with choke to isolate the antenna from the mast.

Now, one can also erect a vertical dipole and consider the 0°-180° line as the horizon and reconsider the patterns in Fig. 4. It should be clear that the 1-1/4λ dipole puts more energy on the horizon than the other length vertical dipoles. Maximum lobes on the horizon are generally assumed to be the most desirable for both DX and VHF communications. The 1-1/4λ dipole has a typical measured gain of 3 dB over a 1/2λ dipole.

Now let's look at the classical description of a monopole or single-element vertical. A single vertical radiator must have a path through which the antenna return currents can flow, so a monopole is usually described with respect to an infinite, perfectly-conductive sheet or ground plane. See Fig. 5, top left. The ground plane carries the other half of the antenna current and mirrors the monopole (Fig. 5, top right), creating a virtual dipole across the ground plane. The radiation pattern is precisely one half of the pattern of the dipole whose leg length is the same as the length of the monopole as in Fig. 5, center. Thus, the 1/4λ monopole has the upper (or lower) 1/2 of the radiation pattern of a 1/2λ dipole.

All this is well and good, but how many infinite, perfectly-conductive sheets are there and what happens if the sheet is not infinite or not perfectly conducting? There have been no reports, to my knowledge, of the discovery of an infinite, perfectly-conductive sheet, so let's examine what happens if the ground plane is merely some finite, physically-realizable size. Interestingly, the size of the conductive sheet has little effect on the impedance of the antenna but has a significant effect on the radiation pattern. As the size of the ground plane gets smaller, the mirror for the monopole gets "cloudy" and the reflection of the image diminishes. The result is a higher angle of maximum radiation than that supplied by an infinite ground plane as shown in Fig. 6 for a 1/4λ monopole over a 6λ-diameter conductive sheet.

This provides the first clue to the poor performance of the 5/8λ antenna over a 1/4λ set of radials. It also raises some questions concerning the use of an auto body as the ground plane for any antenna on bands below 1296 MHz. In fact, the pattern and gain for any auto antenna needing a ground plane is very unpredictable—you get what you get! There are auto antennas which do not use the auto body as a ground plane which do provide predictable radiation patterns and gains for VHF use. On the other hand, a ground-mounted antenna over a large number of buried radials is indeed a reasonable approximation to an ideal monopole over an infinite ground plane, but ground losses can reduce the performance over that of a dipole if the ground is lossy and/or there is an insufficient number of radials.

AM broadcast stations use ground-mounted vertical antennas very effectively with ground systems of at least 120 wires at least 1/4λ long buried radially from the base of the antenna and connected to the shield of the coaxial feedline at the base of the monopole. The larger the number and the longer the length of the radials, the lower the ground system resistance and hence the lower the ground losses. The resistance of a good ground system is about 2 Ohms which, for an antenna whose radiation resistance is about 40 Ohms, is not an insignificant loss. So, if your trap vertical sitting in your back yard isn't getting out as well as you would like, try adding more and/or longer radials where the trade-off is usually for more rather than longer. Better yet, put it on the roof as high as possible to reduce ground losses and do better on the high frequencies as well.

For VHF, say 2 meters, we all know that the height of the antenna is very important (although it has been my experience that on all bands above 160 meters the height of the antenna is more important than any other single parameter) so we prefer to mount our antennas on tops of buildings, towers, poles, trees, etc., to get them as high as we can. One could mount a vertical radiating element on the end of the feedline as in Fig. 7 and depend on the mounting structure and feedline for the ground return. This kind of an antenna will work, but its performance is unpredictable since it depends on the lengths and positions of both the feedline and mounting structure for the radiation pattern it provides. This is because the feedline and mounting structure carry the radiating ground-return currents.

A typical current distribution on the outside of the

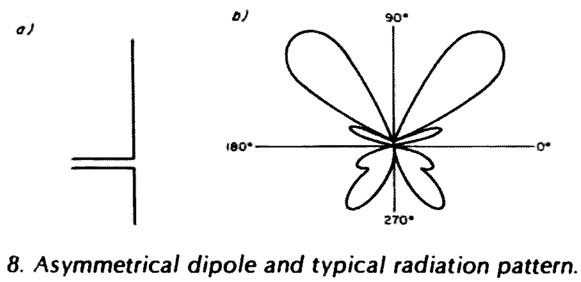


Fig. 8. Asymmetrical dipole and typical radiation pattern.

coax feedline is also shown in Fig. 7. Note that the phase of the current on the outside of the coax reverses at 1/4λ below the top element. This will tend to cancel the effect of the top half wave of the antenna and distort the pattern from that of either the ideal vertical or a dipole in free space. The conductive sheet or mirror can be simulated by wires extending horizontally from the base.

The concept of a mirror formed by wires can be understood easily by first considering a vertical 1/4λ element with a single 1/4λ radial. This forms a bent dipole, a rotated inverted vee, with both horizontal and vertical polarization. If we distribute three or more radials symmetrically about the base of the vertical element, the horizontal components of the radiation from the ground plane will cancel leaving only the vertical component of the radiation. The ground plane performs two key functions. It forms a mirror for the vertical radiating element and provides some isolation of the outside of the feedline from the radiating currents.

Typically, four radial wires slightly greater than 1/4λ long form the ground plane, as in Fig. 7(b). Also, the radials are often bent down to pull the radiation pattern more towards the horizon, as in Fig. 1. This also raises the impedance a bit closer to 50 Ohms. A properly adjusted vertical ground-plane antenna looks very much like a 1/2λ dipole with respect to its radiation pattern and gain—approximately 0.1 dB less. A further refinement of the ground-plane antenna, shown in Fig. 7(c), places an additional ground plane 1/4λ below the first one to act as a choke, which improves the radiation pattern by further reducing the current on the outside of the feedline. A similar result can be obtained by using 1/4λ sleeves instead of a ground plane, as shown in Figs. 7(d) and 7(e) to create a coaxial or sleeve antenna.

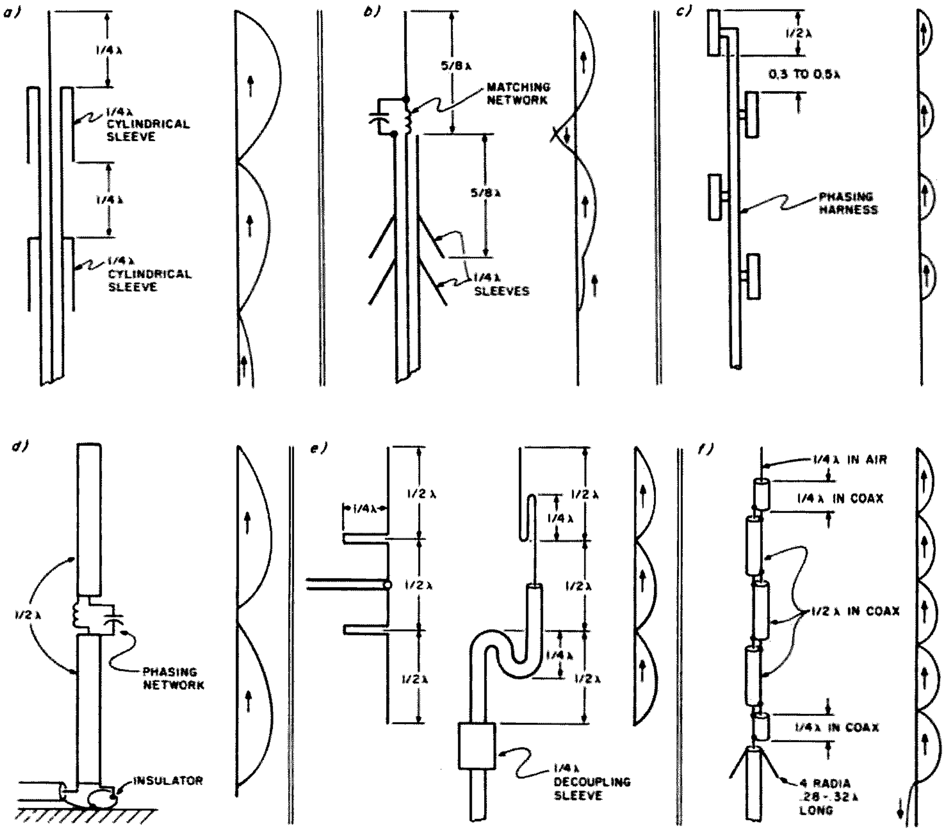


Fig. 9. Several omnidirectional vertical gain antennas and their current distributions. Arrows show phase of current; antennas with the most current in phase have the highest gain. (a) Skirted, to phase feedline currents to form a collinear antenna—1-2 dBD. (b) Isopole, using sleeves to phase feedline currents to form 1-1/4λ dipole and to isolate it from the mast and feedline—3 dBD. (c) Four collinear folded 1/2λ dipoles fed with a phasing harness. Four elements provide 6 dBD omnidirectionally and 9 dBD unidirectionally. (d) Ground-mounted collinear. The 1/2λ sections are insulated from both ground and each other. An LC network provides the phase shift needed to get currents in phase in the two sections—2 dBD. (e) Franklin antenna—dipole and coaxial versions. The 1/2λ stubs provide the phasing for current in adjacent sections. Three sections above—3 dBD. (f) Coaxial collinear uses sections of coax arranged so that the radiation from the outside of the coax is properly phased. Gain is proportional to the number of 1/2λ sections. Eight 1/2λ sections—6 dBD.

The outside of the sleeve acts as a conductor for the return signal while the inside is a shorted 1/4λ transmission line with a high impedance at the open end. The current distribution for both the ground-plane and sleeve antennas is identical to that for the vertical dipole. If one mounts a longer vertical element such as a 5/8λ on the 1/4λ ground plane or 1/4λ sleeve, then we have an asymmetrical dipole equivalent which has a pattern with multiple high-angle major lobes as shown in Fig. 8. This antenna does not work well to the horizon and we have the truth—the end of our fable. Then how do we get the 3-dB theoretical gain from a 5/8λ antenna? We probably do get it but in a direction above the horizon which doesn't do much good. Then how do we get the signal where it does do some good?

First, we *know* that we get 3-dB gain over a 1/2λ dipole with a 1-1/4λ dipole, so a vertical dipole which is 1-1/4λ long will do it in a direction which gets out where we want it. An equivalent can also be obtained by using an appropriate ground plane which properly mirrors the radiator. For example, ground-mounting a 5/8λ element over ground with high conductivity as well as a good ground radial system is one way. A ground plane with 5/8λ radials will also provide the 3-dB gain. Another approach, taken by AEA with their Isopole™, uses a 1-1/4λ sleeve dipole with a second isolation sleeve, as illustrated in Fig. 9(b).

The 1/4λ sleeve on the sleeve antennas and the

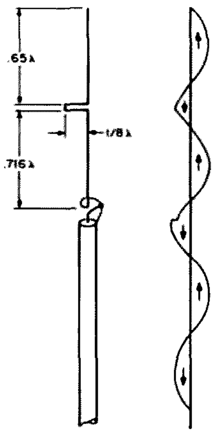


Fig. 10. Ringo Ranger and its current distribution on both the monopole and the feedline.

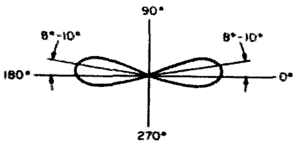


Fig. 11. Radiation pattern of the Ringo Ranger, from the manufacturer's literature. Note that the major lobes are 8°-10° above the horizon.

Isopole ensures the proper phase for the remaining current on the outside of the coax while minimizing that very current, thus ensuring that the radiation pattern is both predictable and on the horizon. The double-sleeve antenna, Fig. 9(a), is a simple collinear which provides 1- to 2-dB gain over a 1/2λ dipole because of the proper phasing of the small current which does flow on the outside of the coax. The addition of more than two sleeves does little to improve the gain because the current below the second sleeve is very small. Other types of collinear antennas can provide additional gain as shown in Fig. 9, with the gain over a dipole, dBD, provided in the caption. The basic objective for obtaining gain is to provide multiple radiating elements in which the currents are as large as possible and in phase.

The phasing can be obtained by:

- Using feedline currents as in the sleeve collinear in Fig. 9(a), as described earlier.
- Spacing the radiating elements as in the collinear dipole in Fig. 9(c).
- Using lumped L and C phasing networks as is done for the low-frequency ground-mounted antennas in Fig. 9(d).
- Folding a half wave of wire or cable up as in the Franklin antenna in Fig. 9(e). Note that folding is also used to provide loading in beams, in particular 40-meter beams and the KLM KT34A and KT34XA triband beams.
- Using alternate 1/2λ sections of coax connected so that the current on the outside of the coax elements is radiating in phase, as in the coax vertical in Fig. 9(f).

Some comments on these various phasing techniques will illustrate the relative merits and trade-offs in these different designs.

Number of 1/2λ Elements	A Close Spacing	B Optimum Spacing
2	2.0 dB	3.1 dB
3	3.0	
4	4.0	6.2
5		
6		
7	5-7	
8	6-8	9.3

Table 1. Gain of collinear antennas consisting of 1/2λ sections for close and optimum, 0.3λ to 0.5λ, spacing for different numbers of 1/2λ sections. The close-spaced numbers are approximate and depend on the type of antenna.

First, spacing four or more folded dipoles as in Fig. 9(c) is a straightforward way to provide phased current flow. The optimum spacing for collinear arrays, between 0.3λ and 0.5λ, is easily obtained by placing the dipoles on a vertical mast. This type of antenna will provide single directional gain of 9 dBD by placing all the dipoles on that side of the mast, or 6 dBD omnidirectional gain by distributing the dipoles around the mast. A phasing harness is required to distribute power to the dipoles in the proper phase. (Details for building such an antenna for 2 meters are given in Reference 2.)

Gain from a low-frequency ground-mounted vertical with a radial system may be obtained by either making it 5/8λ long or by stacking two 1/2λ sections on top of each other, with insulators between the sections. The sections are coupled through an LC network so that the currents in the two sections are in phase; see Fig. 9(d). Since the spacing between the 1/2λ sections is not optimum, the gain is less than one would get if they were spaced 0.3λ to 0.5λ apart. The gain of collinears for different numbers of 1/2λ elements for close and optimum spacing is given in Table 1.

The Franklin antenna uses a folded section in the monopole so that the radiation from that length is cancelled and the currents on the radiating parts of the antenna are in phase. The outside of the coax feedline carries the radiating return currents. The coax is also folded to ensure that currents on all sections of the coax are in phase with each other and the radiating sections of the monopole. Again, the spacing between sections is not optimum, so approximate gain is given in column A of Table 1.

The coaxial collinear, Fig. 9(f), is an antenna that has become very popular as a repeater antenna because it can provide good omnidirectional gain (6-9 dBD) and is relatively easy to make. It can be thought of as the ultimate in using the feedline as a radiator. The goal of the design is to propagate the signal through the coax in 1/2λ sections so that the outer conductors of the coax sections carry a current which radiates. Remembering that electrical 1/2λ in coax depends on the propagation velocity of the cable and is always less than the free-space length, this is accomplished by connecting the 1/2λ sections of coax so that the shield of one section connects to the center conductor of the adjacent section, thus ensuring that the coax radiates a signal which is in phase with that in the adjacent section. Any number of 1/2λ sections can be used with more sections providing more gain. The gain is limited, however, by the fact that the current diminishes as the signal propagates up the antenna, since each section radiates some of the applied energy. Also, the close spacing of the sections further limits the gain. Thus, the gain shown in Table 1 for this antenna can be obtained by considering the number of 1/2λ sections only and not counting the top and bottom sections even though they do radiate. The bottom 1/4λ section ensures the proper phasing for the current fed to the first 1/2λ section. The 1/4λ ground plane on the bottom, which often is replaced by a balun, provides an image for the 1/4λ section and isolates the feedline from the antenna. The top section terminates the wave propagating up the antenna so that the phasing is preserved and the last 1/2λ of radiation occurs.

Coaxial collinears can be mounted either in fiber-

glass radomes on top of a mast or suspended from the side of a tower inside plastic drain pipe. The only difficulty is that the lower sections which carry the greatest radiating current are closest to the ground. See Reference 2 for further information on this antenna.

Performance

Now that the theoretical basis for the poor performance of my homemade 5/8λ antenna was established, I decided to test some of the other popular 2-meter antennas on my simple test setup. Probably the most popular and easiest to use 2-meter base-station antennas are the Ringo™ and Ringo Ranger™ by Cushcraft. The Ringo is described by the manufacturer as a 1/2λ monopole while the Ringo Ranger is described as two 1/2λ elements in phase. The physical dimensions of the Ringo Ranger indicate that it is really a bit longer than 1/2λ, as shown in Fig. 10. Also, the phasing stub is 1/8λ rather than 1/4λ as in the Franklin collinear and is located so that the higher-current portions of the reverse antenna current are in the stub, also as shown in Fig. 10. Also note that the phasing is such that the feedline and/or mounting structure are carrying radiating current. Since this current is not specifically phased, and because the phasing stub is 1/4λ rather than 1/2λ, some compromise in on-the-horizon performance appears to have been made to get a solid, simple antenna. The extra out-of-phase current is probably responsible for the slight elevation of the radiation pattern (about 9 degrees) as given in the manufacturer's literature reproduced in Fig. 11. Thus, one may expect that the Ringo and Ringo Ranger on-the-horizon performance would be less than that of some other antennas and that their performance may be improved by adding a ground plane.

Well, armed with my SO-239, 1/4λ ground plane, my home-brew 5/8λ on the 1/4λ ground plane, a Ringo, a Ringo Ranger, a Ringo Ranger with six 19-1/2-inch radials drooping at 45°, and an Isopole, I went out in the cold of February to find out what worked best.

Note that radials made from aluminum ground wire can be added to the Ringo or Ringo Ranger easily by bending three 40-inch pieces of aluminum ground wire around self-tapping screws in the base of the antenna making six 19-1/2-inch radials. The radials have a negligible affect on tuning.

I used the same testing techniques I had used earlier—measuring the relative received strengths of repeaters and locals in all directions and getting signal reports from locals. The data taken for each station were then normalized by dividing the reading for the best antenna into the readings for each antenna. I then averaged the normalized numbers for all stations for each antenna. This allowed me to get an unbiased relative performance metric across each antenna. The results are plotted in Fig. 12 for received signals from both repeaters, which tend to be at higher elevations around me, and local stations. The averaged values in each direction for signals from repeaters also are plotted. Basically, Fig. 12 indicates that neither direction nor elevation affects the relative performance of these antennas tested at my location, and that the Isopole is the best of the antennas tested. The rest of the antennas were tested with the original four and the results in both receiving and transmit modes are given in Fig. 13. Again, the results are consistent.

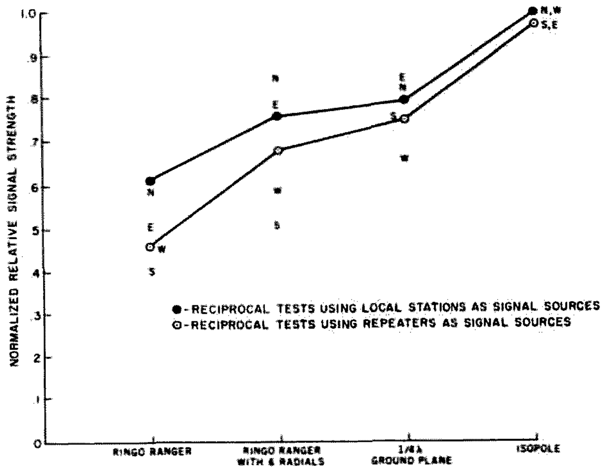


Fig. 12. Relative signal strength of four antennas for repeaters and local stations in different directions. Normalized strengths for each direction are given by N, S, E, and W.

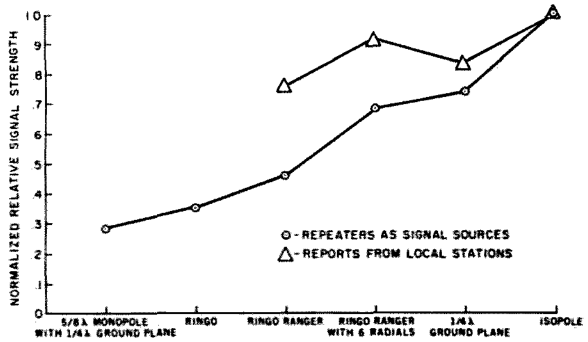


Fig. 13. Relative signal strengths of six antennas in both transmit and receive modes. Wider variance from reports from other stations is expected because S-meters are independently calibrated.

Conclusions

From these tests it is clear that:

1) The 5/8λ radiator on a 1/4λ ground plane is a poor antenna—do not bother with it.

2) The 1/4λ cheap (less than $2.00) SO-239 ground-plane antenna of Fig. 1 is a very cost-effective antenna.

3) Radials do improve the performance of the Ringo Ranger.

4) The Isopole performed better than all the other antennas in almost every case.

It is interesting to note that since these tests were run, Cushcraft has come out with a decoupling kit consisting of a ground plane which mounts some distance below the base of the Ringo Ranger to improve its performance. I will try it as soon as I can get one to my test site.

Acknowledgements

I thank the following for their help in running these tests: Roy K1GSK, George W1DA, Dick AB1F, Bob W1QMN, Russ WA1RKO, Tom WA1MBA, Bruce WBØOFC, Shawn WB1AEL, and Tom KA1AIG. ■

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The 440-MHz Curtain

—hang this broadbanded two-bay collinear on your tower and get 22 dBi to play with

I had been experimenting for several years with various antennas on a UHF repeater, trying to obtain reliable coverage over a 50-mile path. Initially, I used arrays of commercially manufactured yagis with good but not spectacular results, eventually ending up with an array of eight 14-element yagis stacked vertically up the side of the tower.

I began to suspect that something was amiss after removing four, then six, yagis from the array, leaving just two and discovering that signals didn't drop the expected 6 dB. In fact, I observed closer to a 3-dB difference between two and eight yagis.

Experimenting further, I found little effective signal gain between four and eight yagis. I was stumped over this discrepancy until I thought of the losses at 440 MHz of four additional baluns, a four-way splitter, a two-way splitter, some 30' of RG-8, and ten coax connectors!

Photo A. Construction details.

While mulling over different ways to pick up those elusive dBs, an antenna with a whole lot of relatively inexpensive gain came to mind. This was a broadband, high-gain (21.3-22.8-dBi) curtain array used by the VOA in the 9- and 11-MHz shortwave bands for optimum signal into overseas locations.[1] The VOA dumps about 200 kW into such an array and the resulting 20-megawatt erp usually gets the message across. This antenna is a two-bay collinear, with eight half waves per bay, spaced a quarter wave in front of a screen reflector.

When scaled to UHF, the proportions become entirely manageable. I'll be describing an array based on this design consisting of three bays of six elements, occupying a space of about 3-1/2' × 8' and a total material cost of about $20. As opposed to a yagi, a collinear is easy to tune and is almost guaranteed to work well right off the bat.

The framework for the array is made of 2" × 2" pressure-treated lumber for weatherability—redwood or cedar would be excellent alternatives. Assemble the frame using a sufficient number of corner irons and screws to impart rigidity to the structure. The plane reflector is made of so-called chicken wire fencing stapled to the front of the frame. This material is galvanized, light weight, strong, a near-perfect UHF reflector, and has low wind resistance.

Don't substitute ordinary window screening or hardware cloth in temperate climates as the holes will fill with snow and ice causing one heck of a windloading problem. Either the antenna mount would fail during a winter storm or you might find your tower becoming a giant fly swatter. You want to stretch this fencing as much as possible while stapling it to the perimeter of the frame so that it won't flap in the wind.

Once the framework is assembled, the next step is to attach the pre-drilled struts that hold the driven elements in place. I used 3/4" × 1/2" stock in a crossbar arrangement. No insulation is required in mounting the elements this way as the rf voltage at the center of the elements is minimal. The elements are made of #12 copperweld antenna

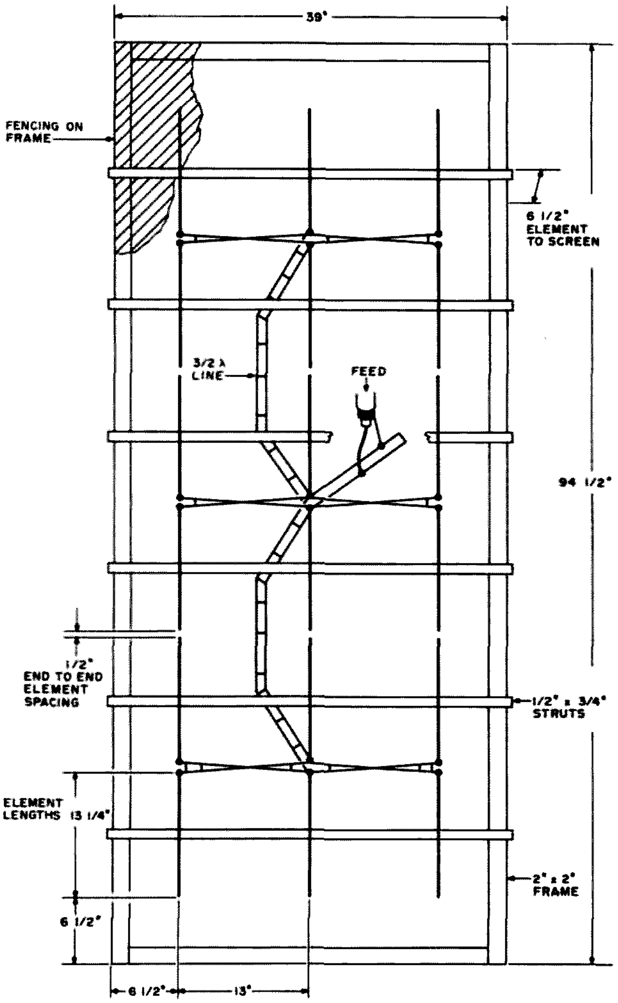

Fig. 1. 440-MHz array construction details.

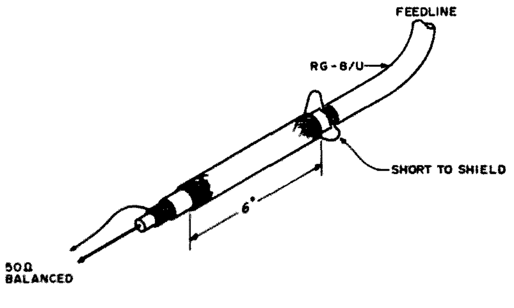

Fig. 2. Details of sleeve balun construction.

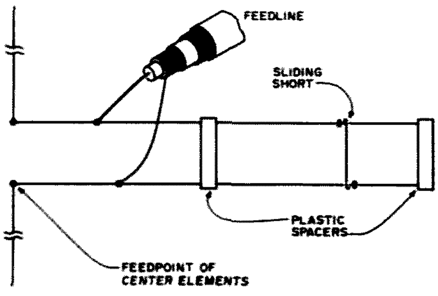

Fig. 3. Universal stub construction.

wire inserted through drilled holes in the cross-bars and held in place with silicone RTV. Center the elements in the struts and apply the RTV. Let the RTV dry for a day or so before proceeding further. It's worth applying several coats of urethane or spar varnish to the struts at this point.

Now you should cut the phasing lines to length that connect the elements and bays together. This is the most critical part of construction and requires attention to detail. I made my phasing lines from 300-Ohm Saxton open-wire transmission line, available from several retailers of amateur equipment. This line is #18, spaced 1/2", and I measured its velocity factor as 0.985 in small sections at UHF frequencies.

Please don't use any kind of ordinary twinlead for a harness and expect a decent swr in wet weather. If you must, make your own open-wire line with low-loss spacers. You need three 1λ lines, one for each bay, and two 1-1/2λ lines to interconnect the bays. The 1λ lines are cut to a length of 26-1/4" and the 1-1/2λ lines were cut to 39-3/8" long. Measure carefully!

Solder the phasing lines to each bay. Find the exact center point of a 1λ line and solder this point to the center two elements in a bay. Put a 180° twist in the free ends and solder these to the outside elements, doing the same for all three bays. Now interconnect the three bays with the 3/2λ lines. Loop these lines between the bays and the reflector and don't forget the 180° twist in them before soldering. It's not a bad idea to use a couple of plastic standoffs on these lines, supporting them about 2" above the reflector to keep them from flapping in the wind. Check that the spacing between line conductors is constant and that the lines are generally balanced and symmetrical with respect to the reflector.

This antenna is fed with a 1/2λ universal stub and coaxial sleeve balun. If you're into Q-sections, one also could be used to match a coax line to this antenna's approximately 100-Ohm feedpoint impedance as an alternative. The sleeve balun (Fig. 2) is constructed by cutting off a 6" piece of braid from some RG-8, tinning the ends to prevent unraveling, and slipping it over the end of the coax feeder. The inside end is soldered to the shield of the RG-8 feedline at a point about 6-1/2" from the end where a 1/4" section of jacket has been removed.

Slather some RTV over this connection and the open end of the coax to prevent moisture penetration after stripping and tinning about 1/2" of the coax end. The 1/2λ stub (Fig.3) is 13-1/2" long and can be conveniently made out of the same copperweld that the elements are made of and some spacers from the open-wire line. Heat the wire with a hot soldering iron and the plastic spread-

Gain Calculation

Calculating the gain of a collinear with a large number of elements can be as complicated as you want to make it. A general rule of thumb for the gain of a collinear aimed at the horizon is 4N, where N is the number of half-wave elements. For instance, a 12-element antenna would have a power gain of 48, or 16.8 dB. (Add 3 dB if a reflector is used.) This figure is strictly a rough estimate, and factors such as ground-reflection gain (or loss) or dielectric and resistance losses can change things considerably. (See *Antenna Theory and Design*, Williams, 1950.)

ers can be easily pressed on or off. A sliding short is made from a piece of #18 tightly twisted around both stub lines. A loose fit here will cause erratic readings while tuning.

You must tune this antenna outdoors aiming it up at the open sky. I had this antenna aimed out at the road in front of my house and every time a car went by the swr went up and down! The tuning process consists of alternately sliding the attachment point for the feedline and the short up and down the stub until the best match is obtained. The optimum point for the short will be near the far end of the stub, and the coax will attach to a point about 1" from where the stub connects to the antenna. A 1.5:1 swr was easily obtained. The antenna's bandwidth is excellent and exhibits a good swr over 5 MHz.

Put simply, this antenna is a real band smoker. Using a calibrated signal generator as a reference and the S-meter of a Drake UV-3 60 miles from a repeater using this array, I made some comparison checks. I measured a 12- to 13-dB improvement over a commercially manufactured 20' long, 10-dB gain fiberglass-type omni on the same tower! This is the difference between a signal just barely opening squelch and one of perfect readability with a little background hiss. The beamwidth appears to be on the order of 20° to 25° and the front-to-back and front-to-side ratios are superb. The close bay spacing produces a very clean pattern.

Now, let's see. A half wave on 29.6 is . . . ■

Reference

1. Jasik, *Antenna Engineering Handbook*, chapter 21.

The Plumber's Parabolic Mount

—a first-class hydraulic system

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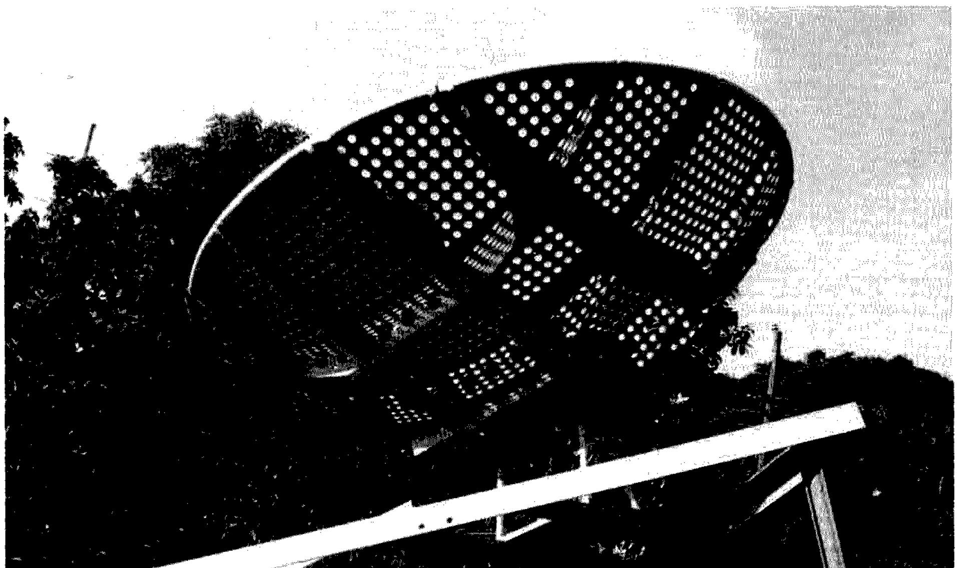

Photo A. Completed mount and two-meter (7-foot) dish after assembly on our roof. The elevation cylinder is at far right. Rooftop portion of controls, housing pump and valves can be seen near the far leg.

Interest in reception of microwave signals from geostationary orbiting satellites has spread rapidly throughout the amateur community. Some amateurs wish to receive TV programs directly from satellites such as Satcom.[1] Others, like my son and I, are more fascinated by receiving weather pictures from the meteorological satellite, GOES.[2]

Wherever your interest may lie, sooner or later we

all encounter the same problems. To receive weak microwave signals, first, a large parabolic reflector, or dish, must be used for an antenna.[3] Second, this dish must be positioned with a fair degree of accuracy and must be mounted securely enough so that it cannot be blown over by an energetic wind. Finally, for the avid experimenters trying to work more than one satellite, one must be able to move the aim of this unwieldy saucer from one point in the sky to another.

Considering that eventually we would use our newly acquired dish for more than one satellite, my son and I decided to build a steerable mount that could be remotely controlled from our electronics lab in the house.

Photo B. Close up of the azimuth steering arm and control cylinder.

The final product of several designs provided a mount that can be reproduced easily by the average amateur. Costs will vary, depending on your resourcefulness, but with careful shopping this mount can be constructed for less than $500.

The mount is hydraulically operated with an elevation range from 46° to 59° and an azimuth scan of 96°. This range of travel covers most of the usable area of view for equatorial satellites from our location. Photos A and B show the completed mount holding a two-meter (7-foot) dish at our station. The remote control panel, located in the electronics lab, is shown in Photo C.

This article will provide complete construction plans for the mount and controls. Although this project can be built using only hand tools and an electric drill, having access to a power hacksaw and a welder will greatly expedite construction and save many kilocalories worth of elbow grease.

A-Frame

The major portion of the mount is constructed of 3" × 3" × ¼" angle iron. Two eight-foot, and one seven-foot length are bolted together to form an A-shaped frame. The lower ends of this A-frame pivot on two pads that serve as the eleva-

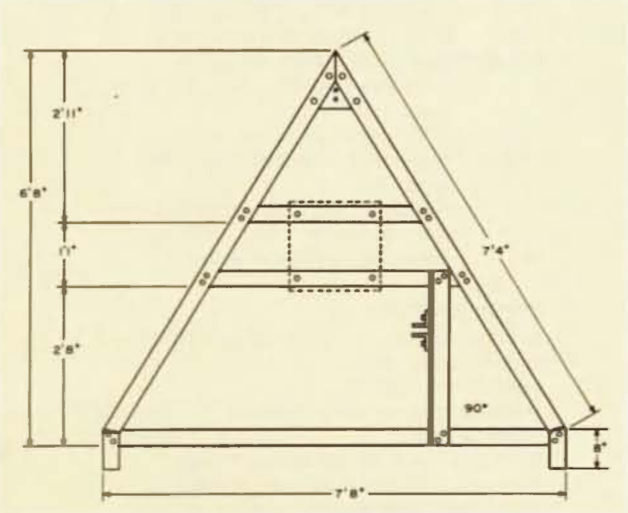

Fig. 1(a). Top view of the A-frame assembly. The dotted line is the location of the pivot frame mounting surface.

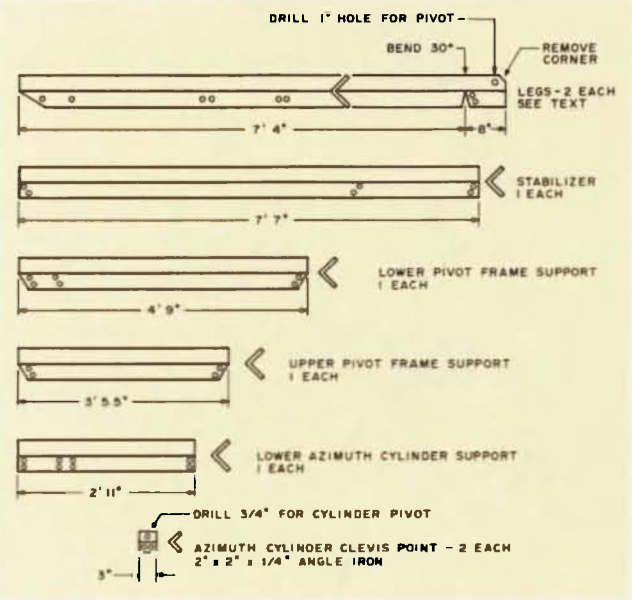

Fig. 1(b). Cutting detail for the A-frame members (see text). All angle iron is 3" × 3" × ¼" unless noted. All bolt holes are ½" unless noted.

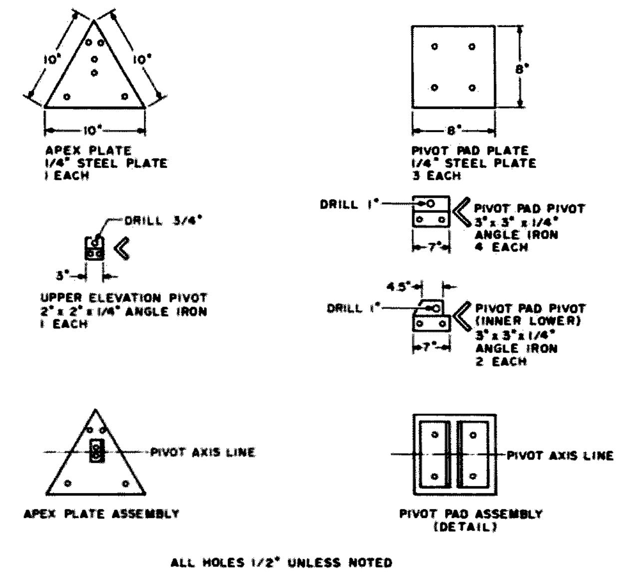

Fig. 2. Apex plate and pivot pad cutting and assembly detail.

tion pivot points. Elevation motion is provided by a hydraulic cylinder extending from the apex of the legs to a third pad. Fig. 1 shows cutting and assembly details for the A-frame. Pivot pad detail is shown in Fig. 2.

A 30-degree wedge must be removed from one side of each of the two legs at a point 8" from one end. The short ends are then bent to close the opening left by the removed wedge. The seams formed at these bends must be closed by welding or by the addition of a web plate bolted over the seams. *Remember*: The cuts must be made so that one leg is the mirror image of the other. The seven-foot length is used as a stabilizer across the bottom of the A-frame.

The pivot pads are constructed from three pieces of ¼" steel plate 8" square and six pieces of 3" × 3" × ¼" angle iron 7" in length. See Fig. 2. Two of these pivots are located at the foot of each leg and one at the lower end of the elevation cylinder.

At the apex of the A-frame a triangular plate of ¼" steel 10" on each side is used for the dual purpose of joining the upper ends of the A-frame and providing an upper pivot point for the elevation cylinder.

Three additional lengths of angle iron are used for the support of the pivot frame and the lower support of the azimuth control cylinder.

Keep in mind that these dimensions are for a two-meter dish. A slightly larger dish could be accommodated, but if your dish is much larger, the A-frame will have to be made longer.

It would be well to mention a valuable construction hint at this time. Although it is theoretically possible to drill all the necessary holes accurately by being very exact in your measurements, in reality it is somewhat difficult. As you may have noticed in cutting-detail Figs. 1, 2, and 3, no measurements are given for hole placement. Ex-

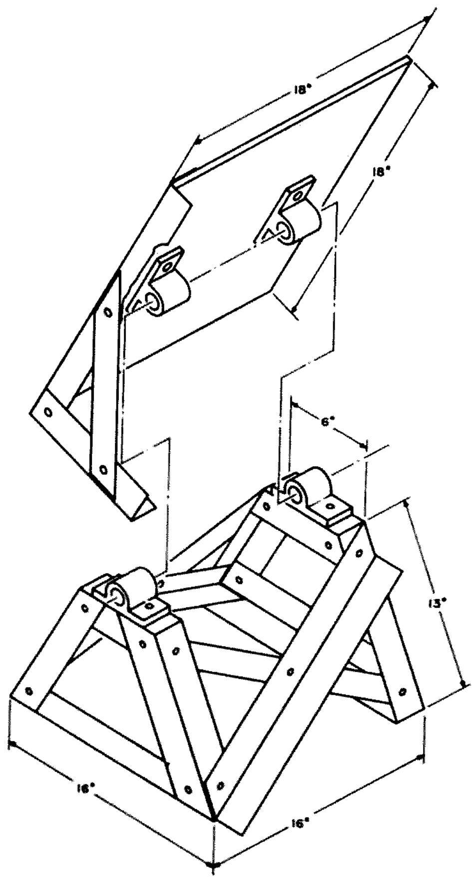

Fig. 3(a). Assembly detail for the pivot frame.

Parts List

Electrical controls

P1	110-V, 15-A ac plug with ground
F1	15-A fuse and holder
F2	5-A fuse and holder
T1	24-V, 5-A transformer
D1	5A, 50-V power diode
C1	1000-uF, 50-V dc electrolytic capacitor
I1-I5	24-V indicator lamps (may substitute LEDs with proper resistor)
TB1	3-position terminal barrier strip
TB2	10-position terminal barrier strip
RY1-RY5	24-V relays, SPDT type
S1	SPST power switch rated at 15 A or more
S2,S3	SPDT center-off toggle switch
S4-S7	Heavy duty microswitch (outdoor type)
PS1	Hydraulic-type pressure switch set to make at 300 psi
MI	Hydraulic pump drive motor

Hydraulic controls

Hydraulic pump capable of delivering 500 psi at .5 gallons per minute
4-way control valves, 2 each
Double-acting hydraulic cylinders, 1.5" bore, 18" stroke, 2 each
Needle valves (flow restrictors), 2 each
Hydraulic pressure regulator set at 500 psi
Oil reservoir tank, approx. 1 gallon capacity
Hydraulic accumulator (optional)

perience has shown us that the easiest way to drill these holes is to clamp all the pieces for a particular section together first. Then the holes can be drilled through the mating sections. This alignment of all the pieces and their holes will ensure accurate and easy assembly.

Pivot Frame

The pivot frame is mounted in the center of the A-frame and provides the azimuth axis and support for the dish.

The prototype shown in all the photos has the pivot frame constructed of three-quarter-inch pipe welded to form the frame. This is because the frame was built for another use but fit so well in this project that I just could not pass it up. My new design is just as good, however, and can be built without any welding. See Fig. 3. Two trapezoidal upright frames are constructed of 2″ × 2″ angle iron. A bronze bearing pillow block with a one-inch bore bolts to the upper short bar of each trapezoid. To prevent lateral movement of the upright frames, cross members of 2″ × 2″ angle are bolted between the frames. This sawhorse-shaped pivot frame mounts on the two center cross bars of the A-frame described earlier.

A length of 1″ steel shafting runs through the two pillow blocks atop the pivot frame and forms the azimuth axis.

At this point we are ready to mount the dish. If your dish has a center-type mount, you probably can use our system with no changes. However, if your dish has a different type of mount, some modifications may have to be made. We used an 18″ square of 3/8″ steel plate as a mounting surface for the dish. Two additional pillow blocks are bolted to this plate on the side opposite the dish. This plate is one half of the hinge formed between itself and the pivot frame.

The same "clamp and drill" method of construction used in the A-frame should be used for the pivot frame.

Steering

As mentioned earlier, all positioning of the antenna is done with hydraulic controls. This type of system was chosen because it provided accurate positioning ability and simplified mechanical design; most of all, however, a hydraulic system was the easiest to make weather resistant.

Azimuth steering is accomplished with a hydraulic cylinder attached between a piece of 3″ × 3″ angle iron on the main A-frame and a steering arm attached to one edge of the dish mounting plate. This steering arm is shown in a partially extended position in Photo B. The dimensions of the steering arm were selected so that the maximum amount of travel could be realized with the available hydraulic cylinder size. Both the azimuth and elevation cylinders were obtained from surplus sources. The length of the cylinder we selected combined with the pitch of the roof the antenna is mounted on gave us the necessary elevation angle for the antenna at our location.

Depending on your geographic location, you may need to change the length of the elevation cylinder or the vertical position of its mount to achieve your correct elevation angle. Positioning data for your location can be computed from the formulas given in Dr. Ralph E. Taggart's excellent article in *73 Magazine.*[4] The cylinders we used have a stroke length of 18″ and are double acting; that is, they can push or pull, depending on which end of the cylinder is receiving fluid pressure.

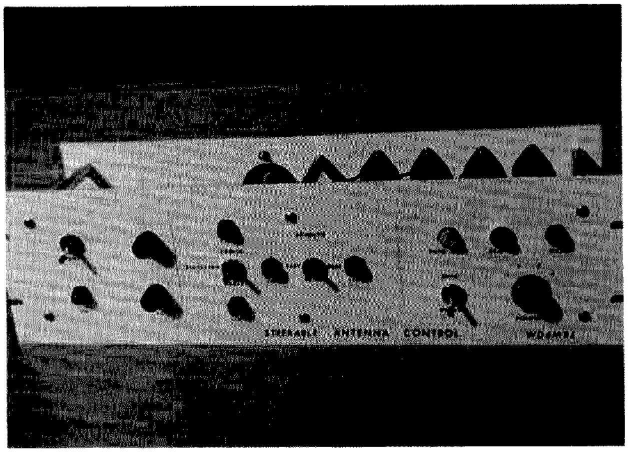

Photo C. Control panel for the steerable mount. Note that the controls on the right third of the panel are for the future installation of automatic positioning controls.

Hydraulic System

A half-horsepower electric motor is used to drive a small hydraulic pump that provides 500 psi of oil pressure. See Fig. 4. This type of pump as well as the cylinders and control valves can be purchased from sources such as those listed at the end of this article.[5,6] Pressure is controlled by a pressure regulator with all excess oil returned to the reservoir. Normally-open pressure switch PS1 (Fig. 5) closes at 300 psi and actuates relay RY1 allowing the control circuits to become active. The purpose of PS1 and RY1 is to ensure that hydraulic pressure is up before any operation can begin. More on this later.

Oil at 500 psi then flows through two flow-restrictor needle valves that control the velocity or rate of position change of the antenna. These needle valves must be adjusted for a flow that will allow accurate control of the dish position. The electric four-way valves are the hydraulic equivalent of

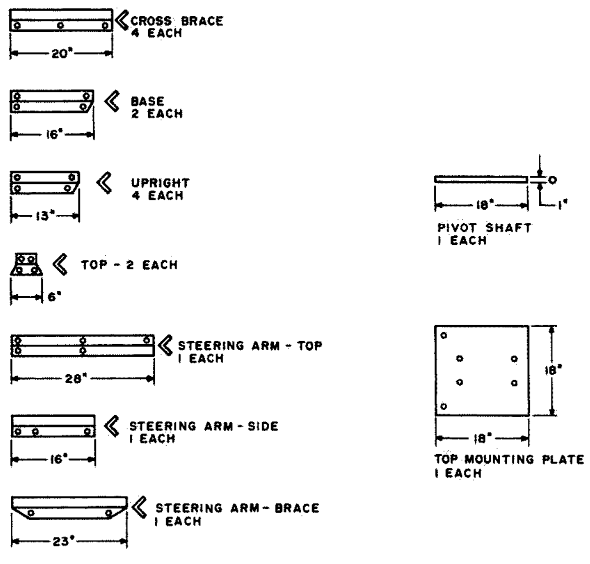

Fig. 3(b). Cutting detail for the pivot frame. All angle iron is 2″×2″× ¼″ and all holes are ½″.

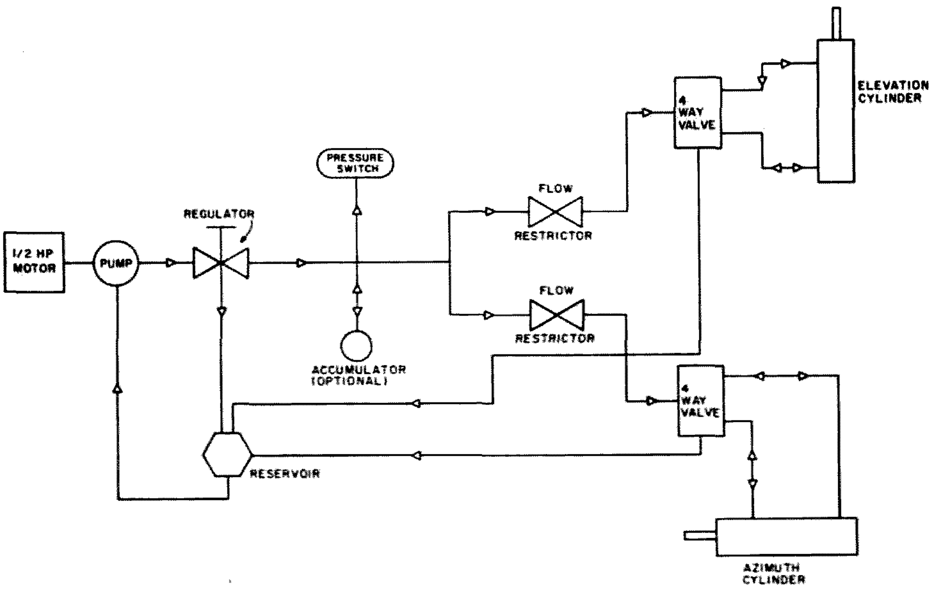

Fig. 4. Hydraulic system diagram. Due to the varying availability of surplus hydraulic components, your system may have to be somewhat different, but the same basic design should be followed.

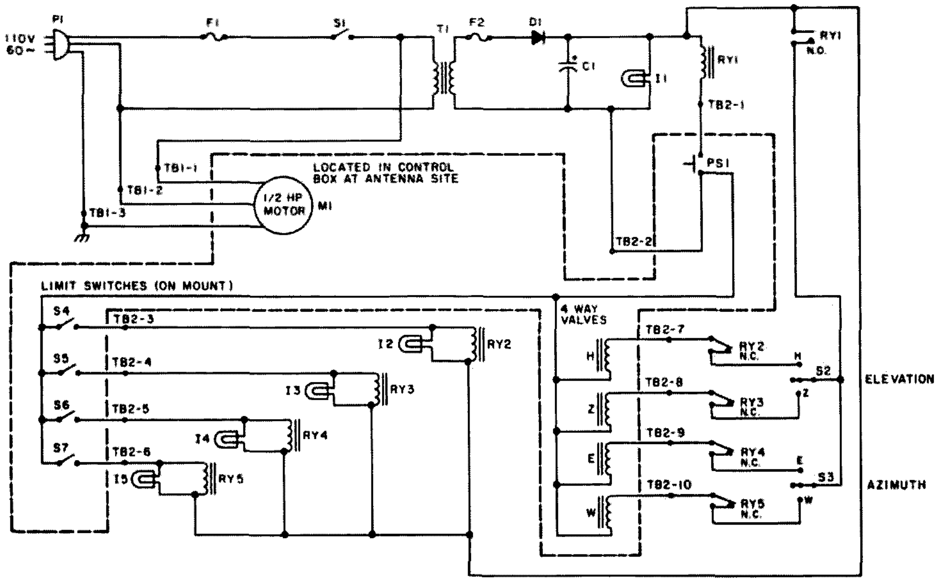

Fig. 5. Control panel wiring diagram.

a center-off SPDT switch. With no power applied to either coil, no fluid will flow to either side of the cylinder. With power applied to one coil, pressure will be applied through the valve to one side of the cylinder, thus moving the piston. Oil on the other side of the piston is returned through the valve to the reservoir. Conversely, if power is switched to the other coil, the piston will move in the opposite direction. An accumulator, a hydraulic cushion, can be installed as shown in Fig. 4 if the system "clangs" or shocks every time the four-way valves operate.

Control Panel

Currently, the electrical controls are only manual. Later, we plan to design a steering control that will input coordinates in degrees latitude and longitude and automatically position the antenna. For now, though, the circuit is simple and straightforward. Fig. 5 shows the circuit currently in use. Power is controlled by S1. Turning on S1 will start the hydraulic pump motor and apply power to the 24-V dc power supply. When hydraulic pressure is up to at least 300 psi, PS1 will close and actuate RY1 applying 24-V control to the position control switches, S2 and S3. These two switches are center-off SPDT type.

Transferring S2 to the horizon position will apply 24 V through RY2 NC to pick the four-way valve coil. This will apply motion to the antenna towards the horizon. If motion is attempted beyond the possible travel limits of the elevation cylinder, a limit switch will be closed. This switch is operated by a lever on the A-frame. Closing the limit switch will actuate RY2 thus opening RY2 NC. The four-way valve coil will drop out and cannot be re-energized until the overtravel condition is cleared. This same system applies to the other directions as well.

Summary

The development of this mount required several months of work before a design was arrived at that provided a well-balanced, sturdy, and easily reproduced device.

Actual construction time involved almost two months of weekend work, but has given us an antenna and mount with which we can enjoy many years of satellite signal reception.

We will be glad to answer any questions you may have about this project if you will please send an SASE. ■

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The History of Ham Radio
—part XIV

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Radio conferences, now commonly referred to as the Hoover Conferences, became yearly affairs and the assembly of 1925 was no exception. The conferences were called to bring about a degree of cooperation between various branches of the developing radio industry. Primarily to cope with the ever-increasing proliferation of interference problems in the interest of the listener and to mediate the differences between broadcast license applicants, government regulation became of paramount importance.

This, the fourth conference, was to be the last one called by the Secretary of Commerce. Radio's destination would be completely revolutionized in the subsequent two years by bringing about the needed legislation to replace the 1912 law.

Convening in Washington on November 9th, 1925, some 700 participants from all sections of the United States were present—and only for three days. They soon came to unanimous agreements on all major issues. The spirit in which various questions were approached signified common understanding of the direction which radio broadcasting was to take in the future.

By the end of 1925, there were some 600 radio broadcast stations operating in the United States with no enforceable regulations. The opinions of the conferees were practically unanimous in favor of not limiting the number of broadcasting licenses issued, but actually to diminish the stations on the air so that the radio listener would benefit from the reduced interference generated.

What was the radio amateur's position? At the conference, the question of greatest interest to amateurs concerned the retention of the 150- to 200-meter band. Its takeover was threatened by the broadcasters. However, after serious consideration, no additional channels were allocated for the broadcast service.

Several recommendations were promulgated for the amateurs:

1. The opening of a 100-kHz band from 83.3 to 85.7 meters (3500 to 3600 kHz) to amateur phone operation, the usual quiet hours applying.
2. The opening of the so-called amateur 80-meter band to naval aircraft.
3. The prohibition of spark to all waves below 200 meters.

These recommendations were to take effect after formal announcement by the Department of Commerce. Meanwhile, the regulations of the past year remained for amateur guidance.

Mr. Hoover, in his opening remarks at the conference, referred in particular to the progress radio had made during the few years of development.

"It has been suggested that the remedy [for congestion] lies in widening the broadcasting band, thus permitting more channels and making it possible to provide for more stations. The vast majority of receiving sets in the country will not cover a wider band. Nor could we extend it without invading the field assigned to the amateurs, of whom there are thousands and to whom constant experimentation in radio development is so greatly indebted. Radio in this branch has found a part in the fine development of the American boy, and I do not believe anyone will wish to minimize his part in American life. And if we did absorb the upper amateur band from 150 to 200 meters, it would not even solve the immediate difficulties . . ."

The conference went on record recommending the following:

1. That no new stations be licensed until, through discontinuance, the number of stations is reduced and until it shall be in the interest of public service to add new stations.
2. That public interest as represented by service to the listener as opposed to private desire be the basis for the broadcasting privilege.
3. That further division of time among stations is not in the interest of public service and that the Department decline to grant any more licenses until the present number of stations is substantially reduced.
4. That duplication of frequencies not be permitted in the case of stations of greater than 500 Watts of power.
5. That advertising efforts via the broadcast be confined to the providing of meritorious programs which build goodwill for the sponsor.
6. That in issuing licenses, the Department uses dis-

crimination looking toward the location of all broadcasting stations outside of congested centers.

7. That Congress be requested to enact new radio legislation vesting the administration of radio in the Secretary of Commerce, subject to approval of an appropriate court.

With the unanimous adoption of the many reports and resolutions at this conference, the radio industry at last came to the realization that a new law was a pressing necessity and new legislation must be prepared as the next big effort by Congressman White, and as was indicated by the report of Hoover's committee on legislation, could now receive unanimous affirmative consideration.

Fourteen Years of Haphazard Growth Come to an End

Without a change in radio legislation in 14 years, especially since the end of World War I, Herbert Hoover had been in control and guided the radio developments as Secretary of the Department of Commerce. These were chaotic years for radio. The radio amateur was in the forefront of practically all major progress made in radio, especially with the support and cooperation of the Commerce Department.

With radio neglected by Congressmen, and court cases looming on the horizon, Herbert Hoover was not only willing to drop out, but also was certainly justified in surrendering the control of radio guidance. Hoover was now willing to surrender further attempts at assigning wavelengths and regulating times of operation and power of stations. He was ready to renounce the absolute control of broadcasting. ■

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The Skeptic's Multiband Ground Plane

—This antenna flies in the face of accepted theory. Do you think it will work?

The idea of feeding a vertical antenna—more specifically, a ground-plane antenna—with balanced transmission line is not new. Balanced, open-wire line lends itself well to multiband antenna applications because of its low loss in comparison with prefabricated coaxial lines. The transmission line used with the antenna described here is designed to have the least possible attenuation within reasonable limits.

How can balanced line possibly work well with an unbalanced antenna? Won't there be radiation from the line, and won't this cause horrible TVI and other problems? Well, since hams have been using unbalanced line (coaxial cable) to feed balanced antennas (dipoles and beams) for a long time and it has been shown that this is a perfectly satisfactory practice, one might be inclined to ask whether the situation should be any different the other way around. In the case of the antenna at W1GV/4, balanced line is being used with success to feed a ground-plane antenna.

Let's take a look at some of the theoretical considerations of balanced transmission lines and antennas before I describe a multiband ground-plane antenna without coils or traps that has proved very effective.

Parallel-Wire Line

In the old days of radio, the type of transmission line most often used was of the open-wire variety. The reason this kind of line works is that at every point along the line the currents in the two wires are always equal in magnitude and opposite in direction. Since the two wires are very close together with respect to the wavelength, they may be considered to occupy the same space. The field produced by one wire therefore cancels that produced by the other wire, and no radiation takes place.

For the currents in the two wires to be exactly equal and opposite, the antenna must have certain characteristics. If one side of the antenna presents a different impedance than the other, the currents in the two feedline wires will not be exactly equal or exactly out of phase. This may occur because one side of the antenna is longer than the other, or because one side of the antenna presents a different capacitance with respect to ground. See (a) and (b) in Fig. 6.

There is a third reason for radiation from a parallel-wire line: antenna currents. If one side of the antenna is closer to the line than the other side, the electromagnetic fields from the two halves of the antenna will not cancel each other in the vicinity of the line. This will induce a current in the line equal in magnitude in both wires but in the *same*

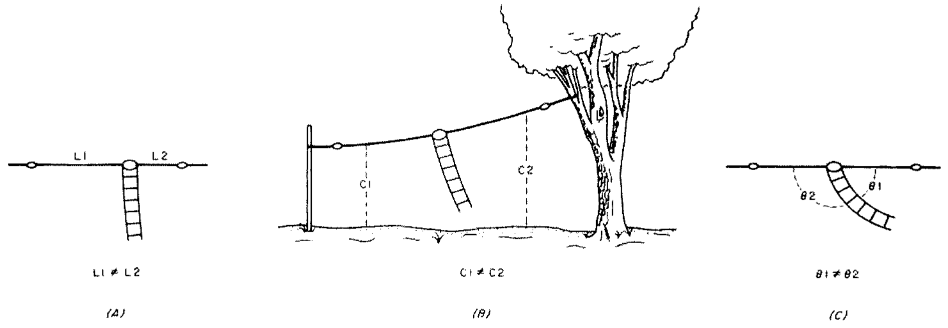

Fig. 1. Causes of feedline radiation. At A, antenna not fed at center; at B, one side of antenna closer to ground or obstructions; at C, feedline brought away from antenna in a non-symmetrical position. These factors can cause radiation from coaxial as well as parallel-wire lines. A perfectly balanced system is, fortunately, not usually necessary for satisfactory antenna performance.

direction (C in Fig. 1). Consequently, the line radiates because this current produces its own electromagnetic field. These antenna currents cause the net current flow in the two wires not to be equal and opposite, and this can result in trouble with an all-too-familiar gremlin for hams: rf in the shack!

Usually, a small amount of radiation from a transmission line is not a great handicap. This is fortunate because it is almost unavoidable. We certainly would want to minimize line radiation if we were using a highly directional antenna where front-to-back ratio is important. But with a simple antenna such as a dipole or ground plane, we need not worry about some deviation from theoretical perfection.

Coaxial Line

Many hams got it into their heads that coaxial line is shielded and therefore cannot radiate. This is not the case! Coaxial lines are just as susceptible to radiation-causing factors as parallel-wire lines. Antenna currents, induced in the outer conductor of coax, will produce electromagnetic fields and rf in the shack. These currents can be caused by any of the three situations shown in (a), (b), and (c) in Fig. 1.

Coaxial line has the advantage of being easy to install. It can be run close to or directly over metal objects such as gutters and pipes, and its attenuation characteristics and impedance will not be affected. This is not true with parallel-wire line. Metal objects very close to the latter type of line will cause "impedance bumps" and possible imbalance.

The main disadvantage of coaxial line is that it has relatively high attenuation. The swr becomes important at high frequencies or with long runs of line. Generally, the antenna must, impedance-wise, be fairly well matched to the line if coax is to be used with maximum success. Any time the swr is 2:1 or better, the line will function at essentially full efficiency. But an swr of, say, 20:1 will almost always cause significant signal loss. Furthermore, such a severe mismatch can cause conductor or dielectric breakdown because of extreme currents and voltages at nodes along the line.

A heavy-duty, balanced transmission line such as is used at W1GV/4 can be operated at amateur power levels with utter disregard for the swr. Thus, all the matching can be done conveniently at the operating position by means of a transmatch.

The Ground Plane

A full-size ground-plane antenna consists of a quarter-wave vertical radiator and several quarter-wave radials (usually three or four), and the base is at least a quarter wavelength above the ground. Such an antenna exhibits excellent low-angle radiation characteristics and consequently is good for DX work. It is less effective for local communication where the angle of radiation must usually be nearly 90 degrees with respect to the horizon. However, the low-angle reputation of vertical antennas has been somewhat overemphasized. Even at a radiation angle of 45 degrees the field strength is nearly as great as it is parallel to the horizon—see Fig. 2. The ground plane is an uncomplicated and versatile antenna.

As the base is lowered to heights of less than 1/4 wavelength above ground, losses begin to occur because the *ground currents,* which should be confined to the radial system, will begin to flow in the lossy earth. Three radials comprise a nearly perfect

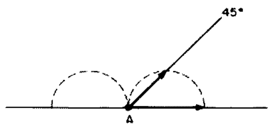

Fig. 2. Vertical-plane radiation pattern for a quarter-wave ground-plane antenna. Although it is generally thought that such an antenna radiates only at very low angles, we can see that it radiates quite a lot of energy at high angles. Only near the zenith is the radiation level very low.

ground if the base is sufficiently elevated. At a height of 1/8 wavelength, some of the ground currents will flow in the earth unless radials are added. The closer the base gets to the ground, the more radials are necessary.

Suppose we tune a full-size, 20-meter ground plane by means of loading coils so that its resonant frequency becomes 7 MHz. If the antenna was 1/4 wavelength above the ground on 20 meters, it will be 1/8 wavelength above the ground on 40 meters. The radial system will not be as good at the lower frequency because of the lower height. Also, the radials are not 1/4-wavelength long on 40. Although they are an *electrical* quarter wave in length, their *physical* length is just 1/8 wavelength. This fact, too, will cause more of the ground currents to flow in the soil. But suppose it is impractical to make the radials any longer; how are we to improve the efficiency without raising the antenna?

The answer is, of course, to add radials. More radials will be required if their physical length is 1/8 wavelength than would be necessary at the same height with 1/4-wavelength radials. I did not try to mathematically figure out how many radials I would need. I just decided, arbitrarily, that eight would be a good number.

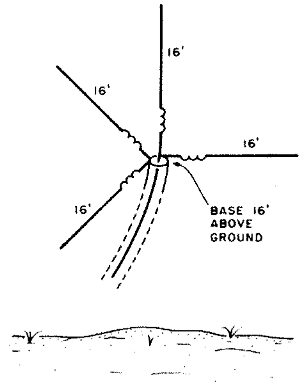

Fig. 3. Inductive loading of a 20-meter ground plane for use on 40 meters. Because of the lower electrical height and radial length, ground currents are no longer confined to the radial system. To restore a good image plane, we must either raise the antenna or add radials.

But maybe I'm getting ahead of myself. The loading system I used did not require any coil winding; this would have restricted me to 40 meters, anyhow. I wanted a 40-through-10 system without any traps or coils or stubs or multiple radiators. The mission was accomplished simply by feeding a 20-meter ground plane with open-wire line.

The Feed System

The actual installation is roughly illustrated in Fig. 4. The antenna acts as a full-size, quarter-wave ground plane on 20 meters. On 15 and 10 meters there is some gain at low radiation angles and correspondingly less radiation at higher angles. This works out very nicely since only low-angle radiation will be returned to Earth by the ionosphere on these bands; the skip distance is usually so long that high-angle radiation will pass through into space.

On 40 meters, the antenna is the equivalent of that shown in Fig. 3, except that there are eight radials rather than three. The radiation resistance at the feedpoint is very low on 40, so it is im-

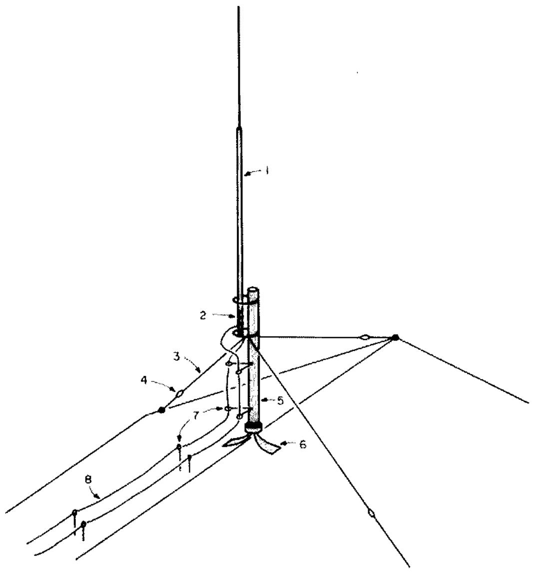

Fig. 4. The system at W1GV/4. Only three radials are shown, but there are actually eight. A feeder-wire spacing of 5 inches is maintained. (The viewing angle may give the impression that they are unevenly spaced.) Illustrated by number: 1—16-foot vertical radiator; 2—hose clamps attaching feeder to vertical radiator; 3—radial wire, 16 feet long, no. 8 solid aluminum ground wire; 4—strain insulator; 5—mast, 5 feet long; 6—TV base plate; 7—TV standoff insulator; 8—feeder wire, #8 solid aluminum ground wire.

portant that the connections between the feedline and the antenna be excellent. The feedline is constructed of #8 soft-drawn aluminum TV ground wire, which can be found in most hardware stores. The spacing used at W1GV/4 is five inches, but any spacing between three and six inches is satisfactory. Since the dielectric is air and the wire is very heavy, this line has just about the least attenuation possible. All connections are aluminum-to-aluminum, avoiding any corrosion problems that might result from contact between dissimilar metals. (Perhaps immersing the entire system in liquid helium would reduce the attenuation still further!)

The antenna itself is unbalanced; the current is different in the radial system than in the vertical radiator. This is true on all bands. Furthermore, the antenna is non-symmetrical with respect to the transmission line, and some feeder radiation is thus inevitable. It should be noted, though, that coaxial line also will suffer from the non-symmetry of the ground plane.

This non-immunity of coax to radiation-causing effects has already been discussed. How much difference, if any, is there in practice? This was determined by means of a field-strength meter. Originally the system was a coax-fed 20-meter monoband antenna. Tests were conducted at various locations in the vicinity of the feedline on 20 meters both before and after the changeover to balanced line. There is a little bit more radiation from the open wire, but the difference is hardly noticeable. Radiation levels in the shack are the same with both types of line (at the same power level, of course).

On 40 meters, the antenna is "tuned" by the feed system rather than by coils as in Fig. 3 (The 1/8-wavelength section of line closest to the antenna has replaced the inductors.) On 15 meters, the feedline also "tunes" the antenna. On 10 meters, the feedline has no actual tuning effect; the antenna is theoretically voltage-fed on this band.

We can be pretty sure that the swr is very high on all bands. But the line has such low attenuation that the swr is of no practical concern. We haven't even paid any attention to the characteristic impedance (Z_0) of the line! It is probably about 500 Ohms. Assuming the feedpoint impedance is 40 Ohms resistive on 20 meters, the swr is about 12:1 on this band. It is no doubt quite high on 15 and 40 meters also, because of the reactance at the feedpoint on these bands. On 10 meters, the feedpoint presents a pure resistance, but its value is difficult to predict. There is a possibility that the line is nearly flat on 10. But it doesn't really matter.

Construction Details

In order to minimize losses, every effort was made to ensure that there are no electrically "weak" points in this antenna system. The feedline spacing is five inches; long TV stand-off insulators are used to support each wire individually at 10-foot intervals. The wire is wrapped with electrical tape until it fits tightly in the large opening in the plastic part of the stand-off insulator. No splices should be made in the line; soft-drawn no. 8 aluminum wire is usually available in lengths that are any multiples of 50 feet.

The wires should be positioned so that they do not come within five or six inches of metal objects. If the wires must be run parallel and close to a metal pipe or downspout, both wires should be kept at the same distance from the object. If the feedline must cross over such an obstruction, it should cross at a right angle. These precautions minimize chances of imbalance.

The connections at the antenna are made in such a way that the primary electrical contact is aluminum-to-aluminum. One feeder wire is clamped directly onto the vertical radiator at the base, using three hose clamps spaced one inch apart. The other wire is connected to the aluminum base mount, using the nut on one side of the lower U-bolt holding the base mount to the mast. (The base mount at W1GV/4 comes from a 14AVQ that has been mutilated from experimentation.)

The eight radials, each 16-feet long, also are made of #8 aluminum ground wire. The radials double as guy wires; strain insulators are used to obtain the correct lengths for radial purposes. The mast is five feet tall. This, in additon to the height of the house, puts the base about 16 feet above the ground.

It should not be necessary to go into much more construction detail. The builder can put the antenna together to suit particular needs and passions. The radials should be the same length as the vertical radiator, but 16 feet is not a magic length. Actually, the longer the better. However, any length over about 18 feet will raise the radiation angle on 10 meters; lengths greater than 25 feet also will raise the radiation angle on 15 meters. This may or may not matter, depending on band preferences.

The length can also be less than 16 feet. However, as the length is shortened from this value, the radiation resistance will decrease markedly on 40 meters and will rapidly become so small that losses will occur no matter how

hard we try to prevent them. I can't tell you an exact minimum length because there is no real cutoff. You'll probably be able to make some contacts on 40 even if the length is four feet, but if you opt for this size antenna, you can rest assured that it will not be very efficient.

Performance

As of this writing, the antenna described here has been in use at W1GV/4 for about four weeks. Many contacts have been made, both long and short haul. Several thick DX pileups were cracked on the first or second attempt. Europe and Japan have been worked on 40 meters, where the antenna is half-size. Since it is a vertical antenna, we should expect that the low-angle radiation will be good even on 40 meters, so this is not too surprising.

The antenna seems to work exceptionally well on 10 meters; including the image, it acts as a vertical 2-element collinear on this band.

Mostly out of curiosity, I decided to try tuning the antenna on 80 meters and found that the transmatch did provide about 1.5:1 match at 3.5 MHz. The tuning was quite sharp, and I was indeed surprised to work a midwestern station and get a report of 589! Several other midwestern and northeastern stations have been worked on 80 with good reports. (Even so, I really can't believe that this antenna is very efficient at that frequency.) The antenna was designed with 40 through 10 in mind. Performance has been eminently satisfactory considering the unobtrusiveness, small expense, and simplicity of the open-wire-fed ground plane. ■

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Dish It Out

— home-brewing a parabolic reflector, with the focus on cost

Some months ago, I began searching for a parabolic reflector to augment some gear for the reception of GOES weather satellite transmissions on 1691 MHz. A reflector on the order of 6 to 8 feet in diameter seemed like a good compromise, so the search went on . . . and on. After looking over some "finds" that several more fortunate hams had made, I began to realize that if you did locate a dish this size, you'd better have a fat wallet and a strong back.

Luckily, I happened upon an article by Norm Foot WA9HUV, in a May, 1975, issue of *Ham Radio* on open-grid parabolic reflectors.[1] This excellent article, along with some others (references 2, 3, and 4), and suggestions and formulae from Roy Cawthon who has had numerous articles in *73* regarding weather satellite pictures during the past several years, started me on this project. I'm grateful to both sources. You won't find any theory here—no proof of performance curves, etc. This is more in the nature of a nuts and bolts kind of article to encourage you along the same route. I can assure you that with a generous amount of diligence and average amount of dexterity (and little over $100 at this date), you'll have a good parabolic reflector. See Photo A.

Photo A. 8-ft. parabolic reflector. Elements are 5/8" aluminum tubing spaced 3". Reflective surface is reinforced with ¼" hardware cloth. The cylindrical horn is a 2-lb. coffee can with probe.

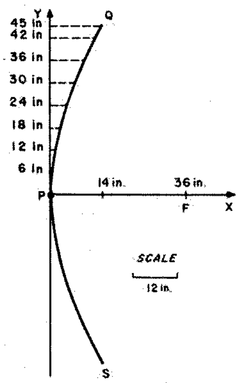

Fig. 1. Parabolic curve generated using $x = y^2/144$. Results are shown in Table 1.

A word about materials: This reflector is 2.3m (7½') in diameter. 8-foot lengths of 5/8" o.d. aluminum tubing (.049" wall thickness) were used. The tubing is the type found in hardware store do-it-yourself displays, a type that is easily bent and remains so after being bent. More rigid material, 5/8" electrical conduit, was used for the two main supporting members to which the elements are attached.

An F/D (focal length to diameter) ratio of 0.4 had been recommended as opti-

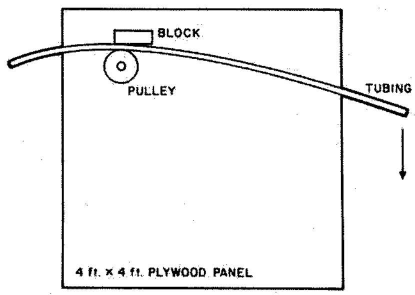

Fig. 2. Tube bending jig.

mum to facilitate illumination of the parabolic reflector. Following this, I chose a focal length of 36" and a diameter of 90". Element spacing is 3" on center (close to the 0.439 wave figure for 1-dB loss in Mr. Foot's data). To get at the business of element cutting (and use tubing cutters, by all means!), Fig. 1, Table 1, and the relations shown in the Math Box were used.

Element lengths, together with number required, are shown in Table 2.

Reflector Construction

A template will be needed to check bending and forming of the aluminum elements to fit the parabolic curve. Assigning 36 inches for focal length and solving $x = y^2/144$ produces the results shown in Fig. 1 and Table 1. Nails or screws at the x and y points will define the curve. The principal tool in the project is a tubing bending jig—that is homemade, too. I used a 4'×4' sheet of 1/2-inch plywood and mounted a 5-inch pulley and hardwood block according to the scheme shown in Fig. 2.

Mark the center of each of the elements. Slip the end in between the block and pulley, advancing the tubing in small bites and gentle bends. The pulley will aid in keeping the tubing parallel to the plywood surface. After just a few bends (even on the very first element), you'll get the feel of it.

I began with one of the longer (95") elements, fashioning it to the parabolic curve, then using it for a pattern for the remaining elements. After all the aluminum elements are formed, proceed to the two conduit supporting members. These will require a little more "tug," but you'll be a pro by that time.

The two supporting pieces (conduit) now are

x	y
¼	6
1	12
2¼	18
4	24
6¼	30
9	36
12¼	42
14	45

Table 1. Curve coordinate dimensions (inches).

ready to be marked for drilling. An easy way to mark the center line is to make a scribe, using a wooden block and finishing nail. Drill a pilot hole in the block at half the tubing o.d., then insert the finishing nail. Place the conduit member on a level surface (the bending jig) and scribe the center line. Starting at the center of the conduit piece and working toward each end, mark off 3-inch intervals. Punch and drill these intersections with the center line, using a 7/64" bit. Drill through just the front wall. A 9/64" bit will be needed for the aluminum elements.

Number 6, 1-inch zinc chromate tapping screws (pan head) are used to fasten the aluminum elements to the conduit supports. Begin with the 32-inch end elements. Measure in 4 inches from each end of the 32-inch elements and using the 9/64" bit, drill through the elements. Attach the elements to the conduit supports, squaring up the assembly. From now on it's just a matter of centering each element on the frame, marking and drilling the elements, and attaching them with tapping screws. (A pair of sawhorses can be used to hold the frame, making the job easier on the back.) After all elements are in place, the conduit supports are prevented from sagging by inserting small "S" hooks in each end and connecting these with supporting lines of number 18 galvanized wire.

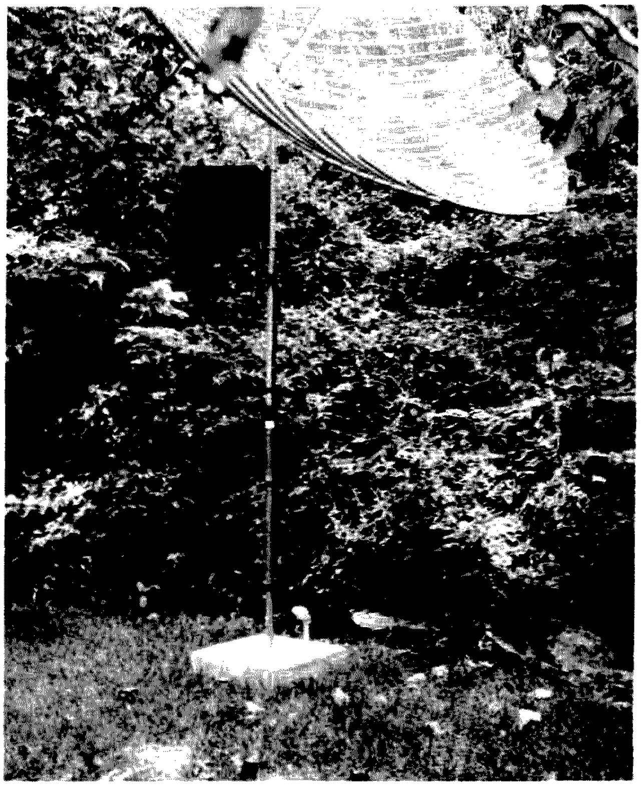

Photo B. Pedestal mount.

Boom Construction

A 26-inch length of 2×4 (treated with several coats of redwood preservative stain) is used for the top member of the boom. The assembled reflector is centered on the boom and attached with U-brackets and brass screws, using two brackets for each conduit support. See Fig. 3.

Install a 1-inch floor flange at the center of the boom to accept the cylin-

2 each (lengths rounded to nearest inch)

32	84
46	87
55	90
63	92
69	93
78	95
80	95

1 central section, extending to 96 inches, to be made of two 46-inch lengths installed on either side of a 1-inch floor flange centered on the boom. (27 lengths of tubing should do it.)

Table 2. Element lengths and number required.

Math Box

1) $r^2 = x^2 + y^2$—for sides and hypotenuse of right triangle.
2) $y^2 = 4Fx$—parabola at origin.
3) Arc QPS $= \sqrt{4x^2 + y^2} + \frac{y^2}{2x}(\log_e)\frac{2x + \sqrt{4x^2 + y^2}}{y}$ — length of arc of parabola.

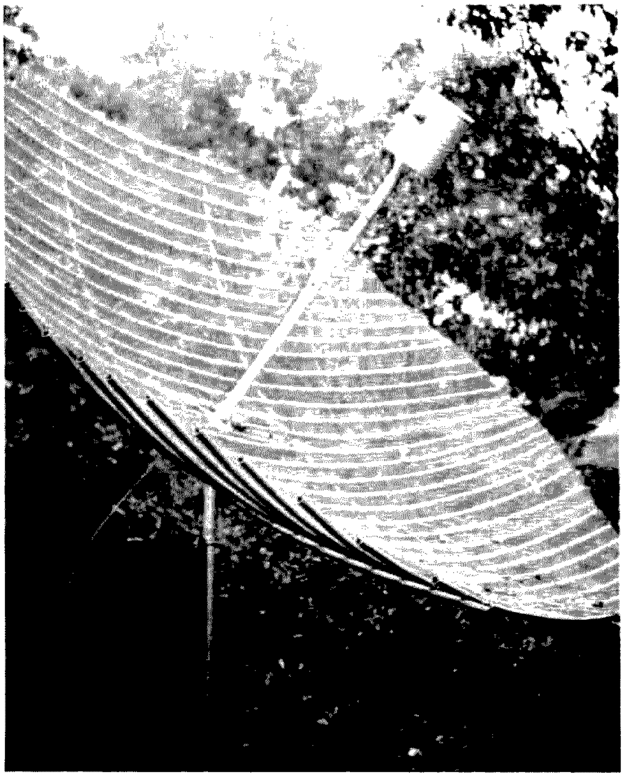

Photo C. Downconverter housing mounted on mast.

drical horn assembly. The horn support is made of 1-inch PVC (plastic) pipe. Cut a 24-inch piece of pipe and install a 1-inch male adapter at one end, using PVC cement. Cut a 12-inch length of 1-inch dowel rod, give it several coats of redwood stain, and install it in the open end of the PVC pipe section so that about 8 inches of dowel extends from the pipe. Attach this assembly to the floor flange.

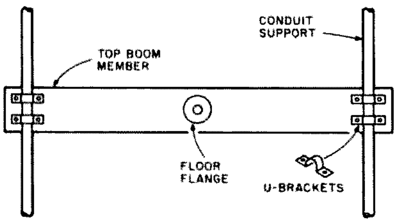

Fig. 3. Boom construction details.

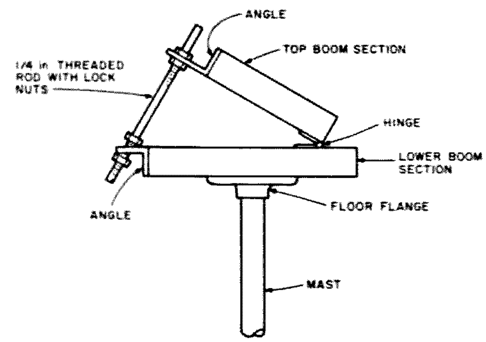

Fig. 4. Elevation adjustment details.

Elevation adjustment is provided by two pieces of 2-inch aluminum angle, 2 inches long, coupled by a 6-inch length of 1/4-inch threaded rod. See Figure 4. The lower boom section is a 26-inch length of 2 × 6 (treat with perservative stain). Another 1-inch floor flange is fastened to the bottom center of this member (use brass screws). The two boom sections are joined by 3-inch brass butt hinges. Attach the elevation control assembly as shown.

The completed parabolic (open-grid) reflector should weigh about 40 pounds. In order to thread it onto the mast, I inserted a 1/4-inch lag screw about 4 inches long into the center of the lower floor flange. This "pins" the assembly to the mast, making assembly a lot easier.

Pedestal

Posthole diggers were used to a depth of about 2 feet, then a form for the pedestal 18 inches square by 6 inches deep was constructed. A 10-foot length of 1-inch galvanized pipe, along with a section of 1-inch conduit (containing RG-8/U and 24 V ac lines) was set in the form. The block was poured, using several bags of ready mix. See Photo B.

Cylindrical Horn

The horn was constructed according to Taggart's article.[5] Using 3/8-inch Plexiglas™, a disk is cut to fit the open end of the 2-lb. coffee can (about 5.9 inches). Using an expansion bit, cut a hole in the center of the disk large enough to accept a 1-inch male PVC adapter. Cut a 1-inch PVC union into two parts. Install a 1-inch male adapter at one end of a 10-inch section of 1-inch PVC pipe. Insert this into the disk and snug it up with the piece of union just cut. Install the disk in the open end of the coffee can, drilling and tapping the Plexiglas disk for six 4-40 screws.

Downconverter Housing

A weatherproof box (11" × 12" × 15") of 1/2-inch outdoor plywood houses a MicroComm RX1691 downconverter. The box was treated with preservative stain and caulked with a generous amount of clear silicone seal. Actually, it's a box within a box, the converter being further enclosed by sections of 1-inch thick styrofoam. A regulated 12-volt dc supply shares the housing with the downconverter. See Photo C.

I used the open-grid reflector for several months, getting good results (usually full quieting) on the two GOES satellites I monitored: GOES Central and GOES East. Recently, I covered the reflector, installing sections of 1/4-inch hardware cloth (24-inch width) to the inside of the reflector with loops of number 18 galvanized wire; I'll admit that there has been some slight improvement in performance. I will certainly say that the open-grid performance was well within what one could expect from Mr. Foot's data.

The project looks much more formidable than it really is and the method easily could be extended to the fabrication of larger dishes, say, for TVRO satellite use.■

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2. "Cylindrical Feed Horn," Norm Foot WA9HUV, *Ham Radio*, May, 1976.
3. "12-Foot Open-grid Parabola, "Norm Foot WA9HUV, *QST*, June, 1971.
4. "Simple and Efficient Feed for Parabolic Antennas," Vilardi, *QST*, March, 1973.
5. "Be A Weather Genius," Taggart WB8DQT, *73*, November, 1978.

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The Earth Mover

—would you believe that this antenna changes its height above ground without moving?

A few years back I was listening to a W8 station in West Virginia tell about how he put a reflector under his 80-meter dipole and his close-in signal improved so much that he sold his linear. He talked only with amateurs within a couple of hundred miles, and he was very pleased with the results. It greatly reduced interference, too.

Recently, I had an inverted vee 40-meter dipole at 60 feet which was very good into places like Australia and Europe, but which was not really good into the USA up to 1500 miles. Since I had a pair of phased verticals for DX use, I decided to lower the vee to 30 feet and found that it was much better into New Orleans and Florida but only fair into California.

I got to thinking about the West Virginia ham and also remembered that when I used to run Antarctic traffic with K1GZL he had tried what he called "a gadget," which was a reflector under his 20-meter driven element with three elements at 66 feet. We both had been talking to KC4VOS one night and he was shocked to get a report of S-6 when I was 20 over 9. Then he remembered that he still had his reflector up, and he ran out and lowered it. When he came back he also was 20 over 9 in the Russian Antarctic Station at Vostok.

His superb 20-meter, full-size, three-element wire beam thought it was only 20 feet above ground and became a high-angle radiator.

Now, what do you do if you have room for only one antenna and yet want to have both DX and local coverage? The answer is the old half-wave line trick.

A half-wavelength line will repeat the impedance at the load that is present at the source. Thus, if you short a half-wavelength line it will show a short at the opposite end.

Let's take an inverted vee as in Fig 1. The apex is at 60 feet, and this is a good height for DX. Actually, since a half-wave height would be 68′ 4″, that would be best for a low angle, but since your electrical ground may be anywhere from 3 to 10 feet below the surface, 60′ is good economical compromise.

Now let's place a reflector which is 5% longer than the driven element ¼-wavelength below it. This is about 34′. Fig. 2 shows the difference between the radiation angle at 60′ both with and without the reflector.

The length of the coax line should be ½-wavelength multiplied by the velocity factor of the coaxial line. This is .66 for polyethylene line. Thus, the length of a half-wave line at 7.2 MHz is 492/7.2 × .66, which is 45′ 1″. If this is not long enough to reach the transceiver, use twice that, or 90′. Forget about the inches since you probably won't be operating exactly at 7.2 MHz most of the time.

Now, at the station end, install a SPST switch, perhaps a toggle, with which to short the line.

Remember that we are talking about a separate line to the reflector and *not* the feedline from the transmitter to the driven element. (See line A in Fig.1; the feedline to the transmitter is at B.)

When you throw the switch closed, the reflector is in operation. When you open the switch, the reflector splits into two 20-meter lengths and has no effect on the antenna at 40 meters. Thus, you have a high-low antenna. Open switch—low angle; closed switch—high angle.

Be sure to run the coax down the tower at right angles to the reflector and

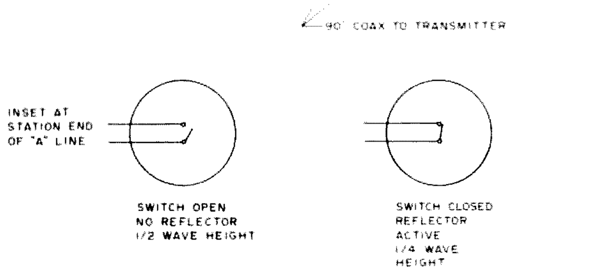

Fig. 1.

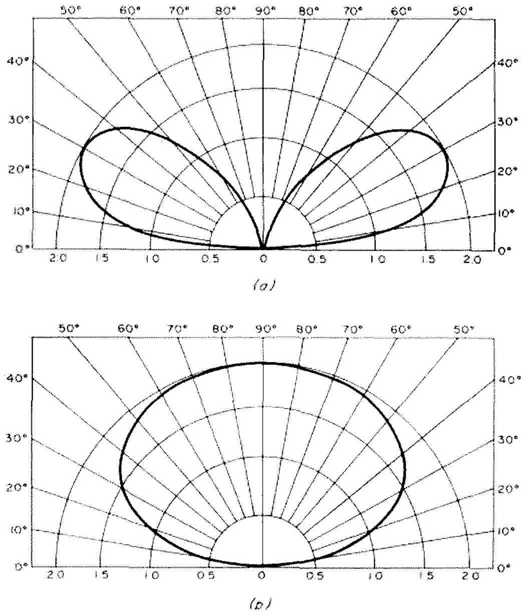

Fig. 2. (a) The radiation pattern with the reflector ¼-wavelength below the dipole. (b) The pattern of a dipole ½-wavelength above the ground without reflector.

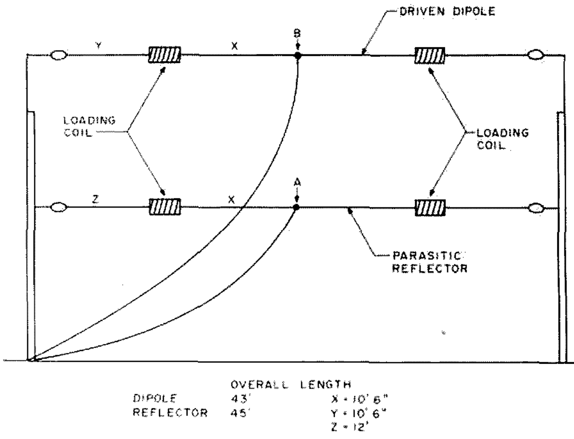

Fig. 3. All loading coils are identical.

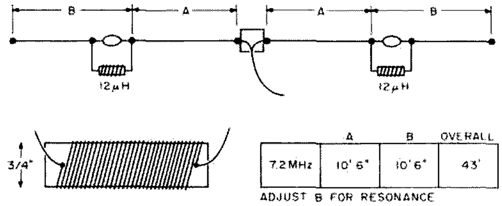

Fig. 4. Loading coil construction details. Inductance required is 12 uH. Close-wind 52 turns of #16 enameled wire on a ¾"-diameter plastic form. Windings should be 2¾" long. Hang coil across insulator at distance A from center of antenna as shown.

antenna to keep them out of the field as much as possible. Running them down inside the tower is the best way.

At this spacing there will be little or no change in the swr since the elements are a quarter-wave apart, and at that distance reflectors have little effect on the impedance of an antenna.

By the way, you can use RG-58 or RG-59 for the switching line to the reflector as there will be little power in the line. When the line is shorted it will take no power, and when the line is open it is detuned and still will take no power worth mentioning. As a matter of fact, you can use even twin-lead as long as you allow for the correct velocity factor of .82 and have a half-wave multiple.

This same principle will work for a flat-top dipole, of course, and will work fine on 75 meters if you have the space and that is your band.

If you are short of space and have two supports, you might try the method shown in Fig. 3. I have two towers 48 feet apart, and this is not room enough for 40-meter dipoles. I want to put up a low pair of 40-meter dipoles using a set of four traps which Bill Pace of Pace-Traps designed for me. Then I will put an 80-meter vee on the tower where the 40-meter vee is now.

Pace-Traps will build a set of coils for you for whatever space you have available. Write them at Box 234, Middlebury CN 06762. They do beautiful work, but if you want to wind your own the information is in Fig. 4, for 40 meters. Be sure to weatherproof them so that snow or rain will not change the inductance. (Pace-Traps are completely enclosed and do not need the external insulator shown in Fig. 4.) They have now added this coil series to their line of traps, for shortened dipoles. My two sets are for 40 meters, 43 feet, and 80 meters, 63 feet.

I expect to have good signals out to about 1000 miles with the 40-meter dipole at 35 feet, and a strong signal out to about 500 miles with the reflector working. This will keep out distant interference when I am working in nearby states, as I do in the daytime.

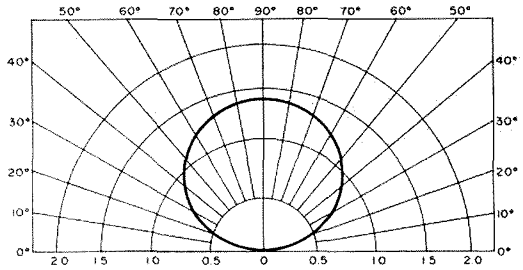

Fig. 5. The radiation pattern with the reflector 1/8-wavelength below the dipole.

The reflector will be 17′ below the driven dipole—1/8 wave. Even at higher dipole heights the reflector can be 17′ below it for even higher angle radiation. Fig. 5 shows the expected radiation pattern.

Some amateurs find that two to five reflectors about one or two feet above the ground below the antenna make a good substitute for a poor ground condition. This would be especially good if you are a local rag chewer on 75 meters. You will not need high power, and will get less QRM for emergency work.

High antennas aren't the answer to all problems. One large manufacturer of commercial equipment says that this is a common mistake of his customers—the use of high antennas for short distance work, such as close-in ship-to-shore operation. ■

Sailing the Triband Sloper

—put some half-waves among your halyards, matey!

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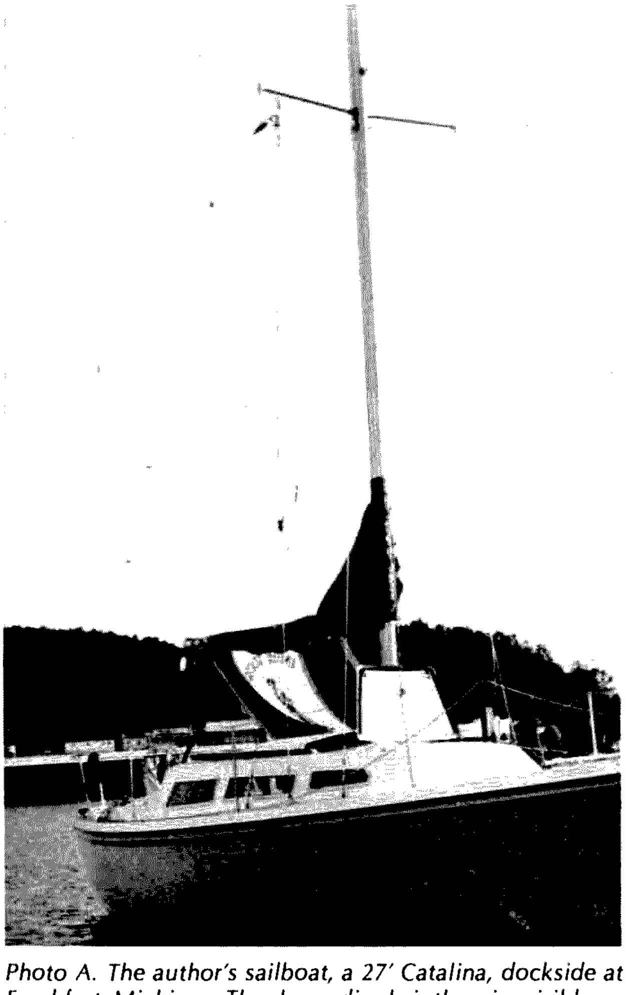

Photo A. The author's sailboat, a 27' Catalina, dockside at Frankfort, Michigan. The sloper dipole is the wire visible on the extreme left side of the picture. The two toggle switches on the lower end of the antenna and the coax feedline are clearly seen. Other wires constitute the rigging of the boat and support the aluminum mast.

Every antenna is designed within a particular set of parameters. I was limited by some specific and inflexible guidelines.

I needed an antenna that was absolutely portable. It had to work on the three most popular DX bands. Finally, its length could not exceed 36 feet.

The antenna was to be primarily used aboard my 27-foot sailboat. It would spend the winter as a backup antenna at my home QTH but had to be small enough to accompany me, my wife, and a TS-120S transceiver on a winter sailing vacation in the Caribbean.

Since 36 feet seemed very short, I did not consider a longwire antenna. But a half-wave dipole for 20 meters would be approximately 32 feet long. When coiled, such an antenna can be easily stored even with its coax lead attached.

There is only one convenient attachment point with any height on a sailboat—the mast. That made the sloping dipole particularly attractive since only one end had to be raised. The sloping dipole also promised a small gain in signal strength compared to a loaded vertical or short longwire; the criteria favored experimenting with a portable sloper. I wanted to be able to use the antenna on 15 and 10 meters as well as 20. Traps were out of the question because of their bulk. I also wanted to keep the cost of the antenna down.

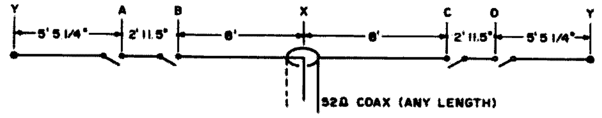

Fig. 1. Sloping dipole for 10, 15, and 20 meters. Using length = 468/f(MHz), total lengths were 16' for 29 MHz, 21' 11" for 21.3 MHz, and 33' 9½" for 14.25 MHz. A, B, C, D are SPST toggle switches. X is a center insulator or balun and Y are end insulators.

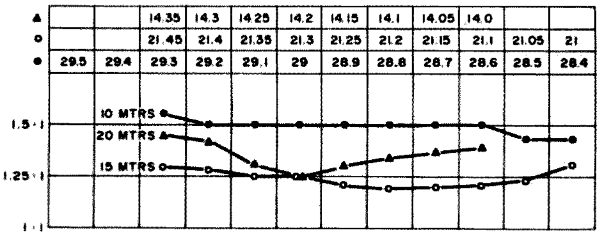

Fig. 2. Swr curves for triband sloper.

Multiband wire antenna designs I had seen described in various books suggested using insulators in the dipole at the required locations and adding clip leads to short across the insulators. In those designs, it is necessary to clip or unclip shorting leads to resonate the antenna on particular frequencies.

I didn't like the idea of using seven insulators; I liked clip leads even less. Since the antenna was to be used in a marine environment, I could predict that rigging or a sail rubbing against any clip leads would either cause the clips to work loose, chafe the sails, or both.

I was still looking for solutions when I wandered through a local Radio Shack store. I browsed through the varieties of toggle and knife switches. A knife switch could work both as an insulator to hold the antenna parts together and as a mechanism to electrically lengthen or shorten the antenna.

But an even smaller, lighter switching arrangement is available if the antenna is built using four toggle switches. The Radio Shack SPST toggle switch (#275-701) features a plastic body and wide brass contacts. I bought four, along with a package of insulators (#270-1518), and started building the sloper that night.

Fig. 1 shows the dimensions I used to build an antenna which resonates in the low end of the DX phone bands. The formula 468/f(MHz) was used to determine the lengths of three dipoles.

Starting with an old ceramic insulator from the junk box and some #14 stranded wire, I cut a 10-meter dipole to length, 8 feet on each side of the insulator. Those who advocate using baluns may find it more convenient to use one in place of the center insulator. Toggle switches were soldered to the ends of the antenna. I calculated the length of a 15-meter dipole, divided by two, and added the second length of wire (another 2' 11.5") to the first set of toggles. A second set of toggle switches was then soldered to the ends of the dipole and the final length of wire added to resonate the antenna on 20 meters (5' 5¼"). Dimensions given are finished dimensions and do not include the additional inches of wire wrapped onto toggles or insulators.

Attach the feedline to the center insulator. I used RG-58/U and I learned, through experience, that there must be strain relief for the coax. Since I reattached my feedline by passing it around the insulator and taping it to itself before soldering, I have had no further trouble. The antenna will *not* load if either side of the coax breaks! In the past, I have used 72-Ohm twinlead for feedline and I am sure that that would work well on this antenna. It would be even lighter than the coax, of course.

The Radio Shack toggles have brass contacts which I bent at 90 degrees to the switch body. There is probably not enough tension to distort them in an antenna this short, but it seemed more aesthetic to keep the contacts in line with the antenna.

Using a VOM, I determined whether the toggles were opened or closed. The Radio Shack switch is large enough to allow space for a label on the side of the toggle body. In the open position, toggles B and C (Fig. 1) act as insulators and the antenna becomes a simple 10-meter dipole. After identifying the open position, I used a soldering pencil to write "10" on the side of the plastic switch housing op-

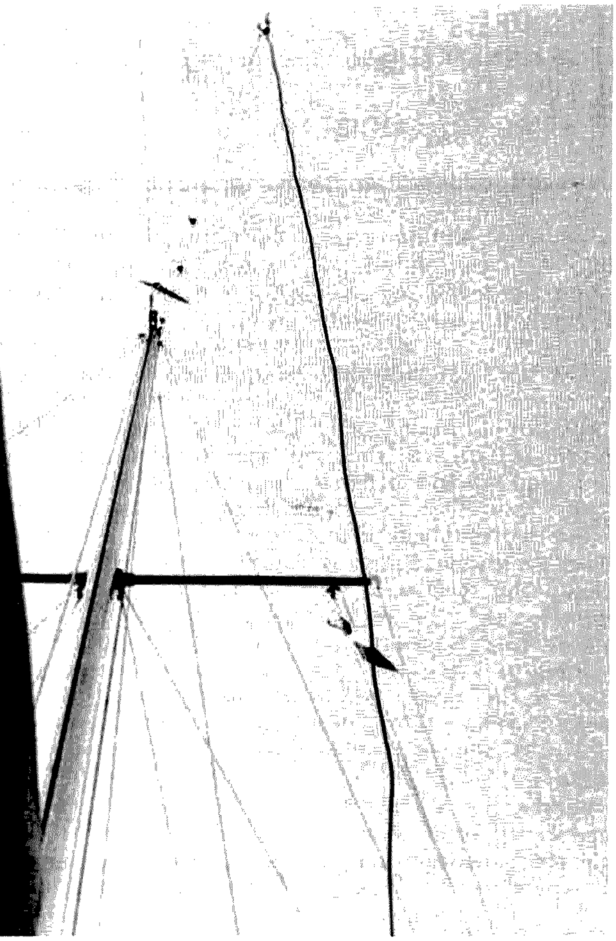

Photo. B. Looking directly overhead from the cockpit of the sailboat, the top half of the antenna from the center insulator to the mast is visible. Two toggle switches can be seen. Other wires are rigging.

posite that position of the toggle. In the closed position, the toggle indicates 15 meters. There I wrote "15".

Use the same procedure to identify the open and closed positions of toggles A and D. Open is labeled "15" and closed is labeled "20".

When operating from my boat, the antenna slopes between the masthead and the stern rail. The angle is steeper than 45 degrees and sometimes I describe the antenna as a vertical dipole. The slope is probably about 30 degrees from the mast.

During fair weather it is possible to leave the antenna erected while sailing. However, when I sail I usually untie the lower end and secure the antenna parallel to the shroud which supports the mast. Most of my operating occurs when at anchor or at dockside. Since I carry the Hustler system, I am still able to put out a signal underway if I want to.

The antenna is quite broadbanded, and in operating from the home QTH it loads without an antenna tuner. On the sailboat, the proximity of rigging and the aluminum mast affects the swr and an inexpensive tuner helps bring the antenna back to resonance. The rigging seems to have no noticeable adverse effect on the radiation pattern.

Fig. 2 is a graph of my swr calculations, computed while the antenna was attached to the 45-foot level of my tower in Okemos, Michigan.

Bandswitching is not instantaneous, as on a trap triband beam or trap vertical. But on my sailboat, I am only a few steps away from the halyard at the mast and I can lower, reset the switches, raise the antenna, and be back at my operating position on another band in less than two minutes. It is not as convenient to walk into the backyard to change bands when the antenna is in use at home but halyards on the tower make it as easy, if not as quick.

Okay, you say, simple to make—but does it work? It works beautifully. Obviously, it is not a beam, but transmitted signals seem to be stronger in the direction of the slope—as they should be. In other directions such as 90 degrees to the slope, it acts like a simple dipole, as near as I can determine.

I had dozens of satisfying rag-chews with stateside stations on the three DX bands during the summer of 1980. I easily worked into Europe and the Caribbean from Lake Michigan while running only 80-100 Watts output with the TS-120S. Signal reports confirmed the sloper worked better than the Hustler vertical mobile whips.

The sloper does not need the ground or counterpoise that is required of a vertical. My vertical, although grounded to the keel of the sailboat and with a pair of radials attached, would probably perform much better in salt water than it does on my sailboat in the Great Lakes. I have talked with sailor/hams operating in the ocean who report that the Hustler whips make fine seagoing antennas.

The sloper dipole went with me on a sailing vacation/casual DXpedition to Tortola in the British Virgin Islands in early December, 1980. If you talked to me as W8KXW/VP2V, you heard the TS-120S operating into the sloper dipole from aboard the 37-foot sailboat we chartered.■

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Touch-Tune

—tactile frequency determination for visually-handicapped hams

A local ham with a visual handicap and limited wrist action needed a means to determine the frequency to which his Drake TR4-CW was tuned. The limitations of his license naturally determine the band limits within which he must operate. And he must do this with a very high degree of precision—to be able to go back to some designated frequency as well as to stay within the limits.

This article covers the approach taken for this amateur to modify his TR4-CW (it can be returned to normal with little or no problem) so that he could operate with relative ease and be sure of his frequency within ±1 kHz at all times.

The first method tried was to use label tape (Dymo™ or equivalent) with braille markings attached to the face of the transceiver front panel, using the dimple on the tuning-knob skirt as a reference point. This method lacked precision of adjustment and was difficult to use because of the limited wrist action of the ham. The markings can be seen under the new plastic disk in Photo A.

After studying the design of the tuning assembly on the transceiver in detail, it was apparent that the easiest and most practical form of frequency display would be a disk behind the tuning knob, in place of the graduated skirt. If the braille markings were on the peripheral edge of the skirt and the skirt were transparent, then either a sightless or a sighted amateur could operate the equipment. In addition, the limited wrist action would not be a problem.

A scrap of ¼"-thick plastic, such as Plexiglas™, was obtained from a local supply house at a very low cost. A local machinist turned a 3½" disc from this piece and drilled a ¼" hole in the center to fit the tuning shaft. See Photo C. A concentric hole had to be drilled partway through the disc at the center to allow for the larger diameter of the concentric shaft on the tuning shaft. This concentric shaft turns the plastic discs on the interior frequency display.

Drake has used a short piece of rubber tubing to transmit the turning motion of the knob to the interior frequency display discs.

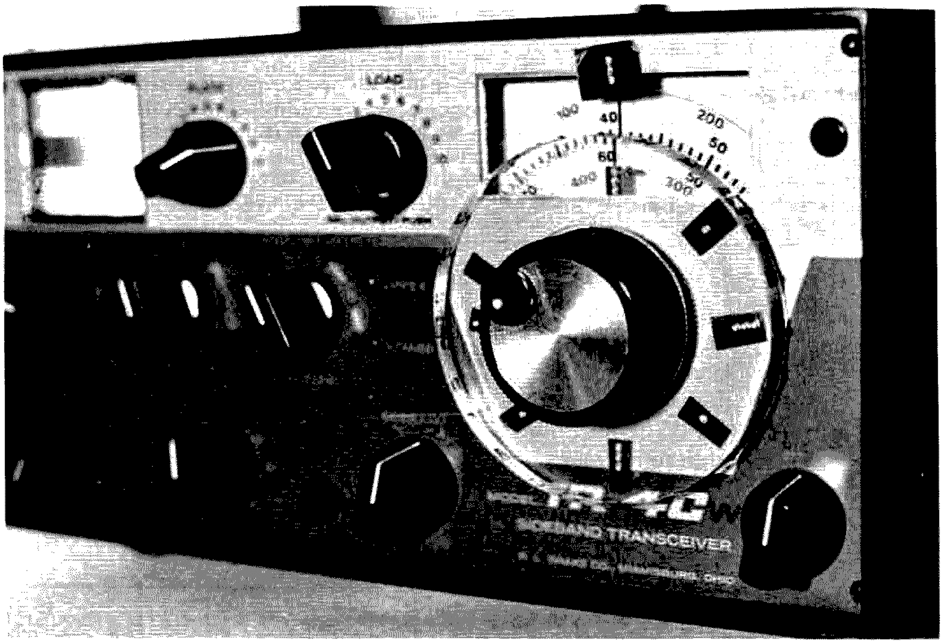

Photo A. Overall view of the TR4-CW with modification in place.

Photo B. Close-up of plastic disk and rubber spacer mounted on the tuning shaft.

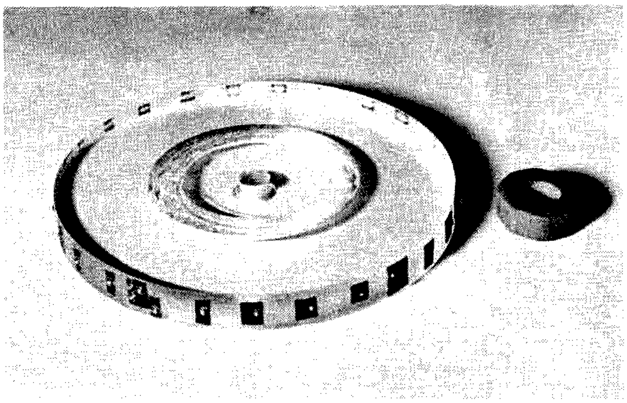

Photo C. Detail of plastic disk and rubber spacer.

Since our design for this modification precluded changes which would prevent returning the set to normal for possible later resale, a piece of ruby-red eraser was used to make a new pad that was not as thick as the original piece of tubing (see Photo C).

When the new parts, rubber pad, and plastic disc were assembled on the tuning shaft, it was discovered that the tuning-knob set screw would not engage the tuning shaft. This minor problem was overcome by machining a 3/16″ × 1/8″ circular flat-bottom groove. This groove allowed the knob to be inset into the new plastic disk far enough for the set screw to engage the shaft and its rough bottom to increase the friction between the knob and the new plastic disc. This machining must be done very slowly, or the plastic will chip along the edges or melt under the cutter. The original aluminum knob skirt was saved, along with the rubber coupling, so that the transceiver could be returned to normal configuration at a later date, if necessary.

Now that the mechanism was working, some method had to be derived so that frequency could easily be determined. Since the tuning system was designed so that one complete turn of the knob was 25 kHz, the perimeter of the new disk was divided at 25 equidistant points (perimeter divided by 25), representing 1 kHz per division. The braille system was used to mark the divisions. The dots were put on label tape, using a braille typewriter that the sightless ham owned. These small pieces of tape were then attached to the periphery of the disk at the appropriate places.

The 1-kHz points were simply marked with a dot while the 5-, 10-, 15-, 20-, and 25-kHz divisions were marked with the appropriate braille symbol and the left-most column of dots aligned as the marker. The starting and ending points were the same and were indicated with the 25-kHz braille tape. In order to establish a reference mark on the transceiver face, a simple column of dots was put on a piece of label tape and attached above the window of the face plate (see Photo A).

Since Drake does not specify the amount of overtravel of the PTO, each transceiver dial will stop at a different frequency. By determining the frequency of the stop (by a sighted ham) and counting the number of turns necessary to get to the edge of the subband, the amateur was able to establish one edge of the subband limit. The set screw hole in the knob can be set so that it is vertical when the edge of the subband is reached, thereby giving the amateur an additional point of reference for counting the number of turns from the PTO stop. The primary reference line is the left-hand edge of dots on the braille 25-kHz mark. With the subband located, the amateur now can stay within the band or operate on a predetermined frequency by aligning the dots used as reference on the front panel with the braille markings on the periphery of the disk. Using this method, the amateur can dial the desired frequency with an error of less than 1 kHz.

The system has now been in use for several months and is working very satisfactorily. The braille dots on the tape attached to the disk edge seem to stay much better than expected. In applying these markers, it is extremely important that the edge of the disk be absolutely clean and that the adhesive on the tapes not be touched with your fingers during application. Small pin heads could be used in the future, but they must be very small so that the ham can feel the entire braille digit without having to hunt around for it.

This scheme could be used on any equipment that uses an external tuning knob with enough shaft so that the knob can be reinstalled after the disk is installed behind it. Also, the frequency-tuning knob frequency-per-revolution must be something that is easily determined.

I would like to thank Jim Devilbiss WA3FUJ for machining the plastic, Bob Hurwitz K3DLC for the photographs, Joe Fincutter W3IK for his help in preparing this article, and Harry Mossberg WB3LFD for the opportunity to devise the system. ■

coil taps should cover progressively more turns, such as 3, 7, 15, etc., to utilize the full 12-position capacity of the coil-tap switch. Going up towards the kW level, one could use a 350-pF capacitor spaced for several thousand volts (E. F. Johnson 154-10) and 3"-diameter coil stock having 4-6 turns/inch to make up the inductance.

A problem at this power level, however, becomes that of finding a suitable coil-tap switch since, especially if low impedances are being matched, considerable amperage will flow through the switch contacts. It might be just as economical to use a roller inductor at the kW level. One suitable type would be the E. F. Johnson #229-203, 28-μH inductor, although various other surplus units which are available on the market also are usable as long as they have 18-28 μH of inductance.

The simple L-tuner is meant for use with an external swr bridge. However, one could combine it with the home-brew swr circuit described for the next tuner if one wanted a completely self-contained unit. Also, it should be noted that the normal/reverse switch arrangement shown could easily be expanded into an antenna-selector switch if desired.

The tuner diagrammed in Fig. 2 is dubbed the "six-square" tuner because it fits into a 6-inch-square aluminum utility box. It will match a far wider range of impedances than the simple L-tuner and, as shown, will handle 500 to 600 Watts PEP of transmitter output. It has been used with multiband antennas, loops, and random-length longwires with equally good results.

The circuitry used is that of a pi-network except that an extra series-capacitor arm has been added on the output side. The added capacitor allows a better matching range and also does not make the coil-tap points so critical. A commercial version of this circuit uses fixed, switched capacitors in place of the variable capacitor to ground on the antenna side of the circuit. One could experiment with this idea if one wants to save a variable capacitor by using five or six fixed capacitors to cover the range approximately from 50 to 300 pF.

Although a coil-tap switch is used, the coil taps are made adjustable by implementing them via spring clips rather than by soldering tap leads to the coil. This method requires a bit more work, locating a source for the spring clips (surplus ones were used), but the advantage is that one can experimentally determine the best coil-tap position for each band and then leave the taps set until an antenna is changed. Since the top cover of the tuner can be removed easily to access the coil, the whole arrangement becomes quite practical and costs far less than using a roller inductor.

As dimensioned, the tuner is mainly useful for the 10/15/20-meter bands. It can be dimensioned easily for the lower frequency bands by using coil stock with a turns/inch dimension which produces up to 28 μH inductance (e.g., 3"-diameter stock, 6 turns/inch, 5 inches long). However, on the lower frequency bands, the 300-pF variable capacitor to ground on the output side will usually not have enough range. One usually will have to parallel fixed capacitors to it so that a total capacitance of 1200-1500 pF can be achieved. The extension of the tuner to the kW level would not require changing the coil but the usage of a suitable

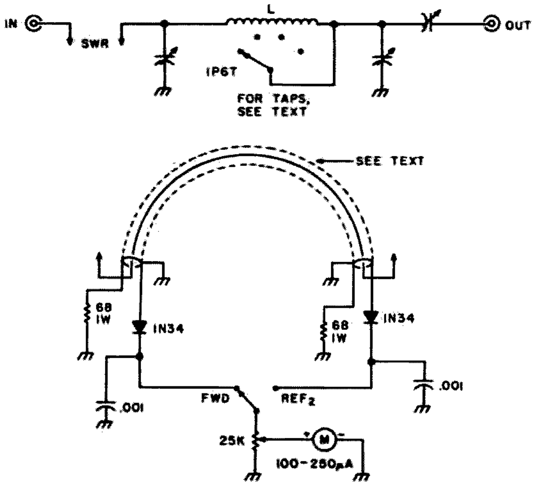

Fig. 2. Circuitry of the "six-square" tuner. The simple swr bridge which is built around a piece of RG-58 can also be used with any of the other tuners described. L is 2½" diameter, 4 turns/inch, 4" long. Capacitors are 300-pF, 2-kV surplus type.

coil-tap switch and wider-spaced variable capacitors as suggested for the circuit of Fig. 1.

The swr circuit used in the tuner is just about the simplest one that can be home-brewed, yet it is very effective. To construct it, one first strips the vinyl jacket off approximately 5½ inches of RG-58. The braid is bunched slightly and slipped off. Two lengths of enameled wire of any small gauge (e.g., #22) are then placed over the insulated center conductor and the braid replaced over the assembly. A 4½" length of shrink tubing is then placed over the braid and heated. The result is a 4½"-long pickup section with ½" left on each end for connections. The assembly can be bent into a U-form, and all the components for the swr circuit (except the sensitivity potentiometer and forward/reverse switch), can be mounted on a multiple-lug terminal strip.

The circuit will operate well over the 80-to-10-meter range with transmitter output powers of 25 Watts to 800 Watts. The meter used was a CB surplus one which happened

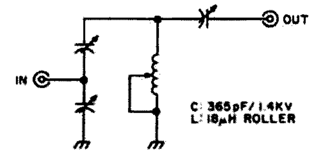

Fig. 3. A T-network type of tuner popularly called a transmatch.

to have an swr scale. Normally there is no need to use a meter with a calibrated scale since usually one will simply be adjusting the tuner for minimum swr in the "reflected" position with the sensitivity potentiometer set at maximum.

There is no special construction care required in putting together the six-square tuner. To provide easy coil access, however, the capacitors were mounted on the bottom cover of the utility box. The one capacitor which has to be above ground was mounted on a suitable piece of Bakelite and, of course, an insulated shaft coupling was used. It was centered between the two other capacitors so that its control shaft could pass between them to the front panel. There is still sufficient room in the enclosure to add an anten-

na-selector switch or 100-Watt-class, dummy-load resistor, if desired.

The final tuner unit is diagrammed in Fig. 3. Most amateurs have come to regard this type of tuner circuitry (which is a variation of a T-network) as the best of the "match anything" variety. Of course, it will not "match anything" any more than any other single-circuit configuration will do, but it does seem to have a wide enough matching range to satisfy most needs ranging from Field Day random wires to the usual fixed-station antennas.

A particular advantage of the circuit is that it does not require unusually large values of capacitance even on the low frequency bands. With the values shown in Fig. 3, the tuner will cover 80-10 meters. By changing only the roller inductor to a 28-μH unit, its range will be extended to 160 meters. With the components listed, the tuner will easily handle 300 to 500 Watts output. It can be made into a kW-level tuner just by substituting variable capacitors with wider plate spacing (e.g., E. F. Johnson 154-10 or equivalent with .075-inch or more plate spacing). The roller-inductor type does not have to be changed.

The unit is constructed in an LMB enclosure, #CR-864, which measures 8″ × 6″ × 4½″ inches. The variable capacitors are all mounted on a Bakelite panel placed in the middle of the enclosure. The panel is fastened to the rear and bottom of the enclosure by means of 4-40 hardware using holes drilled and tapped into the panel where it butts against the enclosure.

Two of the variable capacitors are joined by a shaft coupler to make up the dual-variable capacitor shown in Fig. 3. It is not absolutely necessary, however, to use a dual variable if one doesn't mind having an extra control to tune when two separate variable capacitors are used. A standard J. W. Miller turns counter is used with the roller inductor, but anything that one can improvise that will give the approximate location of the contact roller on the coil will suffice. It is hardly necessary to have a turns indicator that reads out to 3 digits! The antenna-selector switch and indicator LEDs on the front panel were intended for later use to remotely switch antennas by passing a dc voltage of different polarity down a coaxial transmission to control remotely-located relays. The basic scheme is shown in Fig. 4.

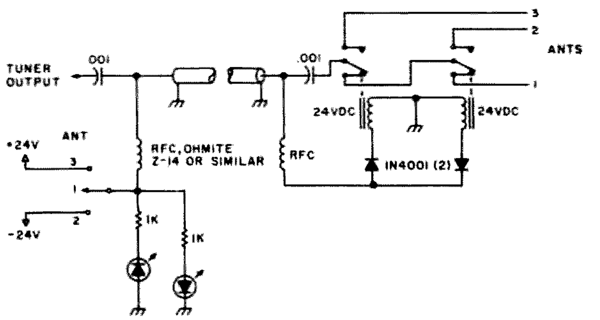

Fig. 4. The antenna-select switch shown with the last tuner was meant to implement a remote relay-switched antenna-selector scheme of the type shown here. Many good surplus 24-volt relays are available which could be used.

Each tuner can be expanded as desired and provisions made to work into a balanced transmission line by adding a balun. The #5 balun kit from Amidon will suffice for power levels of a few hundred Watts, and it comes complete with instructions on how to put together either a standard 1:1 or 1:4 balun. For a kW-level balun, one can follow the same basic instructions but use two or three Amidon T-200-2 cores stacked and covered with some form of good insulating tape, preferably a glass-cloth type.

The tuners are all used in a conventional manner. That is, tuning them so the swr on a coaxial line between a transceiver and the tuner is as close to 1:1 as possible. A general rule of thumb is to use settings on the tuners on each band so that the maximum capacitance is engaged. Some of the tuner circuits, particularly that of Fig. 2, will provide some useful harmonic attenuation. On the other hand, the circuit of Fig. 3, for some settings, will act as a high-pass filter and provide no useful harmonic attenuation.

The best approach probably is not to expect dual benefits from a tuner. If harmonics are a problem, a good low-pass filter should be used and the tuner left to function solely as a matching device.

Can a kW-level tuner be built for $25? One would never think so if one priced all new components, since a simple variable capacitor can run from $20 to $30. The key to building any of the tuners economically is to find good but low-cost parts. It can be done if one is willing to spend a bit of time looking around. The variable capacitors for the tuner of Fig. 3 cost $25 from a new component dealer. The same capacitors, unused but 20 years old, cost $3.95 from a surplus parts dealer who advertises widely in the amateur radio magazines. ■

Jeff DeTray WB8BTH
73 Magazine Staff

Kenwood's New 830S

—evolution, not revolution

Having long been a fan of Kenwood's TS-820S, I looked forward with great anticipation to the arrival of its successor, the TS-830S. The 830S, I knew, promised a number of improvements and additions, among them more flexible receiver controls, smaller size, and the capability of operating on the three new WARC bands. I was both surprised and pleased that Kenwood chose to produce a new radio with a tube-type final amplifier, given the current trend toward solid-state finals. My general impression, after living with the TS-830S for about six weeks, is that Kenwood has kept the best features of the 820S, improved the weak areas, and added controls which make the rig more fun to operate.

The Receiver

On receive, the TS-830S covers all nine ham bands, present and future, from 160 through 10 meters. Sensitivity is rated at 0.25 uV, and side-by-side comparisons with other hot receivers show the 830S to be their equal in this area. Typical of Kenwood gear, the audio is superb, even when heard through the small internal speaker. Kenwood engineers must borrow a colleague from the company's high fidelity sound department when designing the audio stages of their ham equipment.

Some of the most obvious differences between the 830S and the 820S involve receiver features. While the basic dual conversion design scheme with i-fs at 455 kHz and 8.83 MHz remains intact, Kenwood has given 830S owners an impressive array of easy-to-use receiver controls, some of which are not present on the 820S. Three of these controls deserve special mention.

Foremost among these is the Variable Bandwidth Tuning (VBT) control. VBT allows you to change the width of the i-f passband from the normal 2.4 kHz all the way down to 500 Hz, if desired. Among other things, this control makes possible some serious CW operation, even without the optional crystal filters. The narrowing of the passband is accomplished by slightly raising the center frequency of one i-f filter, while slightly lowering the frequency of the second i-f filter. The net result is the narrowing of the i-f passband with no change in the center frequency.

The i-f shift function is a holdover from the 820S. This control actually moves the center frequency of the receiver passband by ±1.2 kHz. When used alone, it allows you to shift the whole passband up or down

Kenwood's TS-830S.

slightly to avoid bothersome interference. What really makes this function a winner, however, is its use in conjunction with the VBT control. By narrowing the passband and at the same time shifting it, some rather remarkable feats of reception can be accomplished. On phone, weak signals which might otherwise be buried by off-channel garbage can be brought up to intelligible levels. On CW, it's possible to reduce the passband width to 500 Hz using VBT, then adjust the Shift control to select one of three or four CW signals, all without touching the tuning dial. It's not as complex as it sounds, of course, taking a lot less time to do it than to describe it.

Notch filters are now standard issue on several modern transceivers. Each manufacturer seems to have a different idea about what hams want on this score. As a result, we have several different types of notch filters on current rigs, all of them useful in their own way. Kenwood's notch on the 830S is moderately deep—a bit better than 40 dB—and very easy to find. It does a good job on all single-tone type (carrier) interference and is especially beneficial during phone operation. It has proven less useful than expected on CW, mostly because there always seems to be more than one station I want to notch out. The notch filter gets only a small fraction of the use that the VBT and Shift controls get.

Once you are past the three controls mentioned above, the receiver portion of the 830S becomes more familiar.

Standard equipment includes a good noise blanker with adjustable threshold. The threshold level is a rather touchy adjustment.

Continued on page 111

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Azden's PCS-3000

—the 2-meter rig of the future is available now

Meet the newest Azden 2-meter rig, the PCS-3000. Many of you are no doubt familiar with the original Azden. The new "Series II" unit has a completely different microcomputer system. It covers an 8-MHz range (142 to 149.995 MHz), has eight memory channels, a back-lighted keyboard, provision for three auxiliary offsets (CAP and Air Force MARS are already included), selectable frequency steps of 5 or 10 kHz, and a nicad battery for memory backup. The radio also comes with a free touchtone™ pad kit.

Interesting, you say? Well, there's more. The above are self-explanatory, but some of the features will have to be described in detail. These include the microcomputer acquisition tone, discriminator scan stop, programmable band scan, auto-resume with delay, memory retention of offsets, and repeater input monitoring. Let's look at these one at a time.

Microcomputer Acquisition Tone

When you first switch on the PCS-3000, it will make a short "tweep" sound. Each time you press one of the buttons on the 12-key microcomputer control keyboard, you'll hear the same sound. The first time I experienced this, I found it to be quite entertaining. But it's very informative as well. Once you get used to it, it's hard to feel comfortable without it. I sup-

The PCS-3000 measures 6-3/4 inches wide by 2-3/8 inches high by 9-3/4 inches deep. The unit comes apart into two pieces: the "control head" (which houses the microcomputer and displays and is 6-3/4 inches wide by 2-3/8 inches high by 2-5/8 inches deep) and the "main unit" (containing the transmitter and receiver circuits). In my car, only the control head is actually mounted under the dashboard, saving much space. The main unit is under the passenger seat. An optional interconnecting cable provides the electrical interface between the two units.

pose it provides some kind of psychological reinforcement, removing all doubt that the microcomputer has gotten the message. All psychoanalysis aside, though, I like this feature.

Discriminator Scan Stop

The PCS-3000 makes use of an exclusive circuit which requires two conditions for the scanner to stop: presence of carrier and frequency centering. Unless the carrier is within a certain range of center frequency, the scanner will keep on going. This circuit allows the radio to scan in steps of 5 kHz without stopping one channel too soon. (Although the carrier is inside the passband when the receiver is 5 kHz below frequency, it isn't centered, so the scanner does not stop.)

Programmable Band Scan

Any section of the frequency range 142 to 149.995 MHz can be scanned in increments of either 5 kHz or 10 kHz. The lower- and upper-limit frequencies are stored in memory channels 7 and 8, respectively. In general, it's probably best to program the lowest commonly used channel into memory 7 and the highest one into memory 8. I programmed 146.52 into memory 7 and 147.00 into memory 8.

The offset in the band-scanning mode is determined by the offset written into memory 8, except for the lower-limit frequency offset, which is the offset stored in memory 7. In my case, channel 7 was programmed for simplex and channel 8 for −600 kHz. The rig was thus set up for simplex at .52 and −600 split at all the other scanned channels.

Auto-Resume with Delay

There are three scanning modes, F, B, and V, chosen by the front-panel Scan/Offset switch. These letters

✓ Reader Service—see page 130

designate free sampling, busy, and vacant scanning modes.

In the F position, the scanner goes along until it hits a busy channel, and then it stops for about 5 seconds. During this time, you can choose either to remain on frequency (by pressing a certain keyboard or microphone button) or to continue scanning (by just waiting). If you decide to continue scanning, the unit will start up again after the 5-second delay and continue until it gets to the next busy channel, where it will stop again for 5 seconds, and so on.

In the B position, the radio scans until it hits a busy frequency and then stops. If the carrier drops out, the unit will start scanning again after a delay of a second or so. Again, you can choose whether or not to stay on frequency by means of the same stop command buttons.

Sometimes I have wanted to stay on frequency but forgot to press a stop command button. The short delay before the radio resumes scanning is very helpful here, because the repeater will usually come back up again before the delay time is up.

In the V position, the radio skips over busy channels and stops at vacant ones. If a signal comes on, the radio moves up to the next vacant channel right away, unless a stop command key has been pressed.

General:	
Semiconductors	IC 18, FET 7, Tr 36, Di 61
Frequency Band*	142.000 – 149.995 MHz
Ambient Temp. Range	– 10 to + 50 degrees C
Antenna Impedance	50 Ohms, resistive
Power Supply	+ 13.8 V ± 15% negative ground
Current Consumption*	0.7 A maximum (receive) 5.0 A maximum (transmit)
Dimensions, overall*	HWD 62 x 158 x 246 mm 2.4 x 6.2 x 9.7 in
Dimensions, head only*	HWD 62 x 158 x 65 mm 2.4 x 6.2 x 2.6 in
Weight*	Approx. 2.5 kg 5.5 lbs
Transmitter:	
Carrier Output*	25 Watts (high), 5 Watts (low)
Emission Type*	F3 by varactor modulation of vco
Frequency Deviation	± 5 kHz maximum
Spurious Output	Down at least 60 dB from fundamental
Microphone	500 Ohms, dynamic
PL Tone Frequency	67 to 250 Hz, adjustable
PL Tone Deviation	0 to ± 1 kHz, adjustable
Receiver:	
Receiving System	Double conversion superheterodyne First i-f: 16.90 MHz Second i-f: 455 kHz
Sensitivity	0.28 uV or better, 20-dB NQ 0.19 uV or better, 12-dB SINAD
Selectivity	± 6 kHz or more at 6 dB down ± 15 kHz or less at 60 dB down
Audio Output	2 Watts or more into 8 Ohms, 10% THD
Accessories, Standard:	
Auxiliary Offset Provision*	Three available
Auxiliary Offset Built In*	Air Force MARS: – 1.305 MHz CAP: – 4.250 MHz
Dynamic Microphone*	500 Ohms
Built-In Speaker*	8 Ohms
Mobile Mounting Bracket and Hardware*	
Accessories, Optional:	
Auxiliary Offset Crystals	Parallel resonant 20 pF, HC18-U holder
CS-ECK 15-foot Remote Cable	$35.00
CS-6R 6-Amp ac Supply	$59.95
CS-AS 8-Ohm Remote Speaker	$18.00
CS-TTK Touchtone Microphone Kit	$39.95

Table 1.

Memory Retention of Offsets

Each of the eight memory channels retains a frequency and one of three offsets (simplex, −600 kHz, or +600 kHz). Programming is simple. Just dial up the desired frequency and offset, set the memory address to the appropriate channel, and press M WRITE. When that channel is recalled, the receiving frequency is displayed while receiving and the transmitting frequency is displayed while transmitting. Pure and simple!

Repeater Input Monitoring

There is a little switch on the side of the microphone labeled "CH LOCK." When this switch is actuated, the *receiver* goes to the *transmit* frequency. If you transmit, the transmitter frequency remains as programmed. This feature is useful if you want to listen to the repeater input frequency instead of the output frequency.

Keyboard Operation

It takes quite a while to learn the operation of this very advanced and sophisticated radio, and I certainly am not going to try to cover all the details here. What I'd like to do, though, is give you some idea of how the thing works, and some idea of how versatile it really is. So let's look at the keys, briefly, one at a time.

The MHz UP key advances the MHz figure only, in the range of 2 to 9, in upward steps of 1 MHz. That is, as this key is pressed over and over, the MHz figure changes in the sequence 2, 3, 4, 5, 6, 7, 8, 9, 2, 3, and so on. No other digits are affected.

The 100K UP key advances the 100-kHz digit upward without changing the MHz figure or the unit kHz figure. Example: You have the frequency 6.940 displayed and actuate the 100K UP key, giving a new display of 6.040. Actuate the 100K UP key again, and the display becomes 6.140. The 100K DOWN key reverses this, so if you have 6.140 and hit the 100K DOWN key twice, you will be back on 6.940. It takes a little getting used to.

The 5/10K UP key advances the unit kHz digit by either 5 or 10 kHz, depending on the setting of a push-button lock switch on the front panel. Suppose this switch is set for 5-kHz steps and you are on 6.940. Hit the 5/10K UP key and you go to 6.945. If you actuate this key over and over, the frequency will increase by 5 kHz steps until you are at 6.995, and then it will go down to 6.000. The frequency is thus tunable within a 1-MHz range using this key. By holding the key down, the radio will move upward very rapidly in 5-kHz steps. This gives a "vfo" feeling. The 5/10K DOWN key just reverses the process of the 5/10K UP key.

The BAND SCAN key causes the radio to scan in steps of 5 or 10 kHz (as selected by the push-button lock switch I mentioned above) between two limit frequencies which can be selected at will by the operator. The lower-limit frequency is the channel in memory 7 and the upper-limit frequency is the channel in memory 8. Band scanning starts at the lower limit and moves upward.

The ±600 SHIFT key puts the radio in the simplex, −600, or +600 offset modes by repeated actuation. Just to the left of the frequency display, small LEDs indicate the offset.

The five keys M ADRS, M SCAN, M1 CALL, M CALL, and M WRITE accomplish memory programming, re-

call, and scanning. The functions of these keys are pretty much self-explanatory. Memory can be easily reprogrammed. When power is turned off, memory is held by a nicad battery that is constantly charging while the radio is on. You can therefore put the radio away for a few weeks, put it back on the air, and you'll still have the same memory channels and offsets.

Inside the Radio

The PCS-3000 uses modular construction (as any state-of-the-art radio does nowadays, after all). Interior layout is neat and rugged. Circuit boards are secured to the heavy-duty chassis with several screws. The vco/PLL section is isolated electrically by means of a shielded enclosure and is padded with wax to minimize microphonics. The layout is orderly and the component designations are marked on the boards.

All circuit boards are easily removed and replaced, since all interconnecting wires unplug and their pin positions are clearly marked. Taking one of the boards out of the radio and visually examining the underside, it is apparent that the manufacturers have taken care to do a neat job of soldering. There are no sloppy connections, bridges, or cold joints.

The control-head section of the PCS-3000 is greatly miniaturized, but the logical modular construction will make it easy to service.

Internal adjustments of PL tone frequency, PL tone deviation, high power and low power, as well as auxiliary offset crystals, are located on the PC board on the top of the main unit. PL tone frequency is adjusted by a blue pot, VR412; PL level is adjusted by VR411 (these are both near the

Continued on page 112

Roy Moses WD5ICY
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Denton TX 76201

Battlewagon

—tales of a mini-expedition to the USS Texas

Photos by Smitty Kiker KB5UM

Battleship TEXAS

Confirming your contact on ________ - meter single sideband with members of the North Texas High Frequency Association operating portable on the quarterdeck of The Battleship TEXAS from 1700Z May 17 to 1700Z May 18, 1980. Equipment included a Yaesu FT7 with 100 watt amplifier on 20 meters and a Kenwood 520 and Swan 500C on 15 and 40, working into inverted Vee antennas strung to the ship's superstructure. Thanks for the contact and 73 from all NTHFA members.

For those of you who missed out on last year's happening, these crazy people will return (with more equipment!) to the USS Texas *for Armed Forces Day weekend, this May 16 and 17. Look for the pileups on 10 through 40 meters, around* 28,550-75, 21,375, 14,300, and 7.245. *A special QSL will be available, but please include an SASE. All visitors are welcome, and if you would like to operate, stop by and say hello. Listen for WB5TSB (Texas State Battleship).*

The ship's "crew:" Kneeling, from left, Smitty Kiker KB5UM; Phil Huckaba KB5VX; Rudy Littrell N5BKQ; Robin Wilson N5BTU; C. J. Taylor N5BKA. Standing, from left, George Watkins WD5FNI; Fred Opaskey WB5TSB; Gary Fellers K5LQP; Al Faubion KA5HLS; Roy Moses WD5ICY; Dennis Jump WB6OCQ/5; J'Nevelyn Faubion KA5HJS; George Lindley WA5HKW; Capt. Robert Martin; and Pat Brannon N5AIZ. Not pictured, Duncan Engler WD5IKY and Dale Gant WB5TWO.

The eight-car caravan of amateur radio operators drove the last 100 miles to Houston in a steady rain, ranging from light showers to torrential downpour punctuated with cloud-to-ground lightning, hail, and gusty winds. The earth, subjected to double-digit rainfall the preceding two days, could absorb no more. Every creek and ditch was bank full and then some.

The National Weather Service predicted more of the same for the next 24 hours, offering grim prospects, indeed, for the success of the event scheduled to kick off at noon the next day.

Those in the caravan were members of the North Texas High Frequency Association of Denton, Texas, some 300 miles to the northwest, and their objective was the battleship *Texas*. Purpose: A mini-expedition to operate portable for 24 hours from the decks of the old warship. It was a hastily-planned operating event that was to capture the imagination of hundreds of hams around the world.

But whatever gods watch over hams, keeping them from falling headlong off antenna towers or frying their body parts with uncontrolled ac, must have had their eyes on these amateurs, too. They arrived in Houston in rain and returned to Denton in rain, but in between they were favored with bright sun, blue skies, and gentle Gulf of Mexico breezes, offering operating conditions nothing short of superb.

Only one small glitch marred the entire three-day outing. A communications breakdown made the dockside arrival of the Denton hams a total surprise to the battleship *Texas* crew, but that temporary setback proved so minor as to become totally inconsequential.

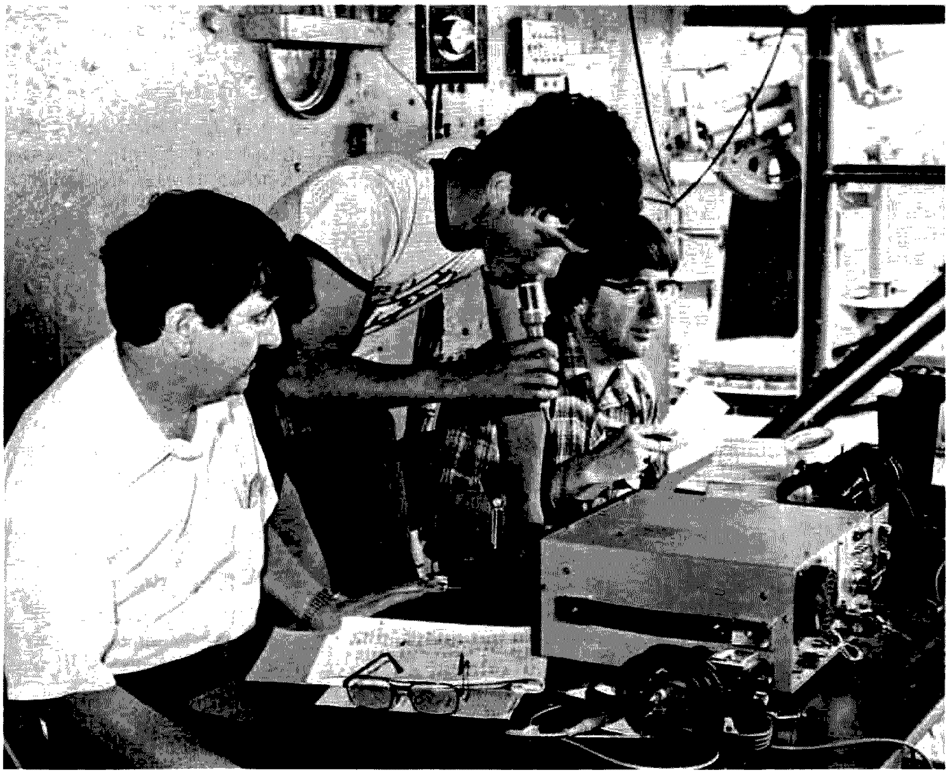
The idea for the battleship mini-expedition, like the brainstorm that resulted in the group's first mini-expedition in the fall of 1979 (Working 'Phone From Telephone, Texas), was hatched one night over post-meeting coffee and doughnuts. As with the first expedition, the idea smouldered a bit at first, but soon caught fire, and by the time final plans were being made, almost half of the Association's 45 members had signed up to go. Last-minute complications cut that number to 16 licensed hams with a total traveling party of 33, counting wives and children.

As with all of the club's special activities, an ad hoc operations chairman was appointed to head the event. This job was filled admirably by George Watkins WD5FNI ably assisted by George Lindley WA5HKW, the organization's secretary-treasurer.

The *USS Texas* was commissioned in 1914, served in two world wars, then was decommissioned and donated to the state of Texas in 1948. It was declared a State Historical Monument and permanently berthed on the edge of the Houston Ship Channel in San Jacinto State Park, an area southeast of downtown Houston. That location marks the site of the decisive battle in 1836 in which the Republic of Texas won its independence from Mexico.

So, the first order of business was a letter to the State Parks Board, seeking permission for the undertaking. The response said that although the ship was berthed in a state park, it was operated under auspices of the Battleship Texas Commission, and the request was forwarded to that body. Another short wait and the response said such an operation was certainly

Stringing antennas, from left, are C. J. Taylor N5BKA, George Lindley WA5HKW, club secretary-treasurer, and George Watkins WD5FNI. In background is Dennis Jump WB6OCQ/5. Shortly after the mini-expedition, Watkins was elected president of the North Texas High Frequency Association for 1980-81.



Bob Dills W5RWW of Dallas, left, was vacationing in Houston when he got put to work. It was Bob's first operating on the HF bands in quite a while, since he sold his HF gear some years ago. Pat Brannon N5AIZ is about to hand the mike over to Bob while Gary Fellers K5LQP handles the logging.

permissible and should be coordinated with the *Texas's* skipper, Capt. Robert Martin. A follow-up phone call to Capt. Martin put the operation on the front burner.

The target date was set for the weekend of May 17, which turned out to dovetail quite nicely, albeit accidentally, with Armed Forces Day. By mid-April, most logistical plans had fallen into place, even though Watkins complained, "This whole operation will probably be a failure—we're doing too much planning." The NTHFA, which has grown from eight to almost 50 members in less than two years, has more or less prided itself on "organized disorganization" and improvisation. Three telephone calls to Houston seemed a little much.

As the date drew nearer, certain firm decisions were made: Operate two rigs on 15, 20, and 40 meters as band conditions dictated, from noon Saturday, May 17, to noon Sunday, May 18, local time; use inverted-vee antennas strung to the ship's superstructure; use the call of member Fred Opaskey WB5TSB (*Texas* State Battleship, phonetically); operate primarily in the lower portions of the General class phone bands; no QSL or SASE required (the club would finance printing and mailing confirmations); and make as many contacts as possible. But, operations would not emphasize contest-style contacts—ragchewing would be permitted at the operator's discretion.

The wisdom of that last decision was to become evident. It was surprising how many former *Texas* crew members, Navy veterans, and just plain ship buffs wanted to ask about the old battlewagon, her armament, and her present

condition. About mid-way through the 24-hour operation, Treasurer Lindley made a quick check of the two logs, then issued the tongue-in-cheek order, "Stretch out each contact; the postage is going to kill us!"

The Denton group arrived at dockside at 9:00 am Saturday morning, an hour before the ship is routinely opened to the public, to encounter that minor setback—nobody knew they were coming that weekend! Watkins, with the charm of a Rhett Butler at an Atlanta ball, conferred briefly with the executive officer, who made a quick phone call to Capt. Martin ("those shortwave guys are here"), and the red carpet was rolled out.

Almost as if planned, but totally by intuition, members undertook the various tasks of unloading vehicles, setting up tables, plugging in radios and accessories, cutting and stringing antennas, and running to a store for the only forgotten item: some screw-in electrical plugs. At 12:02 pm the first station went on the air, on 15 meters, and at 12:03 the first contact was made, with Curt WD6CUN in Anaheim, California. The next contact, a prearranged schedule which was hoped would be the first contact, was with W6RO (Rolling Ocean)—the *Queen Mary* in Long Beach, sort of "maritime immobile to maritime immobile."

The 20-meter antenna required a bit more pruning and the second station went on the air about 12:30 pm. It required a few minutes to find a hole in the heavy QRM, and the first contact came at 12:33, with Norm KB4VM, in Powell, Tennessee. That station operated steadily for the next 23½ hours with the frequency never varying more than 5 kHz in either direction from the spot of the

Fred Opaskey WB5TSB operates the 15/40-meter station while Rudy Littrell N5BKQ does the logging. Phil Huckaba KB5VX, left, lends moral support while waiting his turn.

Duncan Engler WD5IKY enjoys watching James "Abe" Abel WD5BIS work a pileup on 15 meters. Abe, who lives in Houston, served aboard the USS Texas as an apprentice seaman in 1936-37. He cut short his vacation to be on hand for the mini-expedition.

Jan (KA5HJS) and Al (KA5HLS) Faubion were among those who got a special tour of the Texas's *radio room, which is not open to the public. Much of the gear is still in place in apparently well-preserved condition.*

first contact.

The battleship *Texas* is open daily, 365 days a year, to the public, from 10:00 am to 5:00 pm, and since the two stations were operating in the open on the quarterdeck, they became centers of interest for many of the tourists—hams and non-hams alike—visiting the ship.

The equipment consisted of a Yaesu FT-7 with a companion 100-Watt amplifier for the 20-meter station, and a Swan 500C running barefoot through a Den-Tron Super Tuner Plus for 15 and 40 meters. In the wee hours of Sunday morning, when the Swan showed symptoms of losing its spunk, a Kenwood 520 was substituted, although the problem later proved to be one of metering rather than output. The Yaesu and linear were operated on an automobile battery connected to a 6-Amp charger and the Swan and Kenwood rigs were plugged into the ship's power system.

Most non-ham visitors indicated a vague awareness of amateur radio, but their intrigue became considerably more evident when they heard QSOs in progress, especially with stations several thousand miles distant. One of the most enthralled was Toni Tucker, a teenage clerk in the ship's gift shop. She utilized her afternoon coffee break to visit one of the stations and didn't bat an eye when operator Dennis Jump WB6OCQ/5 handed her the microphone and said, "Talk to this guy in North Carolina." But the *Texas*'s PA system shortly terminated her third-party operations with the announcement, "Will Toni Tucker please report back to the gift shop . . . immediately."

Numerous questions were asked by visitors, but the most prevalent seemed to be, "Why are you doing this?" About the best answer the amateurs could come up with was, "Because it's never been done before."

Of the amateurs who dropped by, a few were quickly put to work, and none enjoyed it more than James "Abe" Abel WD5BIS of Houston, or Bob Dills W5RWW of Dallas. Abe had learned of the mini-expedition a few weeks earlier in a 40-meter QSO with Duncan Engler WD5IKY. He was excited because he had served on the *Texas* as an apprentice seaman in 1936-37, but he was disappointed because he had made vacation plans and would be in Tennessee that weekend. But he couldn't resist the opportunity. Abe cut short his vacation and drove nonstop from Tennessee to spend several hours visiting and operating on the *Texas* Saturday afternoon.

Bob had been inactive on HF since he sold his HF gear a few years ago. He was vacationing in the Houston area, heard about the battleship operation via 2-meter repeater, and made it a point to drop by. His arrival came late Sunday morning, when operators' energies were ebbing rapidly, and somebody shoved a mike into his hand and said, "Talk to 'em." He did, for about the last hour that the 15/40 station was on the air. Bob's wife, Barbara, sat patiently in a shady spot nearby. She said with a smile, "He's having the time of his life."

At noon, Sunday, operators at both stations were still working pileups, so it was with considerable reluctance that apologies were made to those still standing by, and Willie Baker Five Texas State Battleship signed clear. The NTHFAers hated to disappoint those who had waited so patiently for a contact, but the seven-hour drive home loomed large in the red-rimmed eyes of the weary operators, especially the 11 who had spent the night on board.

The convoy home was uneventful, and the intervehicle chatter on .52 simplex became more and more subdued as the miles rolled by. Highlight of the return was qualifying three hams for "Worked All Denton" awards for working five or more members of the Association. The first two were Charles WA5FMK and Agnes WB5VWB Ellisor of Houston, who passed the group near the outskirts of the city and became curious about a convoy of so many Texas amateur radio operator license plates. They struck up a conversation on .52 and, since they were near home, subsequently got on their fixed station and continued the QSO for several miles, working each vehicle, in order, down the convoy.

The other WAD award went to Jimmy McCarter WD5DFQ of Mesquite, Texas, when he passed the convoy on Interstate 45 about 100 miles south of Dallas. He, too, was curious about the license plates, but a convoy member made the first call to inquire about an unusual-looking homebrew mobile HF antenna on Jimmy's bumper.

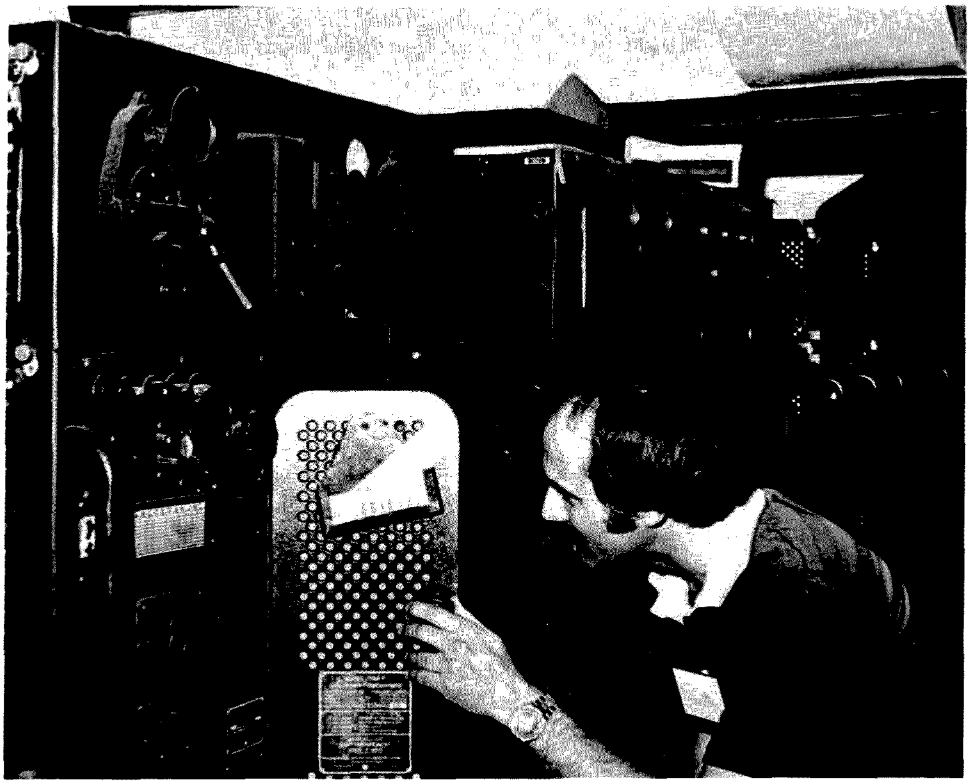
The box score for the mini-expedition went like this: 771 total contacts, plus a couple of SWLs. The total could have easily gone over 1,000 had the operation been handled contest-style. The contacts included 46 states, two VEs, nine foreign countries, and three maritime mobiles.

A special QSL card was printed and mailed to all contacts, except for a few whose addresses could not be verified, and return cards and letters trickled in to NTHFA members for weeks. One operator sought the battleship confirmation so fervently that he wrote one letter and two cards because he had antenna problems and was unsure if his brief contact was logged. "I'll understand if I'm not in the log," he wrote, "but at least send me an SWL card . . . please."

It was surprising how many contacts were made with amateurs who had a firsthand knowledge of the old ship, having served on her, worked on her, or at least been on or around her at one time or another.

"I remember the *Texas* well," said one contact. "She was escorting a convoy that I was in across the North Atlantic in the early forties, and it sure was a good feeling to look out on the horizon and see that battlewagon steaming along beside us. I remember her well."

So will members of the North Texas High Frequency Association. ■



Rudy Littrell N5BKQ examines some of the old gear in the Texas's *radio room, which is not open to the public. A battleship crew member gave several of the visiting hams a special tour of the below-decks area.*

Dennis Jump WB6OCQ/5, a transplanted newcomer to the club, was told that sixes have to work harder—and he did. Dennis finally managed a short nap about daylight, Sunday morning.

Dr. Ken Jenkins WB6MMV/7
1801 Cedar St.
Newberg OR 97132

Inside Coax

—know what you're buying in quality and construction

Coaxial cable seems to be one of those products where any old brand will do. Just use RG-8/U for high power and RG-58/U for low power. Yet, few hams realize that a typical 300-Watt rig can lose more than 100 Watts in certain types of coaxial cable. Also, few realize that RG-8/U varies from manufacturer to manufacturer in TVI prevention capability.

The fact is that RG coaxial cables are different, varying in performance from one manufacturer to another. Cost should not be a major consideration in selecting coaxial cable. Many hams will spend thousands of dollars on a rig, tower, and beam and then scrimp on cheap coaxial cable which eats up transmitter power or S-units!

Prior to World War II, coaxial cable was unheard of. Open-wire balanced line was the standard transmission line. However, with the advent of television, open-wire line was a liability—it radiated rf into many places where it was unwanted. Open-wire feedlines also had a nasty habit of radiating weak harmonics. The solution was to design a transmission line that did not radiate rf itself, so coaxial cable was developed. These early cables were given RG designations and usually manufactured to military specifications.

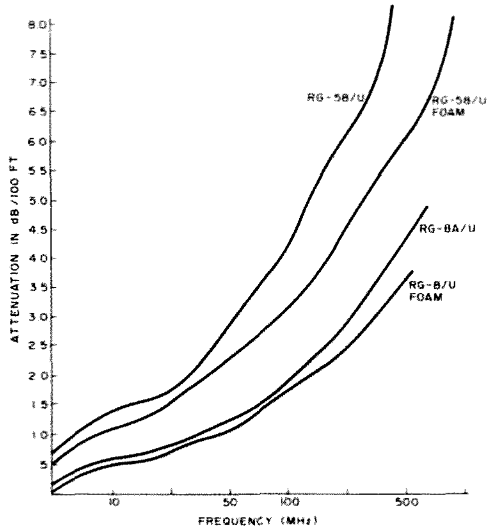


Fig. 1. Attenuation with regard to frequency.

Cable Selection

Since coaxial cable now is taken for granted, few amateurs realize the differences between one cable and another. If a construction article calls for RG-8 or RG-58 coaxial cable, most amateurs assume that any brand so labeled will do the trick. Nothing could be further from the truth. Just what does the RG- /U designation mean? The RG- /U designation refers to a standard military designation for cable which meets certain specifications and test requirements. A new set of updated standards was released by the military in 1978. The new requirements were designed to provide improved coaxial cable standards and are referred to as MIL-C-17E specifications. The basic specifications advanced by the military are covered in the following:

1) Center conductor—type, diameter.
2) Dielectric—composition, diameter, tolerance.
3) Outer conductor—type, number of braid layers, gauge of braid wire, percent braid coverage.
4) Outer jacket—composition and diameter.

If a cable meets the requirements and tests as outlined in the military specifications above, it is designated as meeting an RG specification. However, just because a cable is labeled as RG-8/U by the manufacturer does not ensure that it meets any of the criteria spelled out in MIL-C-17E.

Because coaxial cable is taken for granted, it is well worth spending some time evaluating which cable is best for you. The only reliable means of selecting cable is to evaluate the test data supplied by the manufacturer. There are manufacturers who do not have test facilities or the skills to actually test the cable they produce. Some don't even know what the impedance of their cable is! The military specifications provide a good set of items to evaluate your needs.

Center Conductor

The center conductor of RG-8/U-type cable should consist of seven 21-gauge bare copper wires. RG-58/U variations come with either 19 tinned 33-gauge copper wires or a single 20-gauge bare copper wire. The choice between stranded and solid conductors is easy; if the transmission line is subject to twisting or flexing, then use stranded

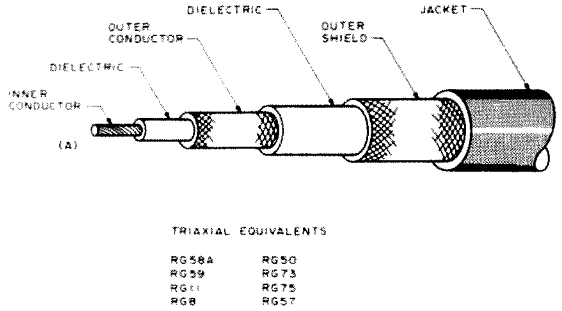


Fig. 2. Triaxial cable construction.

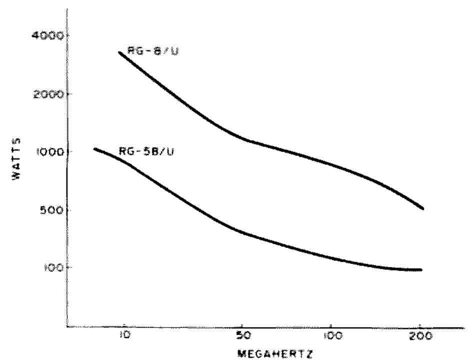


Fig. 3. Power handling capability with respect to frequency.

conductor. Typically, stranded conductor is less efficient than using a single-wire center conductor.

Dielectric

Currently there are a variety of materials being used for dielectric material. The two most common are polyethylene and cellular polyethylene or "foam." Polyethylene cable should be constructed of solid virgin polyethylene. Cable with an amber or gray color was probably made from reclaimed polyethylene scrap. Often there are bubbles in a cross section of this type of cable. This causes line imbalances, creating "loss points" along the line.

The newer and more popular dielectric material is formed by expanding virgin polyethylene with a special foaming agent. This foam dielectric has a dielectric constant of 1.5, compared to 2.26 for regular polyethylene dielectric material. The dielectric constant is very important because the closer the dielectric constant coefficient of a given cable is to 1.0, the lower the attenuating ability of that cable. The dielectric constant is also important for another reason. The dielectric between the center conductor and the outside braid forms a capacitor, and this capacitance can amount to a significant quantity. Consider the typical ham with 100 feet of RG-8/U feedline. RG-8/U has 29.5 pF capacitance/foot, while the foam coax version of RG-8/U has 24.5 pF/foot. This difference alone amounts to 500 pF. This capacitance is equivalent to a large loading capacitor across the pi network of a transmitter. This difference becomes important when evaluating coax cable for VHF work.

There is another consideration with respect to attenuation. As can be seen from Fig. 1, the attenuation of coax cable rises with frequency.

Every time you boost your radiated signal strength by 3 dB, it is the equivalent of doubling transmitted power. A simple example will help here. Compare 100′ of RG-58/U with 100′ of foam RG-8/U on two meters. The RG-58/U will lose almost 6 dB, while the RG-8/U foam cable will lose a little more than 2 dB. In other words, you would need to more than double the power with RG-58/U to achieve the same results as with foam RG-8/U.

Outer Conductor or Braid

The most visible area for spotting defective coaxial cable is in the percent of braid coverage. A good grade of coaxial cable will have at least 95% of the dielectric covered with a braid of 36-gauge copper wire. Good braid coverage is essential for TVI prevention. Double shielded coax cable can be purchased to provide 100% braid coverage. Belden 9888 is an example of double-shielded RG-8/U. Another reason to select cable with good braid coverage is because reduced attenuation occurs for cable that has the shielding characteristics of a metal tube.

An exotic variation of double-shielded cable is triaxial cable, which consists of a second dielectric between the first and second braid (see Fig. 2). This type of cable is very effective at preventing TVI from being radiated and, unfortunately, is also very expensive.

Jacket Composition

Perhaps one of the most crucial factors affecting the average coax's ability to radiate a signal is the chemical composition of the outer jacket of the cable. Most coax cable jackets are composed of black or grey polyvinylchloride. However, there are two types: type I and type IIa. The only way to distinguish between these two is to look for an "A" after the numbers in the cases of RG-8/U (RG-8A/U) and RG-59 (RG-59A/U) cable. For RG-58/U, a "C" will indicate a type IIa jacket (RG-58C/U). RG-213/U is a 50-Ohm version of RG-8A/U that has a type IIa jacket.

Type-I jackets work well until the temperature rises. When the temperature rises, the "plasticizer," a chemical added to the outer jacket to keep it soft and flexible, begins to leach through the outer braid and into the dielectric. This changes the electrical characteristics of the coax cable. Attenuation coefficients increase, characteristic impedances change, and, of course, so will swr. This leaching effect can be seen if you have any old RG-8/U or RG-58/U cable around. Strip off the outer jacket and the copper braid. If the dielectric material has a hazy black tint, then the leaching process has occurred. Good dielectric material will have a characteristic milky-white color, without a trace of black coloring. This leaching process occurs with or without heat, but heat accelerates the leaching process. Thus, buying old, unused coaxial cable is rarely the bargain it might appear to be. Old cable with a type-I jacket is probably useless as an rf carrier.

Type-IIa jackets, on the other hand, use a different method of plasticizing the jacket, with the result being the virtual elimination of the leaching effect. Thus, cable with a type-IIa jacket will last longer as transmission line. The point is simple—don't purchase coax cable unless it has a type-IIa jacket.

Power Ratings

Power ratings, like attenuation characteristics, are affected by frequency (see Fig. 3). These ratings assume a low swr which, if not present, will further reduce

the power-handling capability of the line. The point here should be obvious—don't try to feed a kilowatt into RG-58/U on two meters. It is important to know the power-handling capabilities of the cable you use, not just in general, but for the specific frequencies you plan to use.

Impedance

The critical question here is tolerance. Factors such as percent braid coverage, diameter and composition of dielectric material, and the type of outer jacket material all affect cable impedance. If a power-consuming mismatch is to be avoided, then the cable should be within 10% of its specified impedance. Usually, the tolerance of a cable can be found in the manufacturer's specification sheets. Often, when you go to the local store, specification sheets aren't available. You can play it safe in this situation by sticking with a major brand manufacturer.

Conclusions

By following the points mentioned above, you can usually avoid purchasing second-rate coaxial cable. The best cable you can buy will meet MIL-C-17E specifications. You probably won't find MIL-C-17E cable in your local ham store, and if you do, its price might shock you. The usual high quality cable in your local ham store will probably meet the previous MIL-C-17*D* specifications and won't cost as much as MIL-C-17E cable. However, MIL-C-17D specification coax cable will be adequate for most average ham use. ■

Note: Another cable worth considering is RG-8X. This grey coax is half the diameter of RG-8, displays similar attenuation and power handling characteristics (75%), and is an excellent buy.—Ed.

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The "No Antennas" Antenna

—a coaxial dipole is one woman's solution to problems with pesky landlords

Are you one of the unfortunate few who happens to be an apartment dweller ham? And is your landlord or apartment manager one who forbids outdoor antennas of any sort? If so, this article may be for you. The problem of erecting an antenna in a "no antennas outdoors" situation is a tricky one, indeed. This limits one to indoor antennas, the logic being that what is not seen will not be noticed.

After experimenting with many different types of indoor antennas, all with disastrous results and much TVI, I finally came upon a coaxial dipole suggested by a fellow ham friend. This antenna appealed to me because of its greatly attenuated harmonics, thus lessening the TVI problem. Unlike a conventional dipole, this antenna is very broadbanded, covering from 500 kHz to 1 MHz, depending upon band used, and with an swr under 2:1 at band edges.

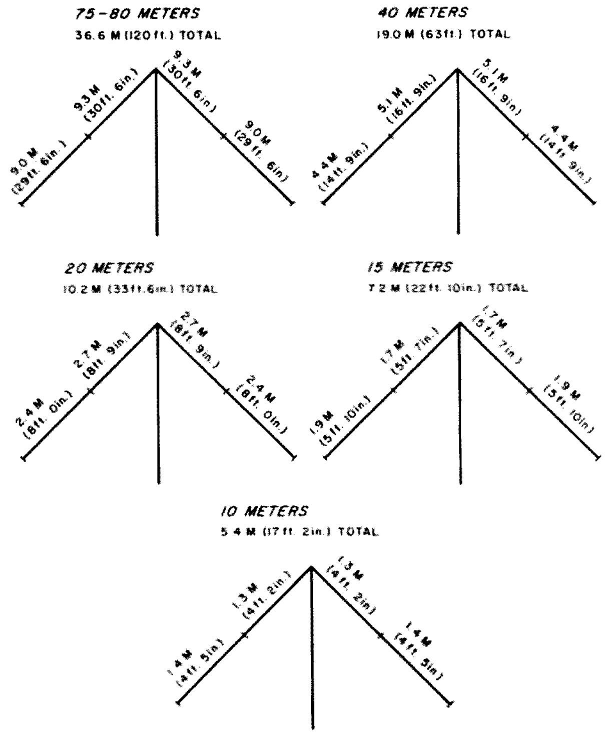

Fig. 1. Antenna lengths.

Its broadband characteristics are due, in part, to the feedline being matched to the antenna and the electrical incorporation of its own balun, with the result that no add-on antenna tuner or balun is required. The coaxial dipole has a slight amount of gain over a conventional dipole, and since the vinyl jacket covers the entire antenna, it reduces static charge build-up considerably, which causes a popping noise in the receiver when discharged. Thus, the coaxial dipole is a very "quiet" antenna with slightly stronger signal punch than a conventional dipole.

Construction of the antenna is simple. One may use either RG-8/U or RG-58A/U coax, the latter being lighter in weight and easier to work with. Maximum legal power can be used with either choice of coax. For antenna lengths, see Fig. 1. The 40-meter antenna will be used as an example.

Begin construction by removing 2.5 cm (1") of vinyl jacket (1/2" each side of center) at the center of the antenna. Cut the shield in the center all the way around the coax. Care must be used so that you do not cut the dielectric or the center conductor. Next, form two leads with the shield as shown in Fig. 2. This is the feedpoint of the antenna.

From this center feedpoint, measure out each side of center 5.1 m (16' 9") and cut the coax at that point. Remove approximately 2.5 cm of vinyl jacket from each of the ends and fold back the shield so that the dielectric is exposed. Cut and remove about 2.5 cm of this insulation, being careful not to cut the center conductor. Then twist the shield and center conductor together and solder. This must be done at both ends and forms the 52-Ohm match-

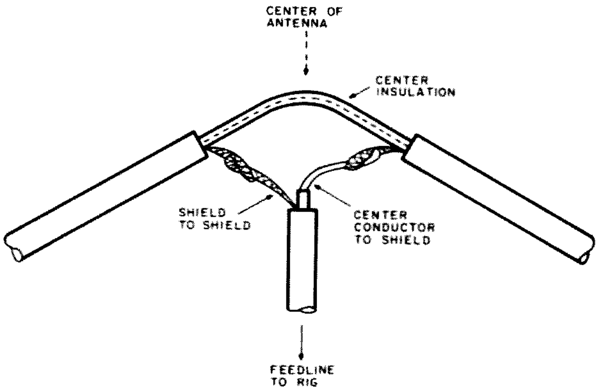

Fig. 2. Feedpoint connection.

ing section and balun.

Next, cut two lengths of coax, each 4.4 m (14′ 9″) long. Then remove 2.5 cm of vinyl jacket from all four ends, fold back the shield, remove center insulation, and twist shield and center conductor together as before. This forms the end sections of the antenna. Attach one of these end sections to one end of the matching section by twisting together the prepared ends and soldering. In the same manner, solder the remaining end section to the other end of the matching section. Waterproof these joints as best you can. Waterproofing of the ends will be done later, for they may need cutting for tuning purposes.

The next step is to attach the feedline. Any random length of coax will do, but it must be of the same type used for construction of the antenna. Remove approximately 2.5 cm of vinyl jacket from the end of feedline, fold back the shield, and remove center insulation. Form two leads with the shield and center conductor. At the feedpoint of the antenna, connect the feedline by soldering the feedline center conductor to one of the feedpoint leads. Then solder the feedline shield to the remaining lead. You may wish to waterproof this area, making sure that the feedpoint leads do not touch each other and short out. Follow this procedure for antennas on other bands.

Erecting the antenna is next. If you have access to an attic or crawl space in the roof of your apartment building, so much the better. Using monofilament fishing line as anchor ties, a series of half hitches along the vinyl jacket ends of antenna will do nicely for anchoring the antenna. The monofilament line will bite into the vinyl as it is pulled taut.

If you are not fortunate enough to have access to an attic, the antenna may be stapled to a living room or bedroom ceiling using plastic cable ties or any other non-conducting material as support. Wrap the cable ties around the antenna at intervals and staple the free end(s) of the ties to the ceiling. Do not staple directly through the antenna itself.

This antenna can be used as a dipole or inverted vee. If used as a dipole, try to erect as much of it as possible in a straight line, keeping it as far away from large metal objects as feasible. The ends may hang down as long as they don't touch any nearby metal objects. More than one antenna may be erected in the same area, providing they are run at angles to each other rather than being parallel. The reason for this is that the inactive antenna could absorb some signal from the active antenna, thereby attenuating the signal output.

After erecting the antenna, check swr and trim the ends if needed. Be sure to twist the ends of the antenna as before (shield to center conductor), then recheck swr. The antenna will interact with any hidden wiring in walls, so a considerable amount may have to be trimmed from each end. Once you have gotten the swr down to an acceptable level, solder the ends of the antenna and waterproof them if desired. This completes construction.

Aside from a low-pass filter, no other add-ons are needed, the filter being only a safety precaution. And, since the antenna is basically omnidirectional, orientation can be determined by the space available at your location.

Once you start enjoying the pleasures of operating from your apartment with this antenna, you will be amazed at what you can work and the signal reports you get with it. I have used coaxial dipoles on 10, 15, 20, and 40 meters from an apartment, and all are stapled to a ceiling in "inverted-U" fashion rather than as an inverted vee. Signal reports received vary from S-6 to 60 dB over S-9. TVI is minimal, considering my TV is only a mere ten feet from the antenna and I run 200 Watts PEP.

With these coaxial dipoles in use for over two years now, I have gotten Worked All Continents, Worked All States, and DXCC with 121 countries worked to date. So there's no telling what you can do with this antenna and you may be pleasantly surprised at the results. It sure beats non-operating just because you live in an apartment! Happy DXing! ■

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Slow-Scan in Bits and Bytes

—microprocessors and plug-in cards can give you flexibility on SSTV

When starting on my first slow-scan television (SSTV) project back in 1977, little help was available. To initiate even the most primitive functions required a significant effort. The microprocessor industry has advanced far in these past few years, however, to a point where hardware is available off the shelf for many applications. A home experimenter can create an entire computer system in a few hours simply by selecting cards and plugging them into a common bus where the bus is just a number of common connectors mounted on a PC board.

The concept of picking and chosing components is not a new one. This technique is standard in hi-fi systems. One can buy speakers from one manufacturer, a turntable from another, and an amplifier from a third. Why not apply this technique to computers?

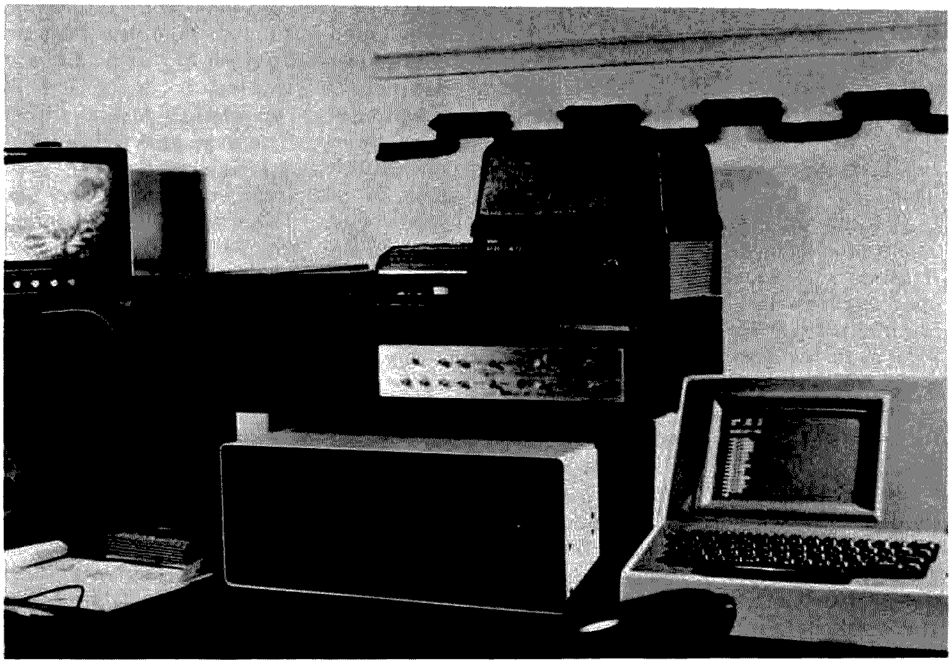


Photo A. Computer installation of K6AEP.

You may ask, how does all of this apply to amateur radio SSTV? In this article I will discuss two components, or cards, which can plug into a common bus to create a microprocessor-based SSTV system. A system of this type, unlike its hardware-only counterpart, has great flexibility. If your ham shack is as congested as mine—see Photo A—you don't have room to install a box which is devoted only to SSTV. With these cards and a general-purpose microcomputer system, an SSTV system with unbelievable flexibility and features can be created. The system can be used for other amateur radio modes, i.e., RTTY or CW, by simple program changes.

Before plowing ahead into pages of technical details, I think a short

review of SSTV is appropriate.

SSTV Description

SSTV is a scheme to transmit and receive television pictures over amateur radio. The pictures have reduced resolution and are slow, hence the name.

SSTV has a bandwidth low enough to be compatible with all amateur transmitters. The pictures are received and generated from audio tones which are varied proportionately to the television rates. Typical tones are 1500 Hz for black and 2300 Hz for white, with in between tones for various gray levels. To synchronize these video frequencies, a tone (1200 Hz) must be provided. All that has to be done to interface SSTV to the amateur equipment is to plug the transmitted SSTV into the microphone jack and the received SSTV directly into the microprocessor.

The Hardware

To make a system like this possible requires the four components shown in Fig. 1. Each component is a product of modern technology and is difficult for the non-computer expert to understand. However, if you treat each component simply as a black box and don't worry about how it functions, interfacing can be easy.

I'll discuss each of the components individually, starting with the two fast-scan interfaces.

1. *The Digisector Television Camera Interface.* The Digisector is an interface card for any standard (NTSC) or non-standard (industrial) television camera. The card is available from a firm in southern California called Microworks.[1] The card is available in three configurations, allowing attachment to a number of microprocessor systems, i.e., IEEE-696 (S-100), SS-50, and Apple. All cards function in a similar manner, as follows: The cards section the TV picture up into a maximum of 256 X and Y coordinates. You can address up to 65k picture locations with the card. The card will respond to the programmed coordinates with a 6-bit (64) gray-level pixel. The card responds very quickly, within 12 microseconds maximum.

The card accomplishes this trick by using a fast sample-and-hold and a medium-speed successive approximation analog-to-digital converter. You program where you want the card to digitize a pixel by loading the X and Y coordinates in their respective ports. The port is connected to two 8-bit comparators which are in turn connected to two counters. The counters are driven by pulses derived from the camera's vertical and horizontal sync. When the programmed count equals the counter, you have a match and the video signal is digitized.

The Microworks people did this using 23 ICs for the DS-68 (SS-50) and 25 ICs for the DS-80 (IEEE-696). They did a great job with the DS-68 in cramming so much circuitry onto a small SS-50 I/O card (Photo B). The card has only two adjustments: brightness and width. The brightness is used to compensate for the camera room lighting. The width is used to adjust the maximum right-hand X coordinate location of picture digitization.

2. *The Fast-Scan TV Display Interface.* This board is one of the most recent additions to the Microworks product line. The board can be used for three unique functions:

- Fast-scan gray-level display interface. (Display has a density of 128 pixels on 128 lines with 16 gray levels.)
- Fast-scan high-resolution graphics display interface. (Display has a density of 256 pixels on 256 lines with two gray levels.)
- Static RAM board, 8K.

Since the purpose of this article is SSTV, the fast-scan gray-level display mode is of the most interest. To display a gray-level picture, all that has to be done is to address the card for any 8K free RAM area and connect the TV display to the appropriate output. The board has two composite video outputs, one for high-resolution graphics, the other for the gray-level display. I found it convenient to mount a switch on the top of the card to switch be-

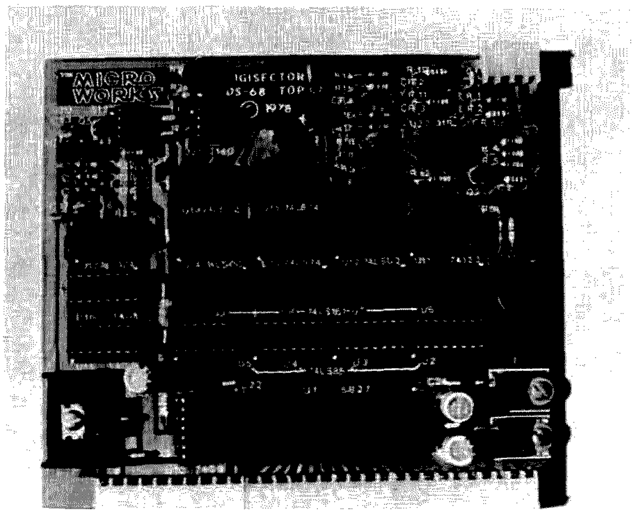


Photo B. Digisector card.

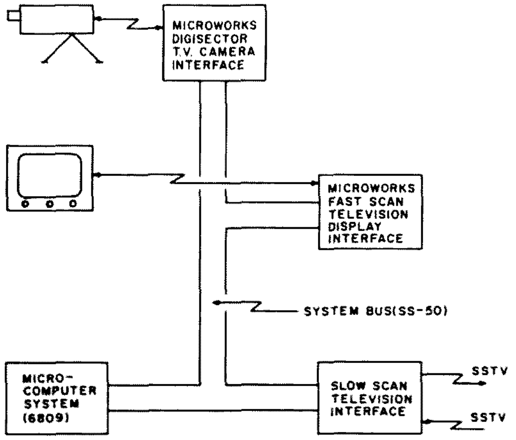


Fig. 1. Block diagram of a microprocessor-based SSTV system.

Gray-Level RAM Formatting

	MSB	LSB
Byte in RAM	X X X X	X X X X
	pixel 1	pixel 2

High-Resolution Graphics RAM Formatting

	MSB	LSB
Byte in RAM	X X X X	X X X X
Pixel #	1 2 3 4	5 6 7 8

Fig. 2.

Program Listing.

```
                     *
                     * SSTV PROGRAM FOR THE RECEPTION
                     * DISPLAYING AND TRANSMISSION
                     * OF AMATEUR RADIO SSTV PICTURES.
                     * THE PROGRAM IS WRITTEN IN 6809
                     * ASSEMBLER LANGUAGE AND IS WRITTEN
                     * TO RUN ON EITHER A SWTPC 6809 SYSTEM
                     * OR THE RADIO SHACK COLOR COMPUTER.
                     * THREE INTERFACE CARDS ARE REQUIRED
                     * FOR OPERATION OF THIS PROGRAM.
                     * TWO OF THE CARDS ARE AVAILABLE FROM
                     * THE MICROWORKS, THE THIRD WAS
                     * PUBLISHED IN "73 MAGAZINE" NOVEMBER
                     * 1978.
                     * PROGRAM WRITTEN BY: CLAYTON W. ABRAMS
                     * 1758 COMSTOCK LANE,SAN JOSE, CALIF
                     * 95124 (AMATEUR CALL K6AEP)
                     * DECEMBER 15,1980
                     *
                             OPT PAG
                             NAM SSTV71 FOR MICROWORKS CARDS
                     *
                     * TEMPORARY LOCATIONS IN RAM
                     * RELATIVE TO USER STACK
                     * SYSTEM STACK IS PLACED
                     * BELOW USER STACK
                     *
                FFFF RECVC  EQU -1          RECEIVE DELAY CONSTANT
                FFFD LINE   EQU -3          NUMBER OF PICTURE LINES
                FFFB RPIXC  EQU -5          RECEIVED PIXELS
                FFF9 PIXC   EQU -7          PIXELS IN A PICTURE
                FFF7 MASK   EQU -9          KEYBOARD ENTRY MASK
                FFF5 INDEX  EQU -11         INDEX STORAGE
                FFF3 RLINE  EQU -13         RECEIVED LINES
                FFF1 FAST   EQU -15         CAMERA BYTE STORAGE
                     *
                     * PROGRAM EQUATES FOR
                     * I/O ADDRESSES AND VIDEO
                     * CARD
                     *
                E000 PIADA  EQU $E000       BASE ADDRESS FOR DIGISECTOR
                E001 PIACA  EQU PIADA+1
                E002 PIADB  EQU PIADA+2
                E003 PIACB  EQU PIADA+3
                     *
                     * SSTV INTERFACE BOARD
                     *
                E010 PIA    EQU $E010       BASE ADDRESS FOR SSTV CARD
                     *
                     * FAST SCAN VIDEO BOARD
                     *
                8000 VIDBEG EQU $8000       BEGINNING OF VIDEO CARD RAM
                9FFF VIDEND EQU $9FFF       END OF VIDEO CARD RAN
                     *
                     * ACIA CONTROL PORT
                     *
                E004 PIACTL EQU $E004       ACIA FOR TERMINAL
                     *
1000                        ORG $1000
                     *
                     * MAIN LINE ROUTINE TO
                     * SELECT PROGRAM OPTIONS
                     *
1000 1F    43        BEGIN  TFR S,U         PLACE U STACK SAME AS SYSTEM
1002 32    E8 EC            LEAS -20,S      PLACE S BELOW USER STACK
1005 20    00               BRA START
                     *
                     ************************************
                     * PROGRAM CONSTANTS FOR
                     * DELAY ROUTINES AND LOCATIONS
                     * IN RAM.ASSUMING A 1MHZ CLOCK
                     ************************************
                     *
                     * FAST SCAN RECEIVE ROUTINES
                     *
1007 21              FRE60  FCB $21         60 HZ DELAY
1008 1A              FRE50  FCB $1A         50 HZ DELAY
                     *
                     * FAST SCAN SSTV XMIT DELAYS
                     *
1009 0044            FDELX  FDB $0044       TRANSMIT DELAY
100B 02C6            FHORX  FDB 710         HORIZONTAL SYNC PULSE (5 MSEC)
100D 1BBC            FVERX  FDB 7100        VERT SYNC (50 MSEC)
                     *
                     * MICROWORKS VIDEO
                     * CARD ADDRESSES
                     *
100F 8380            VIDEO  FDB $8380       SSTV RAM START ADDRESS
1011 84F0            VIDEO1 FDB $84F0       CAMERA RAM START ADDRESS
                     *
                     * BYTE TO TELL IF A RADIO
                     * SHACK OR SWTPC TYPE
                     * COMPUTER IS IN USE.
                     * IF BYTE IS 0 (SWTPC) IF
                     * $FF THEN A RADIO SHACK
                     * COMPUTER IS IN USE
                     *
1013 00              RS     FCB 0           RADIO SHACK BYTE
                     *
                     ********************************
                     *
1014 30    8D 028D   START  LEAX MENU,PCR PRINT MENU FOR OPTIONS
1018 8D    24               BSR OUT
101A 8D    3E               BSR INEEE       GET K/B RESPONSE
101C 81    46               CMPA #'F
101E 1027  0176             LBEQ FASTX      FAST SCAN XMIT ?
1022 81    52               CMPA #'R
1024 1027  0058             LBEQ RECFST     RECEIVE PICTURE ?
1028 81    43               CMPA #'C
102A 1027  01F4             LBEQ CAMER      TV CAMERA ?
102E 81    1B               CMPA #$1B
1030 27    06               BEQ ESC         ESCAPE TO FLEX 9
1032 81    C8               CMPA #$08
1034 27    05               BEQ RSBS        GOTO RADIO SHACK BASIC
1036 20    DC               BRA START
                     *
                     * KEYS TO EXIT PROGRAM
                     * ESC ESCAPES TO FLEX 9 DOS
                     * BS ESCAPES TO RADIO SHACK
                     * BASIC
                     *
1038 7E    C003      ESC    JMP $C003       FLEX 9 WARM START
103B 7E    A027      RSBS   JMP $A027       RADIO SHACK BASIC
                     *
                     * ROUTINES TO SUPPORT
                     * A SWTPC LIKE SYSTEM
                     * WITH A TERMINAL AND ACIA
                     * ON PORT 1 ($E004). ROUTINES
                     * ASSUME A 6850 ACIA IS USED.
                     *
103E 6D    8C 02     OUT    TST RS,PCR      IS BYTE A ZERO ?
1041 26    2A               BNE OUTRS       IF NOT BRANCH
1043 8D    05               BSR OUT1        OUTPUT A STRING
1045 81    04               CMPA #4
1047 26    F5               BNE OUT         LOOP IF NOT A 4
1049 39                     RTS
                     * OUTPUT SUBROUTINE
104A 34    04        OUT1   PSHS B
104C A6    80               LDA 0,X+        GET BYTE FROM RAM
104E F6    E004      OUT2   LDB PIACTL      TEST STATUS
1051 C5    02               BITB #2
1053 27    F9               BEQ OUT2        TRY AGAIN IF BUSY
1055 B7    E005             STA PIACTL+1    OUTPUT BYTE
1058 35    84               PULS PC,B
                     * INPUT ROUTINE
105A 6D    8C B6     INEEE  TST RS,PCR
105D 26    1C               BNE INRS
105F B6    E004             LDA PIACTL      TEST FOR BUSY
1062 85    01               BITA #1
1064 27    F4               BEQ INEEE
1066 B6    E005             LDA PIACTL+1    GET K/B ENTRY
1069 34    04               PSHS B
106B 20    E1               BRA OUT2        ECHO BYTE
                     *
                     * ROUTINES WHICH ASSUME
                     * THAT A RADIO SHACK COLOR
                     * COMPUTER IS USED. PROGRAM
                     * USES CALLS FROM THE BASIC
                     * ROM (VERSION 1.0). ROUTINES
                     * ARE VECTORED THROUGH I/O
                     * VECTORS LOCATED AT THE BEGINNING
                     * OF THE BASIC ROM.
                     *
                     * OUTPUT A STRING
106D 8D    05        OUTRS  BSR OUTRS1      OUTPUT TILL $4
106F 81    04               CMPA #4
1071 26    FA               BNE OUTRS
1073 39                     RTS
                     * OUTPUT ROUTINE
1074 A6    80        OUTRS1 LDA 0,X+        GET BYTE FROM RAM
1076 AD    9F A002          JSR [$A002]     OUTPUT THROUGH BASIC
107A 39                     RTS
                     * INPUT A BYTE TO A
107B AD    9F A000   INRS   JSR [$A000]     INPUT THROUGH BASIC
107F 4D                     TSTA            IS IT A ZERO ENTRY ?
1080 27    F9               BEQ INRS        KEEP LOOKING UNTIL NOT ZERO
1082 39                     RTS
                     *
                     * RECEIVE FAST SCAN
                     *
1083 A6    8C 81     RECFST LDA FRE60,PCR GET DELAY CONSTANT
1086 A7    5F               STA RECVC,U     SAVE IT IN RAM
1088 86    4C               LDA #64         128 LINES/PICTURE
108A A7    5D               STA LINE,U
108C 86    6F               LDA #111        111 PIXELS/LINE
108E A7    5B               STA RPIXC,U     SAVE IN RAM
1090 A7    57               STA MASK,U      MAKE MASK NOT ZERO
1092 8D    28        RFST1  BSR FPIXR       RECEIVE PICTURE
1094 6D    57               TST MASK,U      IS MASK ZERO ?
1096 27    02               BEQ RFST2       IF NOT GET ANOTHER PICTURE
1098 20    F8               BRA RFST1
                     *
                     * LOOK FOR FAST SCAN OPTION
                     *
109A B6    E005      RFST2  LDA PIACTL+1    LOOK FOR A K/B ENTRY
109D 81    35               CMPA #'5
109F 27    C7               BEQ RFST3       50 HZ RECEIVE
10A1 81    36               CMPA #'6
10A3 27    0D               BEQ RFST4       60 HZ RECEIVE
10A5 16    FF6C             LBRA START
                     *
                     * 50 HZ VIDEO
                     *
10A8 A6    8D FF5C   RFST3  LDA FRE50,PCR GET DELAY CONSTANT
10AC A7    5F               STA RECVC,U
10AE A7    57               STA MASK,U      RESET MASK
10B0 20    E0               BRA RFST1
                     *
                     * 60 HZ VIDEO
                     *
10B2 A6    8D FF51   RFST4  LDA FRE60,PCR DELAY CONSTANT
10B6 A7    5F               STA RECVC,U
10B8 A7    57               STA MASK,U
10BA 20    D6               BRA RESTI
                     *
                     * RECEIVE FAST SCAN PIX
                     *
10BC 17    00CA      FPIXR  LBSR INITC      INITALIZE PIA
10BF 6F    5D               CLR LINE,U      CLEAR COUNTERS
10C1 6F    59               CLR PIXC,U
10C3 8D    38               BSR FVERT       WAIT FOR A VERT SYNC PULSE
10C5 AE    8D FF45          LDX VIDEO,PCR GET RAM LOACTION TO STORE PIX
10C9 AF    55               STX INDEX,U     SAVE IT IN INDEX
10CB 86    C8               LDA #8          DELAY FOR  FIRST PIXEL
10CD 17    0098             LBSR DEL3
10D0 8D    78        FPIXR1 BSR STORE       FORMAT BYTES AND SAVE IN RAM
10D2 30    88 40            LEAX 064,X      SET X TO NEXT PIXEL
10D5 6C    59               INC PIXC,U      ADD 1 TO COUNTER
10D7 A6    59               LDA PIXC,U
10D9 A1    5B               CMPA RPIXC,U    IS IT THE LAST ?
10DB 27    07               BEQ FPIXR2      BRANCH IF LAST
10DD A6    5F               LDA RECVC,U     DELAY FOR NEXT PIXEL
10DF 17    0086             LBSR DEL3
10E2 20    EC               BRA FPIXR1
10E4 6F    59        FPIXR2 CLR PIXC,U      CLEAR PIXEL COUNTER
10E6 6C    5D               INC LINE,U      ADD ONE TO LINE COUNTER
10E8 A6    5D               LDA LINE,U
10EA AE    55               LDX INDEX,U     GET NEXT ADDRESS IN RAM
10EC 30    01               LEAX 1,X        ADD ONE TO IT
10EE AF    55               STX INDEX,U     SAVE IT FOR NEXT LINE
10F0 A1    53               CMPA RLINE,U    IS IT THE LAST LINE ?
10F2 27    08               BEQ FPIXR4      IF SO QUIT
10F4 8D    2C               BSR FHORIZ      WAIT FOR A HORIZ SYNC PULSE
10F6 6D    57               TST MASK,U
10F8 27    02               BEQ FPIXR4
10FA 20    D4               BRA FPIXR1
10FC 39              FPIXR4 RTS
                     *
                     * WAIT FOR VERT SYNC
                     * PULSE
                     *
10FD B6    E012      FVERT  LDA PIA+2       LOOK FOR PULSE
1100 48                     ASLA            IS A PULSE PRESENT
1101 24    FA               BCC FVERT       IF NOT KEEP LOOKING
1103 6D    8D FF0C          TST RS,PCR      RADIO SHACK COMPUTER ?
1107 26    10               BNE FVERT3      IF YES BRANCH
1109 B6    E004      FVERT1 LDA PIACTL      LOOK FOR A K/B ENTRY
110C 44                     LSRA
110D 25    07               BCS FVERT2      IF AN ENTRY BRANCH
110F B6    E012      FVERT4 LDA PIA+2       LOOK FOR FALL TIME OF PULSE
1112 48                     ASLA
1113 25    FA               BCS FVERT4      BRANCH IF STILL PRESENT
1115 39                     RTS             PULSE IS NOW GONE
                     *
1116 6F    57        FVERT2 CLR MASK,U      CLEAR MASK K/B ENTRY
1118 39                     RTS
                     * TEST FOR RADIO SHACK
                     * COMPUTER
1119 AD    9F A000   FVERT3 JSR [$A000]     HAS A KEY BEEN STRUCK ?
111D 4D                     TSTA            IS A ZERO
111E 27    EF               BEQ FVERT4      A=ZERO, NO K/B ENTRY
1120 20    F4               BRA FVERT2
                     *
                     * WAIT FOR HORIZ
                     * SYNC OR KEYBOARD
                     *
1122 B6    E012      FHORIZ LDA PIA+2       LOOK FOR HORIZ SYNC PULSE
1125 84    40               ANDA #$40
1127 27    F9               BEQ FHORIZ      NONE PRESENT,BRANCH
1129 B6    E012      FHOR1  LDA PIA+2       LOOK FOR PULSE END
112C 84    4C               ANDA #$40
112E 26    F9               BNE FHOR1       BRANCH UNTIL NO PULSE
1130 6D    8D FEDF          TST RS,PCR
1134 26    0C               BNE FHOR4       BRANCH IF RADIO SHACK
1136 B6    E004             LDA PIACTL      LOOK FOR K/B ENTRY
1139 44                     LSRA
113A 25    05               BCS FHOR2       K/B HAS BEEN STRUCK
113C 86    20        FHOR3  LDA #32         DELAY FOR FIRST PIXEL
113E 8D    28               BSR DEL3
1140 39                     RTS
                     *
1141 6F    57        FHOR2  CLR MASK,U      SET K/B MASK
1143 39                     RTS
                     * TEST FOR RADIO_SHACK COMPUTER
```

tween the two modes.

The board functions by allowing the on-board RAM to be refreshed at a video rate continuously. If you wish to read or write to RAM, the video-refresh process is halted for the period of reading or writing while the CPU gains control of the on-board RAM. This has a noticeable effect on your monitor as a small black line called a "sparkle." Otherwise, the picture is flawless, with a quality compatible with any commercial SSTV scan converter.

An experiment which I enjoy is running memory tests on the board. You can see how your memory test is performing. The patterns on the TV display are striking.

To understand how the pixels are formatted in memory, Fig. 2 can be used as a guideline.

You can see that if somehow the picture was placed

```
1144 AD    9F A000  FHOR4   JSR [$A000]      GET K/B ENTRY
1148 4D                     TSTA
1149 27    F1               BEQ FHOR3        NO ENTRY BRANCH
114B 20    F4               BRA FHOR2
                    *
                    * ROUTINE TO GET A SSTV BYTE
                    * FROM THE INTERFACE CARD AND
                    * PLACE IT INTO RAM
                    *
114D 8D    1D       STORE   BSR GETA         GET A BYTE FROM ADC
114F 48                     ASLA             FORMAT BYTE
1150 48                     ASLA
1151 84    F0               ANDA #$F0        MASK OUT GARBARGE
1153 34    02               PSHS A           SAVE IT ON STACK
1155 A6    5F               LDA RECVC,U      WAIT ONE PIXEL TIME
1157 8D    CF               BSR DEL3
1159 8D    11               BSR GETA         GET ANOTHER BYTE
115B 44                     LSRA
115C 44                     LSRA
115D 84    0F               ANDA #$0F        RIGHT JUSTIFY BYTE
115F 35    04               PULS B           GET OLD PIXEL BACK
1161 34    04 ABE0          ABA              ADD THE TWO TOGETHER
1165 A7    84               STA 0,X          SAVE THEM BOTH IN RAM
1167 39                     RTS
                    *
                    * GENERAL PURPOSE DELAY
                    *
1168 4A             DEL3    DECA             DELAY TILL A ZERO
1169 26    FD               BNE DEL3
116B 39                     RTS
                    *
                    * GET A PIXEL FROM ADC
                    *
116C 34    10       GETA    PSHS X           SAVE X
116E 8E    E010             LDX #PIA         PUT X AT PIA ADDRESS
1171 86    3F               LDA #$3F
1173 A7    03               STA 3,X          PUT VALUE IN SAMPLE AND
1175 86    37               LDA #$37         HOLD
1177 A7    C3               STA 3,X
1179 86    38               LDA #$38         ISSUE A START ADC PULSE
117B A7    01               STA 1,X
117D 86    30               LDA #$30
117F A7    01               STA 1,X
1181 86    05               LDA #5           WAIT FOR CONVERSION
1183 8D    E3               BSR DEL3         MAY VARY WITH ADC
1185 A6    02               LDA 2,X
1187 35    90               PULS X,PC        GRAY LEVEL IS NOW IN  A
                    *
                    * ROUTINE TO INITALTZE
                    * SSTV PIA
1189 8E    E010     INITC   LDX #PIA         PUT ADDRESS IN X
118C CC    FF30             LDD #$FF30
118F ED    84               STD 0,X          MAKE A AN OUTPUT,SET UP CTL
1191 6F    02               CLR 2,X          MAKE B AN INPUT
1193 86    37               LDA #$37
1195 A7    03               STA 3,X          SET UP B CTL REGISTER
1197 39                     RTS
                    *
                    * FAST SCAN XMIT PIX
                    * ON SSTV
                    *
1198 30    8D 0189  FASTX   LEAX MENU1,PCR FAST SCAN XMIT MENU
119C 17    FE9F             LBSR OUT         PRINT IT
119F 17    FEB8             LBSR INEEE       GET K/B ENTRY
11A2 84    0F               ANDA #$0F        CONVERT TO HEX
11A4 34    02       FASTX1  PSHS A           SAVE IT ON STACK
11A6 8D    C8               BSR FTRAN        XMIT PICTURE
11A8 35    02               PULS A
11AA 4A                     DECA             DECREMENT COUNT
11AB 26    F7               BNE FASTX1       BRANCH IF NOT LAST XMIT
11AD 16    FF64             LBRA START       GO BACK TO MAIN LINE
                    *
                    * XMIT SSTV PIX
                    * SUBROUTINE
                    *
11B0 86    69       FTRAN   LDA #105         XMIT 105 PIXELS/LINE
11B2 A7    5D               STA LINE,U
11B4 86    40               LDA #64          XMIT 128 LINES
11B6 A7    59               STA PIXC,U
11B8 AE    8D FE53          LDX VIDEO,PCR    SET X TO RAM POINTER
11BC AF    55               STX INDEX,U
11BE 8D    0E       FTRAN1  BSR FTRAN3       XMIT ONE PICTURE LINE
11C0 8D    0C               BSR FTRAN3       XMIT SAME LINE AGAIN
11C2 AE    55               LDX INDEX,U      SET UP FOR NEXT PICTURE LINE
11C4 30    01               LEAX 1,X
11C6 AF    55               STX INDEX,U      SAVE NEW LINE LOACTION
11C8 6A    59               DEC PIXC,U       LAST XMIT LINE ?
11CA 27    29               BEQ FTRAN2
11CC 20    F0               BRA FTRAN1       IF NOT DO IT AGAIN
                    *
11CE 34    10       FTRAN3  PSHS X           SAVE X
11D0 A6    84       FTRAN4  LDA 0,X          GET BYTE FROM RAM
11D2 1F    89               TFR A,B          SAVE IT IN B
11D4 84    F0               ANDA #$F0        MASK OUT LOW NIBBLE
11D6 30    88 40            LEAX 64,X        SET X UP FOR NEXT PIXEL
11D9 8A    01               ORA $$01         TURN OFF SYNC PULSE
11DB B7    E010             STA PIA          XMIT GRAV LEVEL
11DE 58                     ASLB             SET UP FOR NEXT NIBBLE
11DF 58                     ASLB             BY SHIFTING LEFT 4X
11E0 58                     ASLB
11E1 58                     ASLB
11E2 CA    01               ORB #$01         TURN OFF SYNC
11E4 8D    12               BSR FDEL         DELAY ONE PIXEL TIME
11E6 F7    E010             STB PIA          XMIT GRAY LEVEL
11E9 6A    5D               DEC LINE,U       DECREMENT PIXEL CNTR
11EB 26    E3               BNE FTRAN4       IF NOT LAST BRANCH
11ED 8D    13               BSR FXHOR        SEND A HORIZONTAL SYNC PULSF
11EF 86    69               LDA #105         RESTORE PIXEL COUNTER
11F1 A7    5D               STA LINE,U
11F3 35    90               PULS X,PC        GO BACK TO MAIN LINE
                    *
11F5 8D    1B       FTRAN2  BSR FXVER        XMIT A VERTICAL SYNC PULSE
11F7 39                     RTS              PICTURE COMPLETED
                    *
                    *
                    * FAST SCAN PIXEL XMIT
                    * DELAY (7 MACHINE CYCLES/LOOP)
                    *
11F8 10AE  8D FE0C  FDEL    LDY FDELX,PCR GET PIXEL DELAY TIME
11FD 31    3F       FDEL1   LEAY -1,Y        DECREMENT BY ONE
11FF 26    FC               BNE FDEL1        DO IT AGAIN IF NOT ZERO
1201 39                     RTS
                    *
                    * HORIZONTAL SYNC.( 5 MILLI SECONDS)
                    *
1202 7F    E010     FXHOR   CLR PIA          SEND A SYNC PULSE
1205 10AE  8D FE01          LDY FHORX,PCR GET HORIZONTAL SYNC
120A 31    3F       FXHOR1  LEAY -1,Y        COUNT DOWN TILL ZERO
120C 26    FC               BNE FXHOR1
120E 7C    E010             INC PIA          TURN OFF SYNC PULSE
1211 39                     RTS
                    *
                    * VERT SYNC. ( 50 MILLI SECONDS)
                    *
1212 7F    E010     FXVER   CLR PIA          SEND SYNC (1200 HZ)
1215 10AE  8D FDF3          LDY FVERX,PCR COUNT DOWN
121A 31    3F       FXVER1  LEAY -1,Y
121C 26    FC               BNE FXVER1
121E 7C    E010             INC PIA          TURN OFF SYNC (1500 HZ)
1221 39                     RTS
                    *
                    * TV CAMERA PICTURE FROM DIGISECTOR
                    * INTERFACE CARD
                    *
1222 8D    6E       CAMER   BSR INITCA       INITALIZE PIA ON CARD
1224 8D    5F               BSR CLFST        MAKE RAM AREA TOTAL BLACK
1226 86    01               LDA #1           FIRST X COORDINATE
1228 C6    01               LDB #1           FIRST Y COORDINATE
122A AE    8D FDE3          LDX VIDEO1,PCR GET RAM AREA FOR PICTURE
122E 6F    51               CLR FAST,U       CLEAR TEMP STORAGE BYTE
1230 B7    E000     CAMER1  STA PIADA        PLACE X ADDRESS IN PIA
1233 F7    E002             STB PIADB        PLACE Y ADDRESS IN PIA
1236 34    02               PSHA             SAVE X ADDRESS
1238 86    FF               LDA #$FF         PIA MASK
123A 7D    E001     CAMER2  TST PIACA        IS PIA ZERO ?
123D 2A    FB               BPL CAMER2       IF NOT BRANCH
123F B7    E000             STA PIADA        RESET PIA
1242 B6    E000             LDA PIADA        GET PIXEL VALUE FROM CAMERA
1245 43                     COMA             MAKE IT COMPATABLE WITH PROG.
1246 48                     ASLA
1247 48                     ASLA             THROW AWAY TWO LSB OF PIXEL
1248 84    F0               ANDA #$F0        GET RID OF GARBARGE
124A A7    51               STA FAST,U       SAVE IT IN RAM FOR LATER USE
124C 35    02               PULA             GET OLD X ADDRESS IN PICTURE
124E CB    02               ADDB #2          LOOK AT LINE AFTER NEXT
1250 C1    FB               CMPB #251        IS IT THE LAST LINE ?
1252 27    24               BEQ CAMER4       IF SO GIVE UP
1254 B7    E000             STA PIADA        SET X ADDRESS FOR NEXT PIXEL
1257 F7    E002             STB PIADB        SET UP Y ADDRESS
125A 34    02               PSHA             SAVE A ADDRESS
125C 86    FF               LDA #$FF
125E 7D    E001     CAMER3  TST PIACA
1261 2A    FB               BPL CAMER3
1263 B7    E000             STA PIADA
1266 B6    E000             LDA PIADA        GET THE PIXEL FROM THE CAMERA
1269 43                     COMA             FORMAT THE PIXEL
126A 47                     ASRA
126B 47                     ASRA
126C 84    0F               ANDA #$0F
126E AA    51               ORA FAST,U       ADD BOTH NIBBLES TOGETHER
1270 A7    80               STA 0,X+         STORE THE WHOLE MESS IN MEMORY
1272 35    02               PULA             GET X ADDRESS BACK
1274 CB    02               ADDB #2          LOOK FOR LINE AFTER NEXT
1276 20    B8               BRA CAMER1       DO IT AGAIN
                    * NEW X COORDINATE
                    * ADD 3 FOR ASPECT
                    * RATIO ON FAST SCAN
1278 C6    01       CAMER4  LDB #1           SET UP Y COORDINATE
127A 30    02               LEAX 2,X         ADD 2 TO THE RAM ADDRESS
127C 8B    03               ADDA #3          CAN BE CHANGED TO 2 (ASPECT)
127E 81    FD               CMPA #253        LAST A ADDRESS ?
1280 26    AE               BNE CAMER1
1282 16    F08F             LBRA START       PICTURE IS IN RAM
                    *
                    * CLEAN OUT FAST SCAN
                    * RAM AREA FOR NEW
                    * PICTURE
                    *
1285 108E  8000     CLFST   LDY #VIDBEG      GET RAM BEGINNING ADDRESS
1289 6F    A0       CLFST1  CLR 0,Y+         MAKE IT BLACK (0)
128B 108C  9FFF             CMPY #VIDEND     IS IT THE LAST ADDRESS ?
128F 26    F8               BNE CLFST1       IF NOT DO IT AGAIN
1291 39                     RTS
                    *
                    * INITALIZE CAMERA INTERFACE
                    *
1292 7F    E001     INITCA  CLR PIACA        SET UP X COORDINATE
1295 7F    E003             CLR PIACB        SET UP Y COORDINATE
1298 8E    FF04             LDX #$FF04
129B BF    E000             STX PIADA
129E 8E    FF2C             LDX #$FF2C
12A1 BF    E002             STX PIADB
12A4 39                     RTS
                    *
                    * MENUS  TO PROMPT OPERATOR FOR VARIOUS ACTION
                    *
12A5 0A0D           MENU    FDB $0A0D
12A7 46 41 53 54            FCC /FAST SCAN SSTV PROGRAM (K6AEP)/
12AB 20 53 43 41
12AF 4E 20 53 53
12B3 54 56 20 50
12B7 52 4F 47 52
12BB 41 4D 20 28
12BF 4B 36 41 45
12C3 50 29
12C5 0A0D                   FDB $0A0D
12C7 52 3D 52 45            FCC /R=RECEIVE FAST SCAN/
12CB 43 45 49 56
12CF 45 20 46 41
12D3 53 54 20 53
12D7 43 41 4E
12DA 0A0D                   FDB $0A0D
12DC 44 55 52 49            FCC /DURING RECEIVE 5=50HZ 6=60HZ/
12E0 4E 47 20 52
12E4 45 43 45 49
12E8 56 45 20 35
12EC 3D 35 30 48
12F0 5A 20 36 3D
12F4 36 30 48 5A
12F8 0D0A                   FDB $0D0A
12FA 46 3D 58 4D            FCC /F=XMIT FAST SCAN PICTURE/
12FE 49 54 20 46
1302 41 53 54 20
1306 53 43 41 4E
130A 20 50 49 43
130E 54 55 52 45
1312 0A0D                   FDB $0A0D
1314 43 3D 43 41            FCC /C=CAMERA INPUT/
1318 4D 45 52 41
131C 20 49 4E 50
1320 55 54
1322 0A0D                   FDB $0A0D
1324 04                     FCB 4
                    *
1325 0A0D           MENU1   FDB $0A0D
1327 54 52 41 4E            FCC /TRANSMIT LOOPS 1 TO 9/
132B 53 4D 49 54
132F 20 4C 4F 4F
1333 50 53 20 31
1337 20 54 4F 20
133B 39
133C 0A0D                   FDB $0A0D
133E 04                     FCB $4
                    *
                            END BEGIN
0 ERROR(S) DETECTED

SYMBUL TABLE:

BEGIN   1000   CAMER   1222   CAMER1  1230
CAMER2  123A   CAMER3  125E   CAMER4  1278
CLFST   1285   CLFST1  1289   DEL3    1168
ESC     1038   FAST    FFF1   FASTX   1198
FASTX1  11A4   FDEL    11F8   FDEL1   11FD
FDELX   1009   FHOR1   1129   FHOR2   1141
FHOR3   113C   FHOR4   1144   FHOR12  1122
FHORX   100B   FPIXR   10BC   FPIXR1  10D0
FPIXR2  10E4   FPIXR4  10FC   FRE50   1008
FRE60   1007   FTRAN   11B0   FTRAN1  11BE
FTRAN2  11F5   FTRAN3  11CE   FTRAN4  11D0
FVERT   10FD   FVERT1  1109   FVERT2  1116
FVERT3  1119   FVERT4  110F   FVERX   100D
FXHOR   1202   FXHOR1  120A   FXVER   1212
FXVER1  121A   GETA    116C   INDEX   FFF5
INEEE   105A   INITC   1189   INITCA  1292
INRS    1078   LINE    FFFD   MASK    FFF7
MENU    12A5   MENU1   1325   OUT     103F
OUT1    104A   OUT2    104F   OUTRS   106D
OUTRS1  1074   PIA     E010   PIACA   E001
PIACB   E003   PIACTL  E004   PIADA   E000
PIADB   E002   PIXC    FFF9   RECFST  1083
RECVC   FFFF   RFST1   1092   RFST2   109A
RFST3   1CA8   RFST4   1082   RLINE   FFF3
RPIXC   FFFB   RS      1013   RSBS    103B
START   1014   STORE   114D   VIDBEG  8000
VIDEND  9FFF   VIDEO   100F   VIDEO1  1011
```

in memory, it would automatically be displayed. When you first look at the Microworks board, you will be surprised at the small number of components (Photo C). (This card is not a production model. I include the photo even though it is not representative of the final, professional-looking product.)

3. *The Slow-Scan Television Interface.* The SSTV interface card is the only non-commercially-available interface card that I use in the system. I still use the same card which was described in *73 Magazine*.[2] I would like to redesign the card some day and use more state-of-the-art components.

This card functions by taking a dc voltage proportional to the SSTV frequency, sampling the voltage with an analog-to-digital converter, and then placing the pixel into memory. The SSTV-output inter-

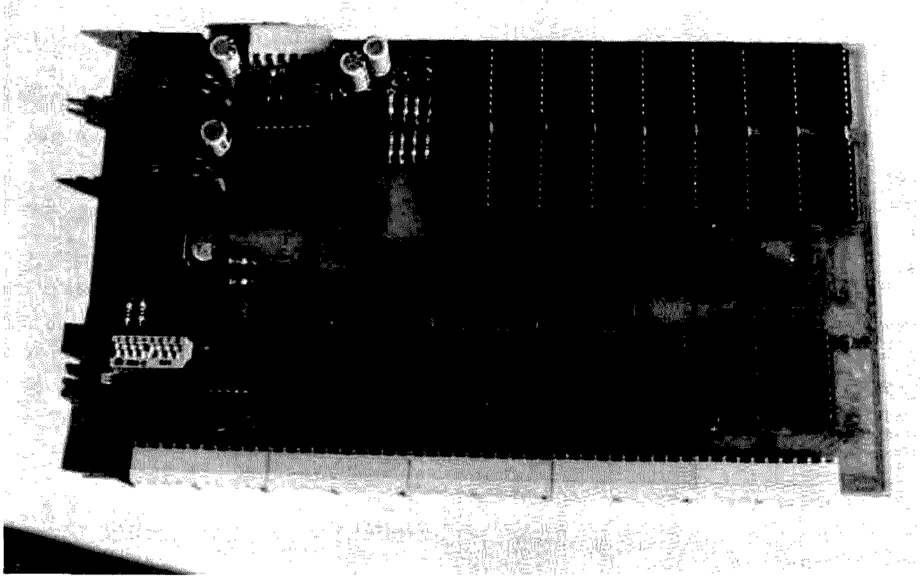


Photo C. Microworks fast-scan display card.

face takes the output from a digital-to-analog converter and feeds it into an SSTV modulator.

4. *The Microprocessor Component*. Remember to treat the microprocessor as just another system component. It can consist of a CPU card, a serial port, and a terminal. (The microprocessor also could be a more complex device such as a single-board computer.) The software which I will present later in this article can provide a software package which could be used for both system configurations.

The Microworks cards which I tested for this article are all SS-50 boards. Therefore, a motherboard must be acquired to plug in the cards if you wish to duplicate my work. The SS-50 bus has been used by a number of manufacturers since 1976. This computer bus structure is a good low-cost approach for system construction. Card costs in most cases tend to be lower than the IEEE-696 (S-100) or Apple bus. The manufacturers and numbers of cards available for this bus are large.

Keyboard Selection	Program Function
F	Transmit the picture displayed on the Microworks display on SSTV. The program will ask for the number of loops desired.
R	Receive SSTV pictures and display them until a key is struck on the keyboard. If a key other than 5 or 6 is struck, the routine will end. If the key is a 5, 50-Hz SSTV will be received. If the key is a 6, 60-Hz SSTV will be received.
C	Capture a TV image from the Microworks Digisector Card. The image is displayed on the Microworks Fast-Scan Display card.
ESC	Jump to TSC FLEX 9 DOS warm start.
Backspace	Jump to Radio Shack BASIC cold start.

Fig. 3.

Program Constant	Function
VIDEO	Picture RAM start of upper right-hand corner
Pixels/line	Constant #111 loaded in RECFST
FRE60	60-Hz delay constant
FRE50	50-Hz delay constant

Fig. 4.

Another approach to interface the Microworks cards is to use a single-board-computer component which can attach to the SS-50 bus. An exciting product which will be very popular in the 1980s is the Radio Shack Color Computer. This computer was introduced in late 1980 and is the first commercial single-board computer which uses the Motorola 6809 processor. The 6809 is a very advanced processor which provides compute power which exceeds that of any of the existing 8-bit processors now available.

One of the interesting features of the color computer is the ease of interfacing. An adapter could be constructed between the side game cartridge connector and the SS-50 bus. Pins on the cartridge connector go directly to the 6809 CPU chip. All that has to be done is to add buffers on a small prototype card. Run short wires to the SS-50 bus. You can then add the Microworks cards and you have a working SSTV system.

I understand that a manufacturer will soon offer such a SS-50 adapter. For those of you who wish to construct your own adapter, Table 1 is provided. This gives a detailed description of each pin on the Radio Shack computer and the equivalent pin on the SS-50 bus.

You may ask if it is possible to adapt older Z80-based Radio Shack computers to the SS-50 bus. It is possible, but probably would take a significant effort. Since the color computer is so cost-competitive, it would be considerably easier to obtain one than to spend the time and effort adapting an older-generation Z80-based machine.

The Software

To glue all the pieces together, what is needed is a software package. The program is a software package which makes a complete SSTV system. It is written to run on either an SWTP 6809-type system or a Radio Shack color computer. The package is less than 1K in size and is written to be position-independent. This feature is available only with the 6809 processor. This means that you can key the program into any place you like in your RAM memory and it will run.

Since the program is well commented, I will not provide flowcharts but will discuss the programming of the Microworks cards in some depth.

Systems Programming. At the start of the program is a listing of program equates and constants. The program assumes that the following is the configuration of the SS-50 cards:

Photo D. SSTV picture via amateur radio—live shot of WB3APB on 10 meters, December 22, 1980.

TRS-80C Pin	Name	SS-50 Pin
1	−12 volts	(note 1)
2	+12 volts	(note 1)
3	Not HLT	45
4	NMI	35
5	Reset	42
6	E	39(phase 2)
7	Q	(note 2) 40 (VMA)
8	Rom init	none
9	+5	(note 1)
10	D0	1(note 3)
11	D1	2(note 3)
12	D2	3(note 3)
13	D3	4(note 3)
14	D4	5(note 3)
15	D5	6(note 3)
16	D6	7(note 3)
17	D7	8(note 3)
18	R/$\overline{W}$	41
19	A0	24
20	A1	23
21	A2	22
22	A3	21
23	A4	20
24	A5	19
25	A6	18
26	A7	17
27	A8	16
28	A9	15
29	A10	14
30	A11	13
31	A12	12
32	Select $C000-FF00	none
33	Gnd	25,26,27
34	Gnd	25,26,27
35	Audio input	none
36	Select $FF40-FF5F	none
37	A13	11
38	A14	10
39	A15	9
40	Disable BASIC ROM	none

Notes: 1. All SS-50 bus voltage must be developed on the bus.
2. VMA is developed by ANDing E and Q.
3. Data lines must be inverted on the SS-50 bus.

Table 1. Radio Shack Color Computer pinout vs. SS-50 bus.

Digisector base address	—$E000
Serial terminal	—$E004
Fast-scan display RAM	—$8000
SSTV interface	—$E010

The object code can be patched to accommodate any configuration you have. If you are using a Radio Shack color computer, the byte labeled RS should be changed to a $FF. With this change, all communications messages to and from program are routed through the BASIC ROM. One other change should be made with the Radio Shack computer. The base address of $8000 is in conflict with the extended BASIC ROM. If this is changed to $6000, the computer should be happy.

You may ask, how do I load this program into my Radio Shack computer? Well, Microworks can help out again. They can provide a monitor program called "CBUG" which will load from audio cassette tape or run in a single 2716 EPROM. The 2716 will plug directly in the Radio Shack computer in the extended BASIC ROM socket. You then will have a program in which you can use machine-language programming to load/save from the built-in audio cassette interface.

Eight bytes of program delays are placed as constants at the beginning of the program. These delays were empirically derived on my home-brew 6809 system with a 1-MHz cycle time. The Radio Shack computer operates at a 0.8949-MHz rate; therefore, all constants have to be increased slightly.

Eight program variables are defined with equates of minus numbers at the program start. These variables can be located anywhere in the memory space. Their location is defined by the location of the system stack when the SSTV program was executed. The system stack is transferred to the user stack and then decremented by 20. All references to these variables are made referenced to the user stack. This is a common programming technique which is used on advanced processors like the 6809 for program-position independence. The user stack is left at this location throughout program execution.

Main Line Software. After initialization of the user and system stacks, the START program is executed. This routine displays a menu on the terminal or TV set in the case of the Radio Shack computer. Five program options are possible, as shown in Fig. 3.

Receive Software. The receive software is very similar to two previously published articles.[2,3] Therefore, I will not discuss the basic principles in this article. One major difference between this program and the others is the formatting of pixels in memory. The memory in this case is the fast-scan display card.

A problem exists with all SSTV display systems—aspect ratio. SSTV has an aspect ratio of 1:1 where a normal TV is 4:3. Another factor which must be addressed is the type of TV which you are using. Some displays underscan the picture while others overscan slightly. In this software package, I chose to slightly overscan the SSTV picture on both the right- and left-hand borders. On the vertical, I decided to lose about 8 scan lines off the bottom of the picture. This appeared to be a satisfactory compromise. A typical SSTV picture received via ham radio appears in Photo D.

You may have to modify slightly the video-scan area to achieve optimum results. This is accomplished by modifying program constants in the areas listed in Fig. 4.

Photo E. TV camera picture displayed on the fast-scan card.

The only other difference in the receive routine from others published is the keyboard polling routine. During a vertical and horizontal sync pulse, the keyboard is polled to see if the keyboard has been struck. If so, the program is ended or a new program delay selected.

Transmit Software. The transmit SSTV picture software is similar to the same two referenced articles. The only major difference is in how the picture is accessed from memory. The picture in the conventional sense is rotated in memory by 90 degrees. This transmit routine accesses bytes from memory in a manner to rotate the picture and transmit it in a correct format.

Camera Software. The software to capture an SSTV picture from the Digisector card was a fun routine to write. The software is extemely time-dependent and functions as follows.

The CAMER routine grabs a picture from the TV camera in a format of 85 pixels/line on 128 lines with 16 gray levels. Why such a strange format? Well, the entire format is based upon a number of compromises of picture appearance, ease of programming, and aspect ratio. The Digisector card is great in that any type of format can be digitized from 256 pixels on 256 lines, with 64 gray levels. You can modify the format to any configuration you like by slight program changes.

Back to the Programming

What I tried to accomplish in this program was to:

- Display the entire camera frame on the fast-scan TV display.
- Make the aspect ratio as accurate as possible on the display.
- Place a black border around the picture to block out any unwanted garbage.

Photo E is a result of the programming. I might add that the lighting and the quality of my TV camera is not the greatest. In any case, you can get an idea of how it looks.

The Digisector is first initialized with the starting X and Y coordinate position in the picture. The program then waits for a response from the card. When the analog-to-digital conversion is completed, the gray level is loaded in the accumulator, formatted, and saved in a constant called FAST. This entire operation must be completed within 2 scan lines or 128 microseconds. The routine in this program takes about 56 cycles or 56 microseconds on my 1-MHz clock processor. The process is then repeated for the next pixel. This time the pixel is ORed with FAST and saved in the video RAM.

The whole process takes about 2 seconds. I was a little concerned with the grab time at first, but I found it quite easy to sit still for 2 seconds while the picture was digitized. Therefore, this condition did not present a problem.

The formatting of the picture may vary depending on the TV camera, the width setting of the Digisector, and the TV display. If you wish to change the aspect ratio for 128 pixels/line, change the $03 at location $127D to $02. You may have to adjust the constant VIDEO1 to a lower value.

Conclusions

The use of the Microworks cards to create an SSTV system is an excellent choice. Unlike the hardware-only SSTV scan converters, the cards and software approach make a versatile and expandable system. Routines can be written to create a software-only SSTV keyboard which mixes graphics and pictures. Picture enhancements can be programmed to achieve many interesting effects. You are limited only by your programming skills and time.

I would like to thank Bob Lentz of Microworks for his help in this project.

If you decide to drop me a line to ask any specific questions, please include an SASE or IRCs for my reply. ■

References

1. The Microworks, Inc., 1942 El Camino Real, Encinitas CA 92024; phone (714)-942-2400.
2. "SSTV Meets SWTPC," *73 Magazine*, November and December, 1978.
3. "Display SSTV Pictures on a Fast Scan TV," *Ham Radio*, July, 1979.

Jeff DeTray WB8BTH
73 Magazine Staff

Cushcraft's Skywalkers

—performance through computer-aided design

Last summer, during what has become the annual antenna renewal at W2NSD/1, a pair of four-element Cushcraft "Skywalker" monoband beams for 10 and 20 meters was added to the antenna farm. Named for *Star Wars* hero Luke Skywalker, they are but two of the six members of Cushcraft's HF monoband family, a family which includes three- and four-element versions for 10, 15, and 20 meters. Like that other Skywalker, these antennas have had a helping hand from computers, being among the first Cushcraft antennas to be designed with the aid of a new computer program.

The Dry Statistics

Cushcraft rates the forward gain of the four-element Skywalkers at 10 dB and that of their three-element relatives at 8 dB. Front-to-back ratio is 30 dB or better for all six antennas.

The 3-dB beamwidth of the Skywalker line averages about 58°. In practical terms, this means that your beam heading can be in error by half that amount, or as much as 29°, and your signal at the other end of the circuit will be down by just 3 dB. That's only half an S-unit, which all goes to show that pointing one's beam with micrometer precision probably isn't worth the trouble.

Monobanders are surprisingly light in weight, for those of us used to triband beams. The four-element 10-meter Skywalker weighs in at a paltry 18 pounds. Even the big 20-meter version tips the scales at only 55 pounds, despite its rugged construction. Wind loadings are 3.1 and 8.1 square feet, respectively. The boom of the 10-meter beam is 16 feet long, while the four elements of the 20-meter Skywalker reside on a boom 32'8" long.

Computer-Assisted Design

The Skywalkers share a common heritage in that all six antennas are the product of computer-assisted design (CAD), using a complex FORTRAN program running on a large IBM computer. With this program, an antenna designer can perform a complete analysis of a projected antenna. The program generates an accurate prediction of the performance of each new design. If an antenna looks good in the computer analysis, a prototype can then be built and subjected to real-life testing.

The advantages of CAD are several. First, considerable research and development time is saved, since a designer using the computer can analyze many potential antenna designs in a short period of time. Unproductive avenues of research can be quickly eliminated from further consideration. With the computer to do much of the tedious work, the designer can spend his time doing what's most valuable—coming up with ideas for better antennas.

Since the computer program makes it easier to check out different designs, it is more likely that unusual or unorthodox configurations will be evaluated. The four-element Skywalkers are direct beneficiaries of this. The computer program figured very significantly in the placement and dimensions of the second director. This particular combination of length and placement very likely would not have been suggested had it not been for the availability of computer analysis.

By the way, if you were thinking it might be fun to run this program on your friendly neighborhood microcomputer, think again. The program is a monster and requires the large amounts of on-line memory available only on large systems.

Assembly and Installation

Although monobanders are usually sold on the basis of their performance, the Skywalkers could be marketed on their ease of assembly alone. One reasonably bright ham can take the four-element 10-meter Skywalker from box to tower in less than two hours. Assembly itself takes less than 90 minutes. The 20-meter version, being twice as large, is more easily assembled with the aid of a helper. Still, the two of you will be able to do the job in a couple of hours.

One firm in our hobby, Heath Company, is famous for its wonderfully complete instruction manuals. Cushcraft has gone them one better, at least in a sense. The Skywalkers are so easy to assemble, you hardly even need the manual at all! Since the boom and the elements are all composed of several sections of telescoping tubing, Cushcraft has sim-

ply marked each piece with a black line to indicate how far it should be inserted into the tubing of the next largest size. You merely insert each piece as far as the black line, tighten the hose clamps, and you have yourself a monoband beam that is resonant at the bottom end of the phone band. Should you wish to be resonant in some other portion of the band, you'll need to adjust the length of the tips of the elements per a table supplied in the manual.

The antenna is matched to the feedline by something called a Reddi Match. This is Cushcraft's name for its variant of the classic gamma match. Here again, adjustment couldn't be simpler. The manual gives the proper position of a sliding bar on the matching unit. If you set this bar to the recommended dimension, a low swr is practically ensured. In the W2NSD/1 installation, this measurement to set the Reddi Match was the *only* measurement required in the assembly of either the 10- or 20-meter four-element Skywalkers.

Cushcraft recommends that antennas of similar size be mounted at least half-a-boom-length above or below a Skywalker when it is stacked with other antennas on the same boom. We initially tried a tribander just six feet above the 20-meter Skywalker, but neither antenna performed well. When the tribander was replaced with the 10-meter Skywalker, both Skywalkers came on like gangbusters.

Both antennas have just endured one of the windiest winters in recent memory, without serious problems. After a very heavy late-February snowstorm, the reflector of the 20-meter antenna was pulled askew by snow and ice accumulating at one end. This was caused by a loose hose clamp on one section of the boom. The problem turns out to be rather common with the Skywalkers, but, fortunately, there is an extremely simple, yet permanent fix. You can drill a small hole through both layers of tubing near the end of each boom section, then insert a 1/2" sheet metal screw. The screw ensures perfect alignment of the boom sections, but is easily removed if the antenna must be disassembled.

Performance vs. Cost

There is little argument that a set of monobanders will outperform a tribander, but what about the cost? Are monobanders really affordable? Well, consider this. For less than $90 above the cost of Cushcraft's ATB-34 tribander, you could own three-element Skywalkers for 10, 15, and 20 meters. Granted, you might need a heftier rotator to turn the three monobanders, but the point is that monobanders don't have to be outrageously expensive.

Should everyone go for monoband beams, then? Of course not. A triband beam is less expensive, easier to install, and probably will require less maintenance than three monobanders. However, when and if you become attracted to the competitive aspects of ham radio, monobanders may be in your future. When you get the urge, the Skywalkers from Cushcraft are a good bet.

For further information, contact *Cushcraft Corporation, 48 Perimeter Road, PO Box 4680, Manchester NH 03108*. Reader Service number 490.■

Lee Hornstein AE3S
9079 Meadow Heights Rd.
Randallstown MD 21133

Avanti's 10-Meter Quad

It was my intent to have an outstanding signal on 10 meters with a small and light antenna before the band went to sleep for the next couple of years. My present 10-meter yagi loaded well but performed like a dummy load. The yagi was interlaced on a 21-foot boom with 4 elements on 15 meters. The 15-meter yagi was an excellent performer, but the 10-meter antenna just didn't do the job. Below this setup was a 5-element monobander for 20 meters. Obviously, there was not much room for another supersized yagi.

For the past couple of years I had been hearing good things from the 11-meter boys about the PDL II by Avanti Communications. Many stations on the CB band were using this quad-like antenna because they could easily switch from horizontal polarization to vertical or vice versa. Contacts were much more solid because of this unusual ability. It was noticed that as band conditions shifted and signal polarity changed from vertical to horizontal, the PDL maintained transmitting and receiving capabilities.

With all this in mind, I went to see my local amateur radio dealer and asked if he had one of those Avanti PDLs on the shelf. To my surprise, he had a 10m one ready to go. The 10- and 11-meter antennas are identical except for minor changes on the element wires and the gamma match dimensions.

That evening, I read through the Avanti manual to familiarize myself with the materials and construction of the PDL. There were lots of instructions and illustrations, and many parts. The actual assembly went rather quickly; in fact, before I realized what had happened, the whole superstructure was almost completely assembled before me. Part of the antenna had to be disassembled before I could get it through the

back door to the yard.

Once out in the yard, I put the pieces back together and began measuring the copper wire for the two quad loops. The wire elements mounted easily and the tension on each side was adjustable. For the first time since I have been building quads (22 years), the loops were beautifully symmetrical.

The only detail which proved to be tricky was adjusting the antenna for lowest swr. I tried to match the vertical and horizontal to the same point of resonance as well as the lowest swr. Maybe I didn't have to go through all the exercise of standing on the picnic table with the PDL, but I felt it might make my signal a bit better.

With the antenna mounted at 65 feet, swr was almost the same as when it was tested on the ground. The highest swr was 1.9:1 and the lowest was 1.2:1 between 28.550 and 28.700. The highest swr in the entire band from 28.0 to 29.6 was only 1.9:1, which is quite unusual. I was very pleased that the PDL resonated exactly where it is supposed to.

The Avanti 10-meter PDL uses quality materials, although it's my normal practice to replace any stock hardware with stainless. The construction details and illustrations were quite adequate. Actual on-the-air tests prove I now have a performer. The Avanti consistently gets through. In a recent test with my neighbor Al K3BVC, comparing his 3-element tribander with my PDL, a PY2 gave me 59+10 and Al a 57. Most Japanese called are now answering my first call, and that's not easy from the east coast! I have also received reports of 10-dB increases when switching from vertical or horizontal feed on the PDL. It is a good feeling to know that I have selected a performer instead of the dummy load that used to be up there!

For more information, contact *Avanti Communications, 340 Stewart Ave., Addison IL; (312)-628-9350.* Reader Service number 477.■

Karl T. Thurber, Jr. W8FX
317 Poplar Drive
Millbrook AL 36054

VoCom's Collapsible Whip for HTs

—5/8-wave from 144 to 450 MHz

Handie-talkies (HTs) are great fun, but their low power output and typically inefficient rubber ducky antennas limit their range and effectiveness. There are basically three ways to increase range: (1) stand on a hill or other unobstructed location; (2) add a power amplifier; or (3) hook up the unit to a more efficient antenna.

The first solution is fine if you can always manage to operate from a good location, but unrealistic for on-the-go HT work. The second will do the trick, but you end up converting your portable hand-held to a *semi*-portable when bulky externals are added. The third seems to hold the most promise and is much easier and less expensive to accomplish than adding an external amp to your HT.

Adding a *quarter-wave* whip to an HT is no big deal and usually entails cutting a length of small-diameter stainless steel rod stock to about 19" and slapping it into an appropriate connector. The problem, if any, that ensues is a mechanical one—that of finding a way to secure the rod stock in a small BNC, PL-259, or F-type connector.

Harnessing a *5/8-wave* whip to an HT is another story. A base-matching network is required to ensure that the transceiver "sees" a 50-Ohm load. Doing this presents problems, both electrical and mechanical, since the whip must be fastened to the matching coil, and the coil must in turn be mounted to the connector. Several designs have been suggested in the amateur literature, but most require some fancy machining or else result in mechanically inferior "Rube Goldberg"-like products. Another problem is that of tuning and matching: How does one insert an swr bridge at the base of the antenna without seriously affecting the measurements? In most cases, one *doesn't*; he or she cuts the antenna and builds the matching network as closely as possible to spec as he can, hoping that any mismatch will not be serious enough to damage the HT's final rf output transistors or trip the swr protection circuit.

Having wrestled with these kinds of problems before, I was attracted to VoCom's ready-to-go 5/8-wave HT antenna, the ads for which claimed that the device was "...just like adding a 10-Watt amp to your 2-meter hand-held." I sent for one and found the product that arrived to be a very good one.

The VoCom antenna, which was shipped via UPS in a small cardboard mailing tube, is a 10-section collapsible whip, somewhat similar to those found on CB handie-talkies and portable AM-FM radios, but of heavier design. The antenna, designed to permit extension to a full 5/8-wavelength (47") on 2 meters, collapses to 8"— about the same length as a rubber ducky. A pretuned matching network is included, and the base spring/tuned coil protects the whip and radio from various "accidents." At present, the antenna is offered only with a BNC connector, but the firm is working to overcome the mechanical problems associated with using other connectors. Claimed swr is better than 1.5:1 over the

entire 144-148-MHz band. (The HT should not be operated with the antenna collapsed, as the whip would no longer be resonant and an excessive swr would be presented to the HT. This could cause damage to the rf output transistor(s).)

As furnished, at full extended length the whip is designed for optimum performance on 2 meters. However, the antenna will resonate at any frequency from about 143 MHz to 450 MHz simply by changing the length of the collapsible whip. The company has produced a chart of the required resonant lengths for various frequencies, which is available on request.

Wondering just how the very good swr figures reported were measured, I contacted the manufacturer. Fred Glenn K9SO, president, advised that VoCom uses production test fixtures the same approximate size and shape as amateur hand-held radios. These test fixtures are fed through Bird wattmeters to determine the resonant point and swr. Fred also advised that a fairly good approximation of resonance could be obtained by mounting the antenna directly to a wattmeter/swr bridge as long as other objects were kept at least one-half wavelength from the radiating portion of the antenna to avoid distortion in the measurements.

Obviously, using an HT-mounted antenna of any kind results in less-than-perfect ground-plane effects. These effects markedly influence antenna pattern and thus overall results—as much or more so than do matching considerations. VoCom found that the HT itself and the operator's body capacitance provide an adequate ground plane for the 5/8-wave antenna; an ideal ground plane would yield optimal results. Nevertheless, the firm reports tests which measured a 5.6-dB improvement over the standard quarter-wave HT-mounted whip, and a nearly 10-dB improvement over the common rubber ducky.

In evaluating the little antenna's on-the-air performance, I immediately noticed the difference between it and the stock ducky. Tested under a variety of conditions, repeaters that were marginally readable at my QTH on the ducky were very nearly full-quieting, and it was frequently possible to access machines that were unusable before because of inadequate signal from the HT.

Partially extended VoCom 5/8-wave 2-meter HT antenna is shown here installed atop an Icom IC-2AT transceiver. Ten-section antenna is base-matched and boasts a 5.6-dB gain over a 1/4-wavelength whip and as much as a 10-dB improvement over stock rubber ducky antennas, according to the manufacturer's measurements. (Photo courtesy of VoCom Products Corp.)

All things considered, at $24.95, supported by a 1-year warranty, the antenna is a very nice range-extending accessory to have.

For more information, contact *VoCom Products Corporation, 65 E. Palatine Rd., Suite 111, Prospect Heights IL 60070; (312)-459-3680.* Reader Service number 476. ■

HAM HELP

I am in need of a schematic for a Dumont 224A oscilloscope of World War II vintage. I will gladly pay.

Gordon Fulp
Rte. 3, Box 572A
Placerville CA 95667

I'm looking for a schematic for the Edgecom FMS-25. Thanks.

Mark M. Maddox KL7IWT
Rte. 3, Box 46
Rapid City SD 57701

After several years of trying to complete my collection of *73 Magazine* through scrounging at hamfests and trying to keep up a subscription through years of military service, I need help for the final few issues. I desperately need the January, February, March, and April 1961 and November 1960 issues to complete my private collection! I have many extra issues between 1965 and 1974 to swap or sell at 50¢ each. I also need a power transformer for a Heath HO-10 monitor scope.

Bill Ward W4PCK
5521 Ashwood Drive
Anniston AL 36201

I need diagrams for the following: GBC Electronics (Japan) type VR-621 and Packard Bell Model 920 "Sync-Lok" TV cameras; Precision Aparatus Co. series 858 VOM; Jackson Electronic Model TVG-2 TV sweep generator; G.E. "Accent 450" mobile model EU-EG48ST8. I will pay reasonable fee and postage.

Joel Jones W4JQB/7
PO Box 745
Airway Heights WA 99001

I need manuals and/or schematics for the following pieces of equipment. Copy yours and return or state price: Aerovox Model 97 LC checker; Precise Development Corp. oscilloscope, Model 300; Anadex Counter, Model CF-203-4R; ME-74/U electronic voltmeter type RUQ; VHF-AM receiver (Collins); Chadwick Helmuth sweep sync, Model 201R.

Anthony T. Lux KC4MI
1421 Eastern Avenue
Rocky Mount NC 27801

I am a high school Spanish teacher and a General class ham. In order to improve my operating skills in Spanish, I am searching for technical and practical materials written in Spanish. Could anyone provide me with a source of such materials?

Patricia Knasinski WD9FQA
Winchester Community High School
700 North Union St.
Winchester IN 47394

I need a schematic and/or manual for a Hallicrafters S-38E. I'll pay copying and mailing costs.

Paul Grupp KA1LR
RFD
Marlborough NH 03455

I have a Sears and Roebuck CB radio, model 934 36772600, which I would like to convert to 10 meters. This is an ac/dc 23-channel SSB rig. I would appreciate any info on converting this rig. Thank you.

D.L. Hecox WA7IRT
6517 Brookview Lane N.E.
Cedar Rapids IA 52402

I need service info/diagram on Collins KWS-1 transmitter. Will pay reasonable cost for info, copies, etc.

Harold D. Wright K4MFN
Rte. 1, Box 259
Chancellor AZ 36316

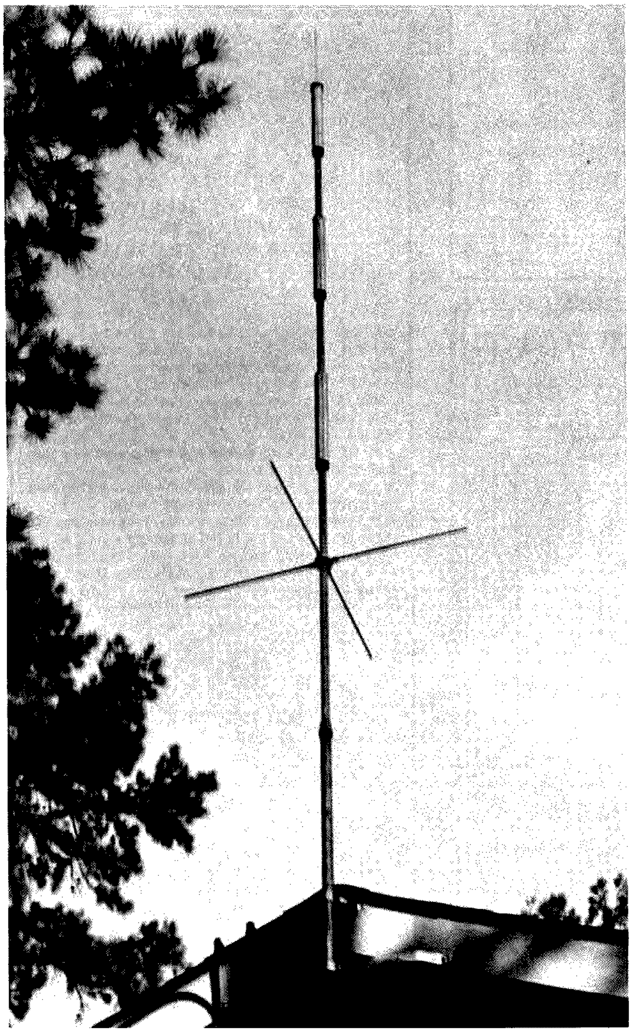
Just a note to say thanks to all of you at *73 Magazine* for placing my request for Ham Help in your January, 1981, issue. I quickly received many offers of help and obtained the manuals and schematics I needed. It's this kind of service provided by your magazine and the friendship of those who responded that makes our hobby so enjoyable. Thanks for a great magazine, keep up the good work.

Phillip R. Lofton
Collierville TN

Karl T. Thurber, Jr. W8FX
317 Poplar Drive
Millbrook AL 36054

Kreco's SC-150A 2-Meter Collinear

—a commercial-quality antenna built to take it



Kreco four-element collinear antenna gives an approximate 6-dB gain on 2 meters. A quarter-wave radiator, three quarter-wave sleeves, and a ground-plane section constitute the antenna's main components.

In the infancy of this writer's amateur radio experience, back in the seemingly prehistoric 1950s, heavy, massive "plumber's delight" beams were all the rage. Indeed, you were "in" if your tower sported an array that appeared to be crafted by no less than a master plumber. I was, therefore, fondly reminded of the "good old days" by recent ads showing the line of VHF antennas sold by the Herb Kreckman Company of Cresco PA.

The Kreckman catalog displays a line of antennas for the ranges 25-50 MHz, 72-75 MHz, and 108-470 MHz that is geared for the commercial FM two-way trade. Most of the firm's sales are to installers for taxicab fleets, police and fire departments, government agencies, paging services, and related applications. For obvious reasons, the antennas furnished these users must be rugged, maintenance-free, and require little or no tune-up or other installation adjustments.

Most of the Kreco antennas are not particularly useful to hams, and they tend to the expensive side due to their exceptional rugged ness. However, I was intrigued by one particular stacked VHF antenna in the catalog, the SC-150, which is a four-element vertical collinear delivering a stated gain of about 6 dB. It can be factory-set to any frequency within the range 108 to 174 MHz, which includes the two-meter band.

Three versions of the antenna are available, with varying degrees of ruggedness. The relatively lightweight (3-1/2 lbs.) SC-150A is built of aluminum and requires a threaded 3/4" support pipe. The intermediate-duty SC-151A is similar electrically, but is made of slightly heavier materials and weighs 4 lbs.; 1" pipe is required for the supporting mast. A third and extremely durable version is the SC-155, which weighs 4-1/2 lbs. and requires a 1-1/4" support pipe. Several brass versions are available for premium installations. (Weights given do not include the weight of the user-furnished supporting pipe.)

I opted for the SC-150A, the lightweight aluminum version, which I thought would be equivalent in construction to typical amateur-grade VHF antennas, and also in the same price category (cost of the SC-150A is about $66). I or-

dered the antenna factory-cut for 146.5 MHz.

After assembling the antenna (which is UPS shippable) and mounting it on a length of 3/4" pipe, I found that I now had a plumber's delight of my own (the pipe forms an integral part of the antenna). The radiator itself is a quarter-wavelength of sturdy aluminum rod, which is supported by a special ceramic insulator into which the user-supplied pipe threads, along with the PL-259 connector for the feedline, which runs down the pipe. A quarter-wave sleeve drops down over the pipe at this point, forming a coaxial antenna. Two more coaxial quarter-wave sleeves are used for decoupling and gain-enhancing purposes at appropriate intervals down the mast, and a ring supporting the four quarter-wavelength radials is located at a point down the mast which is six quarter-waves (or 1-1/2 wavelengths) from the feedpoint.

The antenna performed well, when compared with my Cushcraft Ringo Ranger. Gain claims were not verified, but seemed to be reasonable, and the antenna offered a good match to RG-8/U coax. Particularly impressive was the antenna's obvious physical strength. Though living in a relatively benign climate, I can picture this antenna much more than some defying the elements at a mountaintop repeater or remote base location.

In trying to be objective, I should emphasize the fact that the antenna must be mounted on pipe. Regular galvanized types are fine, but stay away from aluminum or steel TV mast sections. The antenna feedpoint insulator assembly is threaded for 3/4" pipe, and it will not accept an unthreaded TV mast. Also, the antenna's coaxial sleeve sections are designed around the pipe o.d. (outside diameter), which affects the resonance of the cavity between the skirt i.d. (inside diameter) and the pipe o.d. I purchased and had threaded a 12-foot length of 3/4" pipe (the minimum required), plus an adapter to 1" pipe and a 3-foot section of 1" pipe used to attach the assembly to a standard TV-type eave mount. All this plumbing set me back nearly $18, which added to the total cost of the antenna.

Practically all of the Kreco antennas use the pipe as an integral part of the antenna. Most models are available in aluminum or brass, and each is equipped with a female UHF connector so that a one-piece feedline may be used between the antenna and the transmitter. Type N connectors are also available. Lightning protection is automatically provided by a gap inside the insulator assembly. All models are designed to handle any reasonable power level, being limited only by the power-handling capability of the coaxial transmission line feeding the antenna.

Several particularly interesting antenna designs surface in the Kreco catalog. These include a number of low-VHF band *shunt-fed* coaxial antennas; these boast excellent lightning protection since external surfaces are all at ground potential. A large round cap at the tip of the vertical rods on these antennas conducts electrical discharge down through the pipe and to ground via the tower or supporting structure. Two *folded* ground-plane antennas, one for 25-100 MHz and the other for 108-175 MHz use, are available that offer considerably wider bandwidth than ordinary ground planes; they also afford improved lightning protection by virtue of the grounded radiator element. Several unusual 3-element yagis are also made by Kreco, using folded ground-plane driven elements. Most of the antennas can be retuned to the 6-, 2-, or 1-1/4-meter bands, and some are adaptable for 10 meters.

For the "wideband specialist," for the lack of a more suitable term, the firm also sells a group of commercial discone antennas that boast swrs below 2:1 over an 8-to-1 frequency range. Several models are available, including ones for the ranges 30-240 MHz, 100-800 MHz, and 150-1200 MHz. In these models, the disc and cone are not continuous, but rather are fabricated of 12 radials each. A note in the Kreco catalog advises that the discone antennas can be furnished for various frequencies starting at *4 MHz!*

The company also sells a very modestly priced ($19.95 delivered) 2-meter 1/4λ coaxial antenna, the CO-2A, also designed for pipe mounting. For more information on this antenna, see the "Review" section in the January, 1981, issue of *73*.

All things considered, the SC-150A I evaluated represents a good antenna choice. It's a bit expensive and heavy for the typical amateur installation, but in those instances where ruggedness, durability, dependability, and freedom from maintenance are paramount, it would be a hard choice to beat. For repeater or remote base use, it looks close to ideal.

For more information, write to the *Herb Kreckman Co., Spruce Cabin Road, Cresco PA 18326*. Reader Service number 478. ■

TS-830S *from page 67*

Too low and the noise is not eliminated; too high and audio distortion may occur. Once the happy medium is found, the blanker works quite well on pulse-type noise such as faulty power line transformers and automobile ignitions.

A 20-dB rf attenuator is selectable from the front panel. It becomes useful when you operate the rig in the presence of strong local signals while still hoping to hear the weak ones.

The RIT control has a ±2-kHz range. There is a separate XIT for offsetting the transmitted frequency.

One receiver function leaves me completely cold. This is the Tone control, which is concentric with the VBT knob. To my ears, the audio sounds mushy when the Tone knob is set to any position other than full treble. The manual has almost nothing to say on this control function, causing me to wonder if it was included merely to occupy an otherwise unused control position. I'd like to hear from anyone who has found a use for this control!

The Transmitter

Compared to the receiver, the transmitting portion of the 830S is simple and straightforward. It uses a proven combination of vacuum-tube final amplifiers with solid-state supporting circuitry. The tubes used are a 12BY7 driver and a pair of 6146B finals, both common varieties.

The conventional design of the output stage means that the transmitter must be tuned up, a relatively rare skill these days given the profusion of broadbanded solid-state rigs on the market! Fortunately, a "tune" position on the mode switch allows tune-up to be performed at reduced power, protecting the final

tubes from undue wear and tear. Once learned, tune-up is a 30-second procedure.

The speech processor in the 830S is an rf clipper with two stages, one in the VBT circuit and one in the i-f. A small front-panel knob allows adjustment of the compression level. This setting is rather critical, with about 10 dB of compression on voice peaks being about right. More than 10 dB of compression results in a less-than-pleasing voice quality. Incidentally, when headphones are being used, you can listen to your transmitted audio by pushing the "MONI" switch on the front panel, just to the left of the main tuning dial. I find this indispensable in properly setting the compression level.

VOX controls for gain and delay are also located on the front panel, with anti-VOX on the rear panel. The range of adjustment is wide enough to accommodate almost any microphone you're likely to use with the 830S. A high impedance mike is recommended.

The 830S features semi-break-in operation on CW, with the VOX circuitry and controls performing the task. Hams with electronic keyers should be advised that the 830S employs negative keying, with −65 V at the key jack.

As the 830S is delivered from the factory, the three new WARC bands are enabled only on receive. Getting the rig to transmit on the WARC bands is a relatively simple procedure, requiring the clipping of diodes on the rf circuit board.

The Manual

Kenwood's instruction manual for the 830S contains all of the basic operating information, a small section on maintenance and alignment, and little else. Hams planning to do any serious work on their 830S will be advised to purchase a service manual from Kenwood. The lack of even a rudimentary "Theory of Operation" section in the manual is especially annoying, particularly to anyone attempting to write a review of the rig! The manual does contain a set of small but serviceable schematics, although you may need a magnifying glass to read them.

On the Air

On the theory that competition is an excellent test of machines as well as men, the 830S was pressed into service in the CW section of the 1981 ARRL DX Contest. The rig was operated, mostly on 20 meters, for 48 straight hours. Since our 830S is not equipped with CW filters, we debated whether it should be used at all. We finally decided to try it, cranking the VBT control to the minimum bandwidth of 500 Hz, in an effort to get the selectivity needed for contesting. The results were very gratifying. Not only did the 830S go the whole weekend without missing a beat, but also it turned out to be a fine CW rig even without the accessory filters. I imagine that dyed-in-the-wool CW operators will opt for the crystal filters, but even without them, the 830S does a nice job.

One thing becomes clear after you've operated this rig for a while. That is that Kenwood did some heavy thinking about how best to "human-engineer" the TS-830S. Take the knobs on the front panel, for instance. There are 5 distinctly different shapes and sizes. The result is that your mind quickly becomes attuned to seeking out the "small, flat knob" when selecting a meter function, or looking for the "tall, round knob" when going for the VBT. This difference in physical appearance is coupled with a very thoughtful layout, in which the most-used controls are placed in the most convenient positions. Compared to brand-new radios from other manufacturers, and even compared to the old 820S, the TS-830S gets high marks on human-engineering.

Summary

What we have here is an HF ham rig that is evolutionary, as opposed to being revolutionary. Kenwood obviously wanted to produce a worthy successor to the 820S, and they have done so, with a price tag that is lower than the 820S. The aspects of the 820S that endeared that rig to its admirers have been retained in the 830S, while more modern receiver attributes have been added and the layout of controls improved a great deal. If, in these days of the solid-state avalanche, you still feel more comfortable with a pair of nice, friendly 6146Bs, then Kenwood has a radio for you—the TS-830S. It's destined to become an industry standard.

For further information, contact *Trio-Kenwood Communications, Inc., 111 West Walnut, Compton CA 90220.*■

PCS-3000 *from page 71*

rear). High power is adjusted by VR408 and low power by VR407, both near the center of the board. Auxiliary offset crystals are near the front, and can be "pulled" to move the offset up or down, via adjacent inductors, by as much as 15 kHz.

Performance

Of course, all this microcomputer convenience is great. But how does the unit perform? I connected my new PCS-3000 to a fixed outdoor antenna and wattmeter/swr bridge, and after getting acquainted with the microcomputer, I ran some tests.

My radio, on my particular wattmeter, puts out 27 Watts in high power and 6 Watts in low power with a 1.1:1 swr on the antenna. (The PCS-3000 is swr protected to the point that you can transmit into an open or short circuit; high swr will no doubt result in lower power output, but you don't have to worry about burning out the final amplifier.) The low-power level is internally adjustable by means of a potentiometer, VR407, in the center of the board on top of the main unit, over a range of zero to 25 Watts.

Other stations reported excellent audio quality, without exception. Realizing that folks sometimes tend to be overly courteous, especially when they know you've just bought a new rig, I pressed the issue. I asked them specific questions, such as "Does it sound tinny or bassy? Is there any background noise or distortion on modulation peaks?" Still, nobody had anything bad to say.

Received audio quality was also superior. I connected my own external speaker up to the rig via the 1/8-inch phone plug on the rear of the main unit. I haven't heard a better FM rig.

My PCS-3000 uses five Amperes in high power. My supply delivers six Amperes, so this is no problem. A couple of lantern batteries in series probably won't do it, though.

I also conducted tests for microphonics. While talk-

ing to a friend, I literally pounded on the radio and dropped it from a height of a few inches onto the table (which was protected by a placemat!). In both receive and transmit, there was no detectable noise on the signal, except for the noise in transmit that was picked up by the microphone ("What are you doing to that radio, man?").

Mobile Operation

You'd better get acquainted with the microcomputer before you go out and try to operate this radio while driving. Once you're familiar with it, it's easy and convenient to use; it'll almost operate itself.

Here in Miami, the interior of an automobile can rise to formidable temperatures even in the winter. Would this have any effect on the audio quality? Tests with other stations indicated it didn't, other than to produce intermittent gasps and a rather sleepy sound on the part of the operator.

I made a special point to inquire about alternator whine or ignition noise on the transmitted signal. I've never had any trouble of this kind in the past with previous rigs, so I guess my car is pretty quiet in that respect. There wasn't any of this kind of problem with my PCS-3000. Other stations reported the same excellent audio quality in mobile operation as in fixed operation. What about background-noise pickup? Well, going 55 mph into a stiff breeze with all the windows rolled down and a semi truck passing me, I have to confess that other stations noticed quite a bit of background noise. But I was still "solid copy."

The digital "S"-meter, consisting of five red bar-type LEDs, is very sensitive. A full-quieting signal always lights all five of them. If a signal is so weak that none of them is lighted, it's almost unreadable. (Incidentally, even the weakest of weak signals will stop the scan.) The meter reacts very rapidly to changes in signal strength such as "picket fencing." No mechanical meter could possibly follow this.

In an unfamiliar area, the programmable band-scan feature is very convenient. You may want to scan the entire 2-meter FM band, but it is useless to waste scanning time covering a bunch of frequencies you know won't have any FM signals. I program 145.11, the lowest repeater output frequency in the United States, into memory 7 and 147.39, the highest, into memory 8, before going on long trips. The PCS-3000 scans about five channels per second, which is roughly 25 kHz per second using 5-kHz increments and 50 kHz per second using 10-kHz increments. To cover the above range, the scanner takes one minute and 29 seconds in 5-kHz steps and 44 seconds in 10-kHz steps.

Interesting Quirks

One thing that I discovered, after several hours of operation, is that this radio actually has a hidden memory channel. What's more, it is instantly available at any time, just like the priority channel, memory 1. The PCS-3000 remembers the frequency you're on just before you go into memory mode. When you leave the memory mode, you're back on that frequency.

I usually set my rig to 146.52 before I go into memory mode, so that I can instantly go back to this important simplex frequency. Usually, I have 146.52 programmed into memory 7 as the lower limit of the band scan and don't want to duplicate it in memory 1.

If you program the band-scan limits in backwards—that is, the upper limit in memory 7 and the lower limit in memory 8—the scanner won't work. In this case, as soon as you hit BAND SCAN, the microcomputer will go to memory channel 7 and stay there, blinking just a bit as it scans that one channel over and over!

The "channel lock" switch, located on the microphone and used for monitoring the repeater input frequency, operates by making the microcomputer think the radio is transmitting when it is actually receiving. Since the keyboard is disabled in transmit mode, the channel lock switch also has this effect. You can still transmit on the repeater input frequency when this switch is activated.

It's almost as if this microcomputer radio has its own personality traits. I already feel as if I "know" it!

Specifications

I was able to actually check only a few of the specs on my PCS-3000, and have marked those with an asterisk, in the list of vital statistics given in the literature—see Table 1.

Introductory price for this rig (at the time of this writing) is $339 with the free touchtone pad kit. All accessories such as power cord, fuse, microphone, and mobile mounting bracket/hardware are included. Optional accessories include an external speaker, extra dc cord and plug, extra mobile mounting bracket, 15-foot cable for remote-head operation, 6-Amp ac power supply, and touchtone microphone back kit. The PCS-3000 is distributed by *Amateur-Wholesale Electronics, Inc., 8817 S.W. 129 Terrace, Miami FL 33176;* call toll-free, 1-(800)-327-3102. Reader Service number 479. ■

✓ *Reader Service—see page 130*

73 ON THE AIR

THE SCHEDULE

May		June	
5	15m-20m phone	2	15m-20m phone
12	40m-80m CW	9	15m (Novice)-20m CW
19	20m-40m phone	16	40m-80m phone
26	80m-160m phone	23	20m-40m phone
		30	15m-40m phone

Starting this month, W2NSD/1, our station here at *73 Magazine*, will be on the air each Tuesday evening between 8:00 pm and 11:00 pm EDT (0000 and 0300 UTC Wednesday). An operating schedule is provided for May and June.

In order to meet as many of our readers as possible, we will be operating in the General class portion of most bands. You will find us somewhere within the first 25 kHz of each General class segment, so on 20-meter phone look for us between 14.275 and 14.300, on 40 meter CW find us between 7.025 and 7.050, etc. Our Novices and Technicians will be operating in the first 25 kHz of the Novice bands on 80, 40, and 15 meters.

We will be operating on two bands per night, using the higher frequency band for the first half of the operating session and the lower frequency band for the second half of the session.

The operator could be any of our licensed staffers, and don't be surprised if the OM himself answers your call some Tuesday evening.

We are looking forward to speaking with our readers and hope to meet many of you in the coming months. To help you get to know us better, here is a brief look at who we are and what we do at *73*.

Wayne Green W2NSD/1—Wayne is the founder of the 73 *organization. In addition, he publishes two computer magazines (*Kilobaud MICROCOMPUTING *and* 80 Microcomputing*), two industry newsletters, and heads up Instant Software, Inc., a microcomputer software publishing house.*

Wayne's interests include travel, economics, sports cars (a Jaguar XJ6, Datsun 280Z, and Mazda RX-7 owner), gourmet cooking, and technology. He'd enjoy talking about any of these with readers.

Jeff DeTray WB8BTH—Jeff is second in command at 73 *and has a full range of administrative and technical responsibilities. He's known as "The Wizard" around here due to his ability to patch together ham radio and computer projects from a bottomless junk box of LEDs and 741 ICs.*

Jeff, a transplanted midwesterner from Napoleon, Ohio, is the driving force behind the NSD contest effort. Under his tutelage, the station amassed over 1 million points in the phone portion of the 1980 CQ Worldwide DX Contest (multi/single) and 195,000 points and a clean sweep in Phone Sweepstakes (single operator). If you work NSD during a contest, the impatient voice at the other end of the exchange will be Jeff's (unless he's managed to trick some fellow staffers into operating with him).

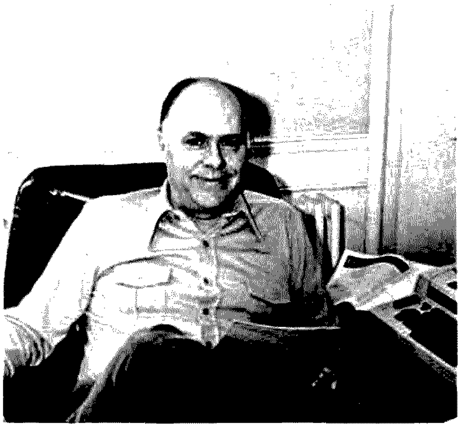
His interests include computers, astronomy, and motorsports (NASCAR, Formula 1, and Indy).

Penny Brooks KA1GAW—Penny, one of our newest Novices, is in advertising space sales for 80 Microcomputing. *She is a Navy veteran with two years of service under her belt who's been known to copy CW at over 30 wpm. Look for her clean fist on the 80, 40, and 15-meter Novice bands, hopefully not at 30 wpm.*

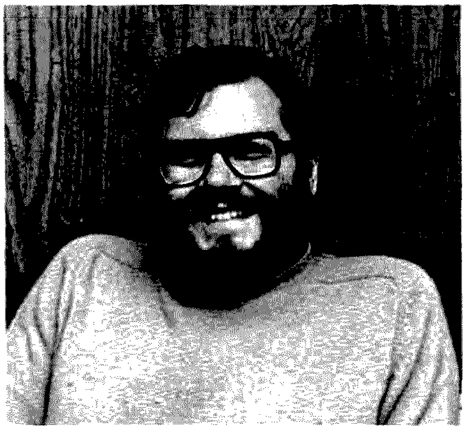
Chris Brown KA1D—Chris is a contributing editor with 73 *and also shares his time with the computer magazines. He handles feature writing assignments and enjoys operating out of the mainstream—160 CW for instance. His interests include running (Boston Marathon survivor), mountaineering, astronomy, and reading. He can often be found on 80 and 40 meters in the still of night.*

Ed Ferman WA1UFY—Ed is our director of publications. He keeps the magazine's printers honest and our editorial and art departments on deadline. He's on his feet so much he doesn't even have a chair in his office.

His outside interests include raising championship Golden Retrievers, gourmet cooking, sailing his 36-foot Choey Lee,

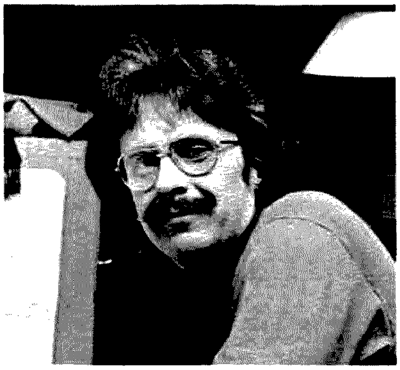


Wayne W2NSD

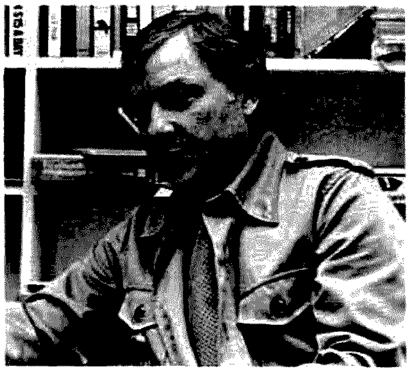


Jeff WB8BTH

Penny KA1GAW



Chris KA1D



Ed WA1UFY


Jim W1XU


Alyson N1BEJ


Paul KA1LR

and blacksmithing. Ed, an Air Force vet with many hours of jet time, plays jazz bass and hopes to have his own haute cuisine restaurant some day.

Jim Gray W1XU—Jim is the Advertising Manager for 73 Magazine. He spends his time on the phone with advertisers past, present, and future trying to convince them of the benefits of four-color versus two.

Jim is a licensed pilot (private/single engine, commercial/glider) and flies whenever he can. He also does a lot of walking in the hills of New Hampshire, rides a motorcycle in all weather, plays tennis, and shoots 35mm photos. Jim has been hamming for 31 years and has a special place in his heart for CW.

Alyson Grupp N1BEJ—Alyson works in our data processing department. She thrives on DX and wants the 73 station to acquire a bigger tower and more monobanders. Aly plans to upgrade to Advanced shortly, without using the Bash book.

She enjoys kit-building and writing, and has penned several reviews for 73. When she's not DXing, Alyson is likely to be canoeing with husband Paul. Together they've paddled most of Minnesota's Boundary Waters hauling ham gear and generators with them.

Paul Grupp KA1LR—Paul is our Product Review Editor. He pores over ham magazines and catalogs looking for likely review prospects and enjoys evaluating new equipment. He is a hopeless DXer and operates phone almost exclusively, pretending that he can't find the CW position on the new rigs that come into the shack.

When he's not building repeaters or chasing DX, Paul enjoys photography, working in his recording studio, and playing his guitars. He was raised in Egypt and hopes to organize a DXpedition to the Mid-East.

Knud Keller KV4GG—Knud, our accounting manager, is the money man at 73. He is the one who ends up with the invoices for the ham shack equipment that the rest of us have ordered. He then tracks down the perpetrator to find out why we have yet another new rig, and how we intend to pay for it. Everyone avoids Knud at invoice time.

Besides being good with figures, Knud is an accomplished musician specializing in strings and keyboards. He's also one of the few licensed piano tuners in New Hampshire and the best Volkswagen mechanic on staff.

Ross Kenyon KA1GAV—Ross is the manager of 73's printing department. He spends his time working on OSL cards and a host of other ASAP projects in the 73 print shop. He is both a new ham and a new daddy, and his Novice ticket arrived at about the same time his new daughter did. His hobbies include fishing, photography, and child rearing. Ross is also a member of the Masons.

Gene Smarte WB6TOV—Gene wears a few hats at 73. He is the News Editor and also the Acquisitions Editor. Gene separates the wheat from the chaff in the newspages and is on the horn with authors when 73 wants to cover a hot topic and needs a story written, pronto.

Gene is a rare bird, a native Californian living in New England. He copes with the puritans in a laid back and mellow manner and, were it not for his collections of weird, flower-print California shirts, we'd almost believe he was a Bostonian by birth.

Gene is interested in beekeeping, astronomy, scrounging flea markets, banjo picking and, by his own admission, California dreamin'. He'd enjoy speaking with sixes.

Tim Daniel N8RK (not shown)—After serving two summer internships with the 73 organization, Tim has finally come on staff full-time. Tim graduated from the Rose-Hulman Institute of Technology in Terre Haute, Indiana, in February with a B.S. degree in Electrical Engineering; he will be in charge of special projects at 73. He has authored our new Novice and General class study guides and enjoys writing almost as much as engineering and design.

Tim is an enthusiastic contester. He operated with Jeff DeTray from Turks and Caicos in March during the ARRL International DX contest under the call VP5TDX.

A transplanted flatlander (Oxford, Ohio), Tim is now getting used to biking up and down New Hampshire's hills and valleys. He also enjoys hiking in the White Mountains, reading, and travel.


Knud KV4GG

Ross KA1GAV


Gene WB6TOV

NEW PRODUCTS

Versa Tuner V from MFJ.

SUPER LOG™ II

Whether you're a rag chewer, contester, award hunter, or DX operator, the new Super Log II is the radio operator's ultimate dream come true! Created by MICRO-80 programmer Joe Richey, this "machine language" software is compatible with both the TRS-80 Model I and Model III computer systems.

How many times have you had to search through all your logs trying to find a record of a particular contact made? If you're an award hunter or DX operator, you already know the nightmare of sorting through all those QSOs trying to satisfy various award requirements. If you're a contester, we don't need to remind you of the awesome task of keeping an accurate and legible log to be able to determine if a contact is a duplicate or not. Now you can eliminate all those frustrations and enjoy keeping a log once again.

Super Log II will instantaneously retrieve information about a previous contact with its special "Lightning Search & Sort."

Super Log II initializes popular column headings found in conventional radio operator logbooks: date, beginning and ending QSO times, callsign worked, QTH, RST sent and received, mode and frequency of operation, and a special section is reserved for entering comments relative to the contact made.

For a limited time only, all customers purchasing Super Log II will also receive free from MICRO-80 the very popular amateur radio program Super Duper II. With this program, the operator can keep calls sorted by band or mode. The computer immediately alerts you to duplicate contacts as they occur and allows the option to delete them from the log. Now contesters can eliminate the drudgery that has taken the fun out of their competitive hobby!

Both programs are available now for the price of one.

For further details about MICRO-80 products and services, write *MICRO-80, Inc., S-2665 North Busby Road, Oak Harbor WA 98277.* Reader Service number 489.

NEW MFJ 3-KW TUNER WITH ROLLER INDUCTOR

The new MFJ-989 "Versa Tuner V" uses a roller inductor with a 3-digit turns counter and a spinner knob for precise inductance control to get swr right on down to minimum.

This new tuner has a big 3-kW PEP rating that you won't outgrow and smaller, more compact, size to match the new smaller rigs.

For convenience, the MFJ-989 gives you several products in the same compact cabinet. First of all, it's a 3-kW antenna tuner, roller inductor and all, that matches coax, balanced line, and random wire from 1.8-30 MHz. Second, it's a six-position antenna switch (2 coax lines, through the tuner or direct, random/balanced line, and dummy load). Third, it contains a 300-Watt, 50-Ohm non-inductive dummy load. Fourth, it's a wattmeter using a lighted meter with 2% accuracy (requires 12 volts for lighted meter). This wattmeter reads both forward and reflected power on 2 scales (200 Watts and 2000 Watts), plus it reads swr directly. Finally, it has a built-in 4:1 balun for balanced line.

It's amazing that all these features can fit into such a small package (just 10-3/4" W × 4-1/2" H × 14-7/8" D). The deluxe aluminum low-profile cabinet has a subchassis for RFI protection. It has a black front panel with raised brushed aluminum lettering, and the cabinet has a black finish. There is also a bail to raise the front for easy viewing.

If ordered from MFJ, there is a 30-day money-back trial period. If you are not satisfied, you may return it within 30 days for a full refund (less shipping). MFJ also provides a one-year limited warranty.

For more information, write *MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762, or phone toll-free 1-(800)-647-1800.* Reader Service number 487.

CORRECTION

The price for Benjamin Michael Industries' 24-hour clock was incorrectly listed in our March "Review" section. The correct price is $29.95.

COMM-X FROM VALOR

A forerunner in the Valor Enterprise family of new products for 1981 is the "Communications Extender" antenna series. Known as "COMM-X," the series presently includes two models. Model CX-144 is designed for 144-148 MHz and is 52" in length. At 35" in length, the CX-220 model operates in the 220-225 MHz range.

Both models feature adjustable whips designed to allow field tuning for optimum vswr, typically 1.5:1 or less at resonance, and typical gain of 3 dB over a 1/4 wave standard. In addition, two stainless steel set screws secure the heavy-duty whips to provide double-locked protection. The ferrule is attached with adhesive, besides being mechanically staked to ensure integrity.

The COMM-X is power rated at 200 Watts and is made of quality materials. These materials include 17-7 taper-ground stainless steel whip, 16-gauge copper matching coil, and standard 3/8-24 chrome-plated brass base. This combination provides excellent wear resistance for long-lasting service.

Valor Enterprises specializes in communication products. Additional information may be obtained by writing *Valor Enterprises, West Milton OH, or calling (513)-698-4194. Outside Ohio call toll-free 1-(800)-543-2197.* Reader Service number 480.

HUSTLER INTRODUCES NEW TEN-METER YAGI ANTENNA

The new beam from Hustler, designated 10-MB-4, is the conclusion of extensive design refinements of previous beam technology.

The result is a four-element yagi optimized for best directivity, excellent front-to-back ratio, and maximum gain through selective element spacing and precisely resonated element length.

The 10-MB-4 employs a gamma-match feed system and is fully adjustable for a 1.2:1 or better swr at resonance.

The mechanical structure of the Hustler 10-MB-4 is ruggedly designed to withstand severe weather, yet is light enough to be accommodated by a TV antenna rotor.

The entire antenna is constructed from high-strength aluminum tubing and can be easily grounded for lightning protection.

For further information, write *Hustler, Inc., 3275 North B Avenue, Kissimmee FL 32741.*

NEW ZAP TRAPPER™ PROVIDES SUPERIOR PROTECTION FOR ANTENNAS, CABLE, AND COMMUNICATIONS EQUIPMENT

The new Zap Trapper™ (patent pending), introduced by PolyPhaser Corporation, significantly outperforms previous lightning protection apparatus for communications antennas,

cable, and equipment, according to Roger R. Block, PolyPhaser president.

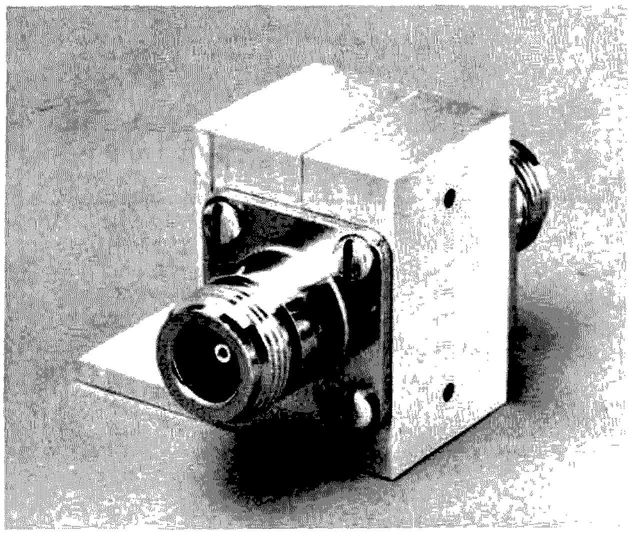
The new Zap Trapper impulse suppressor utilizes controlled atmospheric technology. "This process is field-proven in the telephone industry and ensures a microsecond response to lightning impulses, plus multiple impulse suppression which is especially critical for the protection of today's solid-state communication equipment," Block stated.

"Typical air-gap type arrestors will shunt the first of many impulses within a single strike safely to ground and then become useless due to contact vaporization for the remaining impulses." In effect, Block remarked that "arrestors" or air-gap devices do little more than provide a sense of false security beyond the initial energy impulse.

PolyPhaser's Zap Trapper installs quickly, directly into the transmission feedline, and is available with either type N or UHF connectors.

The Zap Trapper will handle up to 750 Watts of rf power with an insertion loss of 0.1 dB at 1000 MHz. Vswr is less than 1.15 with a constant 50-Ohm impedance. Turn-on voltage is 280 V dc and it will handle a 10,000-Amp surge.

For more information, contact *PolyPhaser Corporation, 1500 West Wind Boulevard, Kissimmee, FL 32741, telephone (305)-846-1807.* Reader Service number 482.

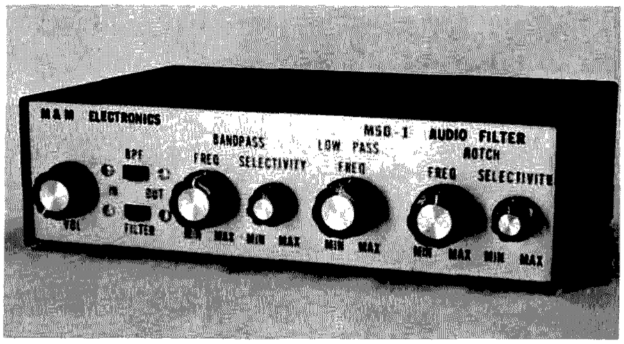


PolyPhaser's Zap Trapper.

MSB-1 AUDIO FILTER FROM M & M

The MSB-1 audio filter from M & M Electronics utilizes four basic filters arranged to provide the maximum in flexibility and effectiveness during SSB, CW, or RTTY reception. The fixed high-pass filter, tunable notch filter, six- and eight-pole tunable low-pass filter are engaged at all times. The tunable bandpass filter can be switched in for further shaping of the audio. This means that all three tunable filters can be engaged at the same time and tuned independently.

For more information, contact *M & M Electronics, PO Box 1206, Brewton AL 36427.* Reader Service number 488.



New audio filter from M & M.

NEW BASE STATION ANTENNA FROM VALOR ENTERPRISES

Joining Valor Enterprises' most recent announcement of the "Omni-Gain" mobile antenna is the "Omni-Gain" base station antenna. Designed to complement its mobile counterpart, the base station antenna features the same unique construction and power rating of 200 Watts.

Made of 17-7 stainless steel whip, 6061-T6 electro-polished aluminum coaxial matching section, and chrome-plated brass 3/8-24 ferrule, the "Omni-Gain" has no copper coil.

The base station antenna is 5/8 wavelength, has a 3-dB gain, and is available for 2-meter and 220-MHz amateur bands. The series is field tunable to a typical vswr of less than 1.5:1 at resonance.

Valor Enterprises is a manufacturer of personal and amateur communication products and accessories. For more information and complete product catalog, write *Valor Enterprises, West Milton OH or call (513)-698-4195; residents outside Ohio dial toll-free 1-(800)-543-2197.* Reader Service number 481.

MFJ INTRODUCES NEW LOW-COST VHF OPERATING AIDS

The new MFJ-812 is a VHF swr/wattmeter/field-strength meter combination. It keeps you informed about your antenna and feedline as well as you rig's output. It reads swr at lower power levels from 14 to 170 MHz, and also reads forward and reflected power from 144 to 148 MHz on two scales (30 and 300 Watts). Easy push-button operation switches from forward to reflected power.

Binding posts are provided on the back panel for easy field-strength antenna connection. The MFJ-812 reads field-strength level from 1 through 170 MHz.

The MFJ-812 measures 4-1/4" W × 2-1/4" H × 2-3/4" D. The all aluminum cabinet has an eggshell white front panel with black top and sides.

MFJ provides a 30-day money-back trial period. If you are not satisfied, you may return it within 30 days for a full refund (less shipping). MFJ also provides a one-year unconditional warranty.

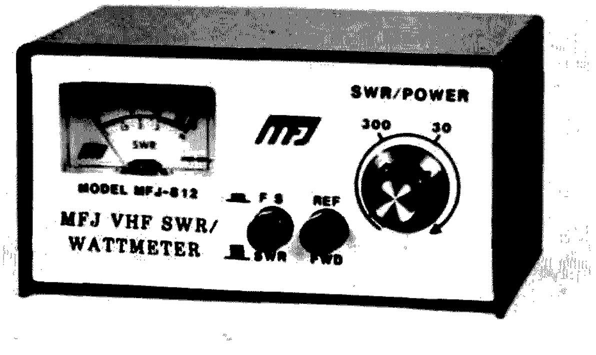
The MFJ-810 is like the MFJ-812, less the field-strength function.

For more information, write *MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762, or call toll-free 1-(800)-647-1800.* Reader Service number 486.

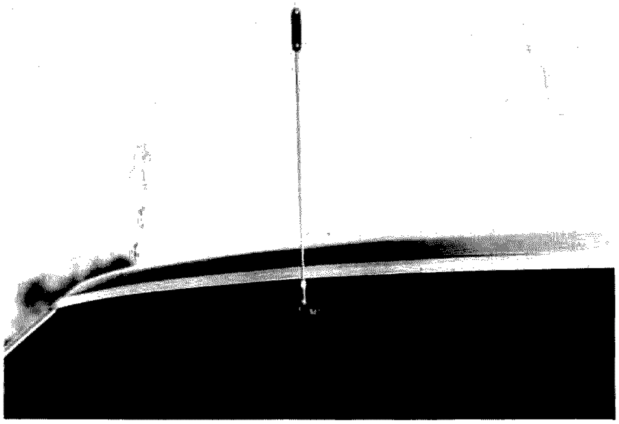
NEW 5 dB-GAIN MOBILE ANTENNA FROM AVANTI

Avanti Communications has recently modified its 5-dB gain on-glass mobile antenna designed for use in two-way and amateur radio communications.

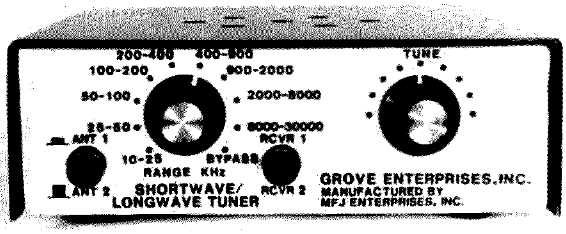
The new 3/4-meter 410-512 MHz AP450.5G features a straight 30-inch whip with a small center-positioned phasing coil. By popular request, the former loop section has been eliminated and replaced by a small, sleek coil measuring only



New swr/wattmeter/field-strength meter from MFJ.



Avanti's AP450.5G antenna.



New tuner from Grove Enterprises.

1-1/2 inches in length and a maximum diameter of 3/8", making it the smallest UHF 5-dB gain whip and phasing coil combination on the market.

As with each of Avanti's on-glass communications antennas, the new AP450.5G offers improved performance, requires no holes to be drilled, features shorter installation time, and requires no metal ground plane, thus allowing it to be used in many more applications than conventional mobile antennas.

For more information, contact *Avanti Communications, 340 Stewart Avenue, Addison IL 60101; phone (312)-628-9350.* Reader Service number 483.

SHORTWAVE/ LONGWAVE TUNER

Designed to enhance reception in the 10-kHz through 30-MHz spectrum, this new shortwave/longwave antenna tuner claims the widest frequency coverage of any tuner on the market.

The wideband tuner preselects desired signals while reducing or elminating intermodulation, crossmodulation, images, and desensitization from unwanted signals.

Front-panel switching allows push-button selection of two antennas and two receivers, while a front tuning dial permits signal enhancement.

The wideband tuner is guaranteed to improve reception on any shortwave or longwave receiver.

For more information, write *Grove Enterprises, Inc., Dept K. Brasstown NC 28902, or call toll-free 1-(800)-438-8155.* Reader Service number 485.

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

COUNTY HUNTERS SSB CONTEST

Contest Periods:

0001 to 0800 GMT May 2
1200 GMT May 2 to 0800 GMT May 3
1200 to 2400 GMT May 3

Please note the two 4-hour rest periods. Mobiles may be worked each time they change counties or bands. Mobiles that are worked again from the same county on a different band count for point credit only. Mobiles that are contacted on a county line count as one contact but 2 multipliers. Fixed stations may be worked by other fixed stations only once during the contest. Repeat QSOs between fixed stations on other bands are not permitted. Fixed stations may be worked by mobiles each time they change counties or bands. Repeat contacts between mobiles are permitted provided that one station is on SSB. Contacts made on net frequencies will not be allowed for scoring in this year's contest.

EXCHANGE:

Signal report, county, and state or country.

FREQUENCIES:

Suggested frequencies are as follows: 3920-3940, 7220-7240, 14275-14295, 21375-21395, 28625-28650. There will be a "mobile window" of 10 kHz on the following frequencies: 3925-3935, 7225-7235, 14280-14290. Mobiles will be in this 10-kHz segment and fixed stations are asked to refrain from calling "CQ Contest" in the mobile window. After working mobiles in the window, fixed stations are requested to QSY outside the window to work fixed stations in the contest. This will allow the mobiles running lower power a chance to be heard and worked in the contest. There will be a special effort to work DX on 28.636 by mobiles.

SCORING:

Contact with a fixed US or Canadian station = 1 point. Contact with a DX station (KL7 and KH6 count as DX) = 5 points. Contact with a mobile station = 15 points. The multiplier is the total number of US counties plus Canadian stations worked. The final score is this multiplier times the total QSO points.

AWARDS:

MARAC plaques to the highest-scoring fixed US or Canadian station, DX station, and top 2 scoring mobile stations. Certificates to the top 10 fixed and mobile stations in the US and Canada and to the highest-scoring station in each DX country.

ENTRIES:

Logs must show date and time, station worked, reports exchanged, county, state, band, claimed QSO points (1, 5, or 15), and each new multiplier must be numbered. Logs and summary sheets are free for a #10 SASE or SAE and appropriate IRCs. Write to: John Ferguson WØQWS, 3820 Stonewall Ct., Independence MO 64055. All entries must be received by June 15th to be eligible for awards. DX entries should use air mail. Winners will be announced at the 1980 Independent County Hunters Convention during July and in the MARAC newsletter.

ALEXANDER VOLTA RTTY DX CONTEST

Starts: 1200 GMT May 2
Ends: 1200 GMT May 3

This is the 16th contest sponsored by the SSB and RTTY Club of Como and the Associazione Radioamatori Italiani. Use all amateur bands from 80 through 10 meters. Operating classes include single operator, multi-operator/single-transmitter, and SWLs. Stations may not be worked more than once on any one band. Additional contacts may be made on different bands.

EXCHANGE:

RST, QSO number, and zone number.

SCORING:

All 2-way RTTY contacts between stations of the same country are not valid. Contacts with stations outside your zone count for points in accordance with an Exchange Points table (available from Associazione Radioamatori Italiani). Any RTTY contacts made on 80 or 10 meters are worth double.

A multiplier is given for every country worked on each band worked. An extra multiplier is given for each intercontinental country worked on at least 4 bands. Use the ARRL Country List and count each USA, Canadian, and Australian district as separate countries.

SWLs use same scoring rules but based on stations and messages copied.

CALENDAR

May 2-3	County Hunters SSB Contest
May 2-3	Alexander Volta RTTY DX Contest
May 9-10	Rocky Mountain Division QSO Party
May 10	DARC Corona—10-Meter RTTY Contest
May 16	Dogwood Festival QSO Party
May 16-17	Florida QSO Party
May 16-18	Michigan QSO Party
May 16-18	Massachusetts QSO Party
May 23-24	Europe and Africa Giant RTTY Flash
Jun 6-7	VK/ZL/Oceania RTTY DX Contest
Jun 6-7	New York State QSO Party
Aug 8-9	European DX Contest—CW
Aug 15-16	SARTG Worldwide RTTY Contest
Aug 22-23	Ohio QSO Party
Sep 12-13	European DX Contest—Phone
Sep 12-13	G-QRP-Club CW Activity Weekend
Sep 12-14	Washington State QSO Party
Sep 26	DARC CORONA—10-meter RTTY Contest
Nov 8	DARC CORONA—10-meter RTTY Contest
Nov 8	OK DX Contest
Nov 14-15	European DX Contest—RTTY
Dec 26-31	G-QRP-Club Winter Sports

RESULTS

3rd DARC CORONA CONTEST

These are results of the 3rd DARC Carona Contest held on 27th September, 1980. Congratulations to N8ES for a really convincing win, and to G3HJC for being top "G".

Call	Score	GSO	Countries	Prefix
CLASS A:				
1. N8ES	2340	45	15	37
2. DL5GAS	1739	37	16	31
3. WB2UEF	1548	36	13	30
4. OZ1CRL	1209	31	13	26
5. DF6ZV/A	1120	28	12	28
6. WA6WGL	962	28	12	25
7. AD0V	945	27	11	24
6. G3HJC	851	23	15	22
9. I5CBF	851	23	15	22
10. SL5AR	828	23	14	22
CLASS B:				
1. H. Ballenberger	972	27	13	23
2. Werner Ludwig	580	20	10	19
3. OK1-20677	252	12	09	12
4. Y2-7111/A	144	09	07	09

AWARDS:

Usual awards to top stations in each class.

ENTRIES:

Use one log per band. Logs must be received by June 20th to qualify, so it is advisable to use air mail. Logs should contain band, date/time in GMT, callsign, exchanges sent and received, points, and multipliers. Enclose a summary score sheet along with any comments. Address entries to: G. Vulpetti I2VTT, PO Box 37, I-22063 Cantu, Italy.

ROCKY MOUNTAIN DIVISION QSO PARTY

Starts: 1800 GMT May 9
Ends: 2400 GMT May 10

The contest is sponsored by the Arapahoe Radio Club of Littleton CO. Stations outside the Rocky Mountain Division may work any station. The same station may be worked once per band, although mobile stations may be worked each time they change counties. Novices will indicate as "/N", club stations with "/C", and mobiles with "/M". RM states are: Colorado, Wyoming, Utah, and New Mexico.

EXCHANGE:

RS(T) and state; Rocky Mountain Division stations will also send their county.

FREQUENCIES:

3560, 7060, 14060, 21060, 28060, 3900, 14300, 21370, 28570, 3725, 7125, 21125, 28125.

SCORING:

Phone QSOs count 1 point; CW QSOs count 2 points; QSOs with club stations count 3 points. RM entries multiply QSO points by number of states, RM counties, and DX countries (not to exceed 5 DX multipliers). Others multiply QSO points by the number of RM states and counties worked per band. All stations add following bonus points after multiplying by the appropriate multiplier. Working 5 RM Division Novices—add 50 points. RM mobiles operating from 3 or more counties—add 100 points. RM club stations with at least 5 operators (minimum 10 QSOs per operator)—add 100 points.

ENTRIES AND AWARDS:

Awards will be issued to the high scorer in each state and DX country, high Novice in each state, and to high-score mobile in each RM Division state. Club stations in the Division will compete by state for the Silver Dollar Award.

Submit logs, with large SASE, by June 15th to: Buster Boatman KA0CLS, 8973 W. Harvard Drive, Lakewood CO 80227.

DARC CORONA 10-METER RTTY CONTEST

Contest Period: 1100 to 1700 GMT May 10

This is the second of four tests during the year sponsored by the DARC eV to promote RTTY activity on the 10-meter band. Each of the four tests is scored separately. Use the recommended portions of the 10-meter band.

EXCHANGE:

RST, QSO number, and name.

SCORING:

Each station can be contacted only once. Each completed two-way RTTY QSO is worth 1 point. Multipliers include the WAE and DXCC lists and each district in W/K, VE/VO, and VK. The final score is the total number of QSOs times the total multiplier.

AWARDS:

Plaques will be awarded to the leading stations in each class with a reasonable score present. Operating classes include: Class A for single- or multi-op and Class B for SWLs.

ENTRIES:

Logs must contain name, call, and full address of participant. Also show class, times in GMT, exchange, and final score. SWLs apply the rules accordingly. Logs must be received within 30 days after each test. Send all entries to: Klaus K. Zielski DF7FB, PO Box 1147, D-6455 Erlensee, West Germany.

The remaining contest periods are on September 26th and November 8th.

DOGWOOD FESTIVAL QSO PARTY

1300 to 2200 GMT May 16

The annual Dogwood Festival celebrated in Fairfield CT will also be observed on the air by members of the Greater Fairfield Amateur Radio Association with a Dogwood Festival QSO Party. Members of the club will operate on six bands with the club call WB1CQO. A special commemorative QSL card will be available to confirm each QSO upon receipt of an SASE or IRCs to QSL manager Grace von Stein KA1JT, 248 Euclid Avenue, Fairfield CT 06432.

Dogwood Festival stations will operate on SSB using 3975, 7235, 14330, 21420, and 28710. FM operation will be on 146.55 simplex.

The Dogwood Festival marks the blossoming of 30,000 pink and white dogwood trees in the town of 55,000 persons. The Festival began in 1936, although the original trees were imported from Japan in 1895 and earlier.

FLORIDA QSO PARTY

Contest Periods:
1400 to 1900 GMT May 16
0001 to 0500 GMT May 17
1500 to 2300 GMT May 17

This is the 16th annual Florida QSO Party sponsored by *Florida Skip*. All amateurs worldwide are eligible and invited to participate. All amateur bands may be used. All stations will separate phone and CW logs; phone and CW are separate contests. A station may be worked once on each band mode. Neither crossband nor crossmode contacts will count for contest credit.

RESULTS

3rd VK-ZL-OCEANIA RTTY CONTEST

Single Operator

1. DJ8JC	793,282	(101)
2. VK5RY	774,996	(117)
3. JA6QIJ	611,038	(79)
4. VK3KF	539,435	(72)
5. VK8HA	461,184	(82)
6. VK4AHD	388,060	(84)
7. F8XT	352,432	(54)
8. I1TXD	320,062	(59)
9. W5HEZ	266,900	(34)
10. DF2OK	253,680	(60)

Multi-Operator Stations

1. VK2TTY	1,207,340	(135)
2. VK3DGA	520,352	(46)
3. HB9Z	422,000	(66)
4. DK0MM	180,420	(56)
5. OZ8JYL	99,200	(60)
6. LZ1KDP	95,300	(60)
7. OK3VSZ	78,306	(60)
8. DF5LK	37,555	(31)

SWL Stations

1. Horst Bellenberger OL SWL	64,472
2. Dedic Jeroslav	62,884

RESULTS

15th ALEXANDER VOLTA RTTY DX CONTEST

	Points	QSOs	Mult.	Bonus	Score
1) I3FUE	2.904	186	84	-	45.372.096
2) I5MYL	2.033	165	96	-	32.202.720
3) W4CQI	3.187	125	50	50.000	19.843.750
4) I5FZI	1.500	158	83	-	19.671.000
5) I2OLW	1.633	133	70	-	15.203.230
6) I7FKO	1.172	184	62	-	13.370.176
7) 3B6RS	2.985	101	41	26.000	12.366.865
8) Q3UUP	1.141	159	56	66.000	10.578.302
9) I2WEO	1.022	147	69	-	10.366.146
10) I2DMI	1.552	105	80	-	9.777.600

SWLs

1) Horst Bellenberger DL-SWI.
1.446 173 72 51.000 18.067.288
2.) Oedic Jeroslav OK1-11857
1.227 178 64 46.000 14.026.864
3.) Vaclav Casek OK1-20677
1.840 134 46 18.000 10.787.240
4) Kurt Wuetner OL-SWL 065-1684785
772 105 45 41.000 3.666.700
5.) Eichler Helmut DM-2S14/M
433 118 40 23.000 2.084.060

AWARDS

I3FIJE—Silver plaque and certificate
I5MYL—Plaque and certificate
W4CQI—Plaque and certificate
Horst Bellenberger—Plaque and certificate

Florida stations may work other Florida stations, but for contest points only. Out-of-state stations may not work each other for contest credit. Contacts made on repeaters do not count for credit.

Florida stations will be divided into two classes. Class A stations are those operating portable or mobile on emergency power and running 200 Watts or less (CW or PEP phone) inside Florida but outside of their home counties. Class B stations are all other stations operating in Florida.

Each entrant agrees to be bound by the provisions of the contest announcement, the regulations of the applicable licensing authority, and decisions of the *Florida Skip* Contest Committee, which are final.

EXCHANGE:

Florida stations send RS(T) and county of operation. Others send RS(T) and US state, Canadian province, or country.

FREQUENCIES:

Phone—3945, 7279, 14319, 21379, 28579, 50.2, 146.52.
CW—3555, 7055, 14055, 21055, 28055.

SCORING:

Florida stations count one point per QSO with out-of-state or other Florida stations. Multiplier is the sum of states (49 maximum), provinces (12 maximum), and DX countries (27 maximum) actually worked; maximum multiplier is 88. Others count 2 points per QSO with each Florida station. Multiplier is the number of different Florida counties worked (67 maximum). Final score is the product of QSO points and the multiplier. Class A stations *only* multiply score by 1.5 to obtain final total.

AWARDS:

Certificates for phone and CW to the top single-operator score in each state, province, DX country, and each Florida county. There are also 5 plaques to be awarded as follows: high single operator in Florida and out-of-state, CW and phone, and to the Florida club with the highest aggregate score.

ENTRIES:

Phone and CW entries *are to be separated*! Along with legible logs in chronological order, a summary sheet is required with each entry. The summary sheet must contain score, number of QSOs, multiplier, station's callsign, entry class, and number of Florida counties, power source for Class-A entries; county, state, province, country, or region of operation, callsigns of all operators/loggers if multi-op; name of club if part of a club aggregate score; name and address TYPED or PRINTED in BLOCK LETTERS; and a signed declaration that all rules and regulations have been observed. All stations making more than 200 QSOs should also include a dupe sheet. Include a 15-cent stamp for contest results from a future issue of *Florida Skip*. At the discretion of the contest committee, stations and/or operators may be disqualified for improper reporting, excessive dupes, errors in multiplier lists, unreadable logs, obvious cheating, etc. Anyone disqualified in this year's Florida QSO Party will be barred from the contest next year. All entries must be received on or before June 15th; late DX entries will be accepted within reason. Mail all entries to: *Florida Skip* Contest Committee, PO Box 501, Miami Springs FL 33166.

MASSACHUSETTS QSO PARTY

Starts: 1600 GMT May 16
Ends: 0200 GMT May 18

Sponsored by the Greater New Bedford Contesters. A station may be worked once per band. Phone and CW are considered separate bands. No crossband or repeater contacts are permitted. Mobiles and portables may be contacted each time a county change takes place.

EXCHANGE:

RS(T) and state, VE province, or Massachusetts county.

SCORING:

All stations count 2 points for each completed SSB exchange and 4 points for each completed CW exchange. Massachusetts stations then take the total QSO points and multiply by the total number of Massachusetts counties, states, and provinces worked to compute the final score. Others multiply the total QSO points by the total number of Massachusetts counties worked. Add a 50-point bonus to the total score for each sponsor worked; each can be worked only once for bonus points. The sponsors are W1FJI, N1AS, and K1KJT. DX stations count for QSO points only.

FREQUENCIES:

Phone—1820, 3960, 7260, 14290, 21390, 28590, and 50.110.
CW—1810, 3560, 7060, 7120, 14060, 21060, 21120, 28060, and 28120.

Use of FM simplex is encouraged. Please use CW in CW bands only!

AWARDS:

Certificates will be awarded to 1st, 2nd, and 3rd place winners in each Massachusetts county as well as each state. Two special awards will be given out: one to the amateur radio club with the highest aggregate score in Massachusetts with a minimum of three logs, and a 2nd award to the station in Massachusetts who submits the all-time highest number of QSOs. The current record is held by K1GSK with 1483 QSOs in the 1979 Massachusetts QSO Party. In addition, a certificate will be given to stations working all 3 sponsors.

ENTRIES:

Logs must show date, time, band, mode, callsign, state and province worked, and exchange RS(T). Submit a separate summary sheet along with the logs. Summary sheet should include name, call, mailing address, club affiliation for aggregate score, total QSO points, multipliers claimed, and total score. Deadline for mailing is June 30th. For awards and results include $0.30 postage (no envelope). Address entries to: Larry Purcell N1AS, 146 Armour Street, New Bedford MA 02740.

MICHIGAN QSO PARTY

Contest Periods:
1800 GMT Saturday, May 16 to 0300 GMT Sunday, May 17
1100 GMT Sunday, May 17 to 0200 GMT Monday, May 18

This year's QSO party will be sponsored by the Oak Park ARC. Phone and CW are combined into one contest. Michigan stations can work Michigan counties for multipliers. A station may be contacted once on each band/mode. Portable/mobiles may be counted as new contacts each time they change counties.

EXCHANGE:

RS(T), QSO number, QTH as state, country, or Michigan county.

FREQUENCIES:

Phone—1815, 3905, 7280, 14280, 21380, 28580.
CW—1810, 3540, 3725, 7035, 7125, 14035, 21035, 21125, 28035, 28125.
VHF—50.125, 145.025.

SCORING:

Multipliers are counted only once. Michigan stations score 1 point per phone QSO and multiply by the total number of states, countries, and Michigan counties. Each CW contact counts 2 points; KL7 and KH6 count as states; VE counts as a country. Maximum multiplier is 85.

Others take QSO points times the total number of Michigan counties. QSO points are 1 point per phone QSO and 2 points per CW QSO. Maximum multiplier is 83.

All stations score 5 points for each club station contact with W8MB.

VHF only entries: same as above except multipliers per VHF band are added together for total multiplier. Score 5 points for each OSCAR QSO. No repeater contacts are allowed.

AWARDS:

Only single-operator stations qualify. Michigan trophies to high Michigan score, high Michigan (Upper Peninsula) score, high aggregate club score. Plaque to high VHF only entry and high mobile. Certificates to high score in each county with a minimum of 30 QSOs. Out-of-state high trophy and certificates for high score in each state and country.

ENTRIES:

A summary sheet is requested showing the scoring and other pertinent information, name and address in BLOCK LETTERS, and a signed declaration that all rules and regulations have been observed. Michigan stations include club name for combined club score. Party contacts do not count toward the Michigan Achievement Award unless one fact about Michigan is communicated. Members of the Michigan Week QSO Party Committee are not eligible for individual awards. Decisions of the Contest Com-

mittee are final. Results will be final on July 31st and will be mailed to all entries. Mailing deadline is June 30th to: Mark Shaw K8ED, 3810 Woodman, Troy MI 48084.

MICHIGAN ACHIEVEMENT AWARD

This will be the 23rd year that hams have had their own program to publicize Michigan and its products. Just as for the past years, the Governor will award Achievement Certificates to hams who take part in telling the world of Michigan's unlimited resources, opportunities, and advantages. Certificates are awarded on the following basis:

1. A Michigan ham submits log information and names and addresses (if possible) of 15 or more contacts made to out-of-state or DX hams with information regarding Michigan.

2. An out-of-state ham, including Canada, submits log information and names and addresses (if possible) of at least 5 Michigan hams who relate facts to him about Michigan.

3. A foreign ham, excluding any resident of Canada, submits the call letters and name/address plus log information for at least one Michigan ham who has told him about Michigan.

Only QSOs made during Michigan Week, May 16-23, will be considered valid. All applications for certificates must be postmarked by July 1st and mailed to: Governor William Milliken, Lansing MI 48902.

EUROPE AND AFRICA GIANT RTTY FLASH

Contest Periods:
1400 to 2400 GMT May 23
0800 to 1800 GMT May 24

This is the 13th annual contest by the IATG Radiocommunications as part of a new promotional program for RTTY. The basic purpose of this contest is to increase interest in RTTY, but even more to increase interest in intercontinental contacts. The contest committee is open to and welcomes suggestions which might improve future contests.

Use all bands from 80 to 10 meters. Remember that all contacts must be on RTTY! Each station may be contacted once per band.

EXCHANGE:

RST, QSO number, and your continent.

SCORING:

QSO points are as follows: QSO on 80 or 40 meters = 2 points; QSO on 20 meters = 3 points; QSO on 15 meters = 6 points; QSO on 10 meters = 8 points.

No points or multipliers for contacts with one's own country. Only 2-way RTTY contacts are valid.

Multipliers are given for countries and continents. Use the DXCC Country List plus count each call area of VE/VO, W/K, VK, PY, LU, JA, and UAØ/9 as separate countries. A multiplier is given for each country worked on the 20 through 10 meter bands. No multipliers for contacts on 80 or 40 meters with one's own continent. A separate multiplier may be claimed for the same country if a different band is used (maximum of 3 times). Only countries which appear in at least 3 other logs will be valid multipliers. One's own country is not valid as a multiplier. For contacts with Europe and Africa, both the sender and the receiver will receive 100 points as a multiplier. Each of the remaining continents receives 50 points. An additional 100 points will be given for each contact with Europe and Africa on 15 or 10 meters.

The final score is the total QSO points times the total number of countries times the total number of continents plus the total points for EU and AF stations worked. Example: 600 QSO points times 10 countries worked times 100 continent points equals 600,000 plus 20 stations of EU and AF worked on 15-10 meters giving a grand total of 602,000 points.

ATTENTION! Two promotional periods are included in the contest: 1700 to 1800 GMT May 23 and 1000 to 1100 GMT May 24. Stations operating from North America, South America, Australia, Oceania, and Asia contacting EU and AF during these hours will double their points for these periods.

Beginner handicaps are offered to RTTYers entering logs in the contest who have not participated in previous contests. They will receive an additional 5% of their final score. Additional handicaps are offered as 10% of the total final score for the winner of previous RTTY Championships or 8% of the total final score for the winner of one or more preceding RTTY contests.

SWLs may also enter and they should use the same scoring rules. A separate results table will be made for these entries.

AWARDS:

Prizes, as usual, are reserved for the four first place winners. Consolation prizes will also be awarded.

ENTRIES:

Use separate log sheets for each band. Logs must contain date/time in GMT, callsign, RST and QSO number sent/received, country and continent multipliers, points, and final score. The contest disqualification criteria used by the ARRL in its contest apply also to this contest. Failure to observe any rules will result in exclusion of the entry for the final results and any such log will be considered as a check log. Logs compiling errors exceeding 10% of the final score will also be excluded from the final standing. Each log received becomes the property of the IATG Radiocommunications and will not be returned. The decision of the organizing committee in any dispute will be final and any subsequent controversy may not be referred to the Civil Court. Remember, the contest is valid towards the final standing of the 5 Continent World Championship.

In order to qualify, all logs must be received no later than June 30th and sent to: Prof. Franco Fanti, Via A. Dallolio n 19, Bologna 40139, Italy.

FUN!

John Edwards KI2U
78-56 86th Street
Glendale NY 11385

When I mentioned to a friend that I was going to do a column on the American Radio Relay League, his reaction was, "Don't do it; they're too easy a target!"

True, but it's also too great a temptation. Few topics supply as much grist for the old puzzle mill as our friends in Newington. When it comes to creating offbeat, unusual, and downright strange tidbits of ham radio trivia, the ARRL provides your "FUN!" columnist with a veritable field day (if you should pardon the term) of material. (For instance, how many nongovernmental organizations do you know that once had their own "Department of Defense?")

All in all, the ARRL should make for a very entertaining column. Even more interesting, one might say, than evaluating the League's financial status from their annual report.

ELEMENT 1—CROSSWORD PUZZLE
(Illustration 1)

Across

1 League's original QTH
5 What incentive licensing made many hams
7 Propagation form (abbr.)
8 ARRL message service (abbr.)
9 League "breakthrough" (abbr.)
11 Pin or spike
12 Over
13 Interference type
15 League often gets this in its bonnet
16 ARRL constituents
17 League state (abbr.)
18 Bigwig's initials
19 Choose
21 Pacific prefix
23 Oceanian prefix

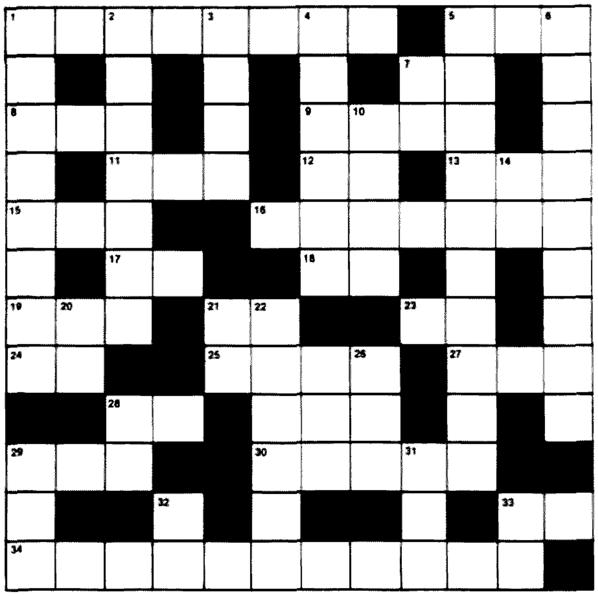


Illustration 1.

24 Old island prefix
25 Opposite of short path
27 Charged particle
28 Double dash
29 League watchdogs (abbr.)
30 British tube
33 Morse mode (abbr.)
34 League headquarters (2 words)

Down

1 ARRL publication
2 League seeks this
3 League banner
4 Old rig
5 Long-term Leaguer (2 words)
6 ARRL areas
7 Slow scan (abbr.)
10 Code of Ethics description
14 Guinea-Bissau prefix
20 Night (abbr.)
21 Midnight sun prefix
22 Former League president
26 Late *QST* cartoonist
28 League forum byproduct (abbr.)
29 ARRL award (abbr.)
31 Af gain (abbr.)
32 Morse slash
33 Personal radio service (abbr.)

ELEMENT 2—MATCHING "Who Am I?"

Below are self-descriptions of various people associated with the ARRL. Match these statements with the names listed.

1) In 1914, I co-founded the ARRL with Hiram Percy Maxim. _____
2) Although I drew the cartoons and illustrations that became an integral part of all League publications, my death was all but ignored by *QST*. _____
3) Back in 1953, when W1AW caught fire and suffered severe damage, I was the last operator on duty. The fire burned a hole through the floor directly behind the main operating console. _____
4) After being a sales representative for Motorola, I joined the ARRL as *QST*'s managing editor in 1956. Today, I am the day-to-day boss of the League, having even more direct power than President Dannals. _____
5) I write those "folksy" humor articles for *QST* that you have to read twice to "figger out" what I'm saying. _____
6) In 1971, I led the ARRL delegation to the ITU Space Conference—a conference that took away 99.99684% of our satellite frequencies. _____
7) I wrote *QST*'s "How's DX?" column for over 30 years. Since my retirement, *QST*'s had a problem finding anyone to write the column for more than 30 hours. _____
8) I was the League's first general counsel and the author of its "Amateur's Code." _____
9) For many years, I was *QST*'s VHF columnist. In 1946, I took part in the first 6- to 10-meter crossband transatlantic QSO. _____
10) In the June 1964 *QST*, I wrote an article extolling the virtues of incentive licensing. However, by the beginning of the 1980s, I still hadn't achieved my Extra-class ticket. _____

A) Robert W. Denniston W0DX B) John Troster W6ISQ C) William Orr W6SAI D) Rod Newkirk W9BRD E) Richard Baldwin W1RU F) Michael Samanka KA2AEV G) Edward Tilton W1HDQ H) Paul Segal I) Murray Powell W1QIS J) Phil Gildersleeve W1CJD K) Clarence Tuska 1WD

ELEMENT 3—MULTIPLE CHOICE

1) W1AW pays its operators. Since hams are not allowed to accept material compensation for their radio efforts, how is this legal?
   1) It isn't
   2) By the grace of FCC Part 97.112, which allows compensation to operators of club stations under certain restricted circumstances
   3) W1AW operators may be paid only when the station isn't actually transmitting
   4) W1AW operators aren't paid
2) According to the ARRL's "Amateur's Code," to whom does a ham "owe his amateur radio to"?
   1) The FCC
   2) Radio pioneers
   3) The credit company
   4) The ARRL
3) Back in 1977, when Jack Anderson ripped amateur radio apart in his column, how long did it take the League to form its reply?
   1) 24 hours
   2) 1 week
   3) President Dannals met with Anderson to discuss the column 2 weeks after it appeared
   4) The ARRL never formally responded
4) Under ordinary circumstances, how much does *QST* pay writers of top-notch construction articles?
   1) Nothing
   2) $50
   3) $200
   4) A 2-year ARRL membership
5) What did the ARRL "slay" in 1977?
   1) 220-MHz CB
   2) Amateur radio
   3) The "Russian Woodpecker"
   4) Mobile logging requirements

ELEMENT 4—TRUE-FALSE

		True	False
1)	W1AW is a club station.	____	____
2)	The 1980 ARRL Hudson Division Convention was actually held in the Atlantic Division.	____	____
3)	The ARRL's goodwill is worth only one dollar.	____	____
4)	In 1979, out of the 2,238 people who applied for ARRL code proficiency certificates and stickers, only 90 failed.	____	____
5)	Under a special agreement with the FCC, W1AW is allowed to run up to five kilowatts of dc input power.	____	____
6)	The ARRL is in favor of giving phone privileges to Novices.	____	____
7)	When the FCC raised Novice power restrictions from 75 to 250 Watts in 1976, the League expressed its disapproval.	____	____

8) The League's headquarters in Newington CT stands on the site of a former mental hospital. ____ ____
9) Eugene C. Woodruff was the founder of "Amateurs for Action," an anti-ARRL organization of the 1950s. ____ ____
10) "The American Radio Relay League" was almost named, at its inception, "The American Amateur Radio League." ____ ____

ELEMENT 5—MISSED QUOTES

Below are misquotes of familiar League slogans, titles, and expressions. Your task is to restore them to their correct form.

1) "You'll find RIT in a League publication."
2) "Of, by, and against the amateur."
3) "Devoted entirely to itself."
4) "Calling some radio amateurs; this is W1AW."
5) "The World Above 50 kHz"
6) "Ham's Wild World"
7) "Silent Key Night"
8) "Kinky Hints for the Radio Amateur"
9) "YL Views and News"
10) "Frequency Estimating Test"

THE ANSWERS

Element 1:
See illustration 1A.

Element 2:
1-K, 2-J, 3-I, 4-E, 5-B, 6-A, 7-D, 8-H, 9-G, 10-C

Element 3:
1-2 The so-called "W1AW clause."
2-4 Who else?
3-4 Instead, they asked members to write their local newspapers.
4-1 You get what you pay for.
5-1 To paraphrase Mark Twain: The reports of 220-MHz CB's death are greatly exaggerated.

Element 4:
1 True It's actually licensed to the "ARRL Headquarters Operators Club."
2 True For convenience of division members, no doubt.
3 True That's what it says in their Annual Report—I think it's an overestimate.
4 True Gee, and who says code is hard to learn?
5 False W1AW must live with the same rules as the rest of us. Serves them right.
6 True They've even filed a petition with the FCC to allow Novices phone on 220 MHz. See Element 3, question 5.
7 True W2HD got so mad, he even wrote a letter.
8 False No comment.
9 False Not likely, since Woodruff was League president from 1936-1940.
10 True It would have made a better name, but could you imagine griping about the AARL?

Element 5:
1 "You'll find it in a League publication."
2 "Of, by, and for the amateur."
3 "Devoted entirely to amateur radio."
4 "Calling all radio amateurs; this is W1AW."
5 "The World Above 50 MHz (mc.)"
6 "Ham's Wide World"
7 "Straight Key Night"
8 "Hints and Kinks for the Radio Amateur"
9 "YL News and Views"
10 "Frequency Measuring Test"

SCORING

Element 1:
Twenty points for the completed puzzle, or ½ point for each question correctly answered.

H	A	R	T	F	O	R	D		M	A	D
A		E		L		A		T	E		I
N	T	S		A		N	B	V	M		V
D		P	E	G		G	O		B	C	I
B	E	E			M	E	M	B	E	R	S
O		C	T			R	B		R		I
O	P	T		K	H			Z	L		O
K	M			L	O	N	G		I	O	N
		B	T		O		I		F		S
O	O	S			V	A	L	V	E		
T			D		E			O		C	W
C	O	U	N	T	R	Y	C	L	U	B	

Illustration 1A.

Element 2:
Two points for each correct answer.

Element 3:
Four points for each correct answer.

Element 4:
Two points for each correct answer.

Element 5:
Two points for each quote corrected.

Think you know your League? Let's see.

1-20	points—Received a congratulatory form letter from W2HD after passing Novice test
21-40	points—Once threw away a League promotional mailing
41-60	points—Ardent member
61-80	points—You wear your 25-year pin to work
81-100+	points—Charter Life Member

By the way, about the ARRL "Department of Defense" mentioned at the start of this column: That was the League's World War I plan to organize an amateur civil defense network in the event of an enemy invasion. It's a good thing the Kaiser never tried invading Connecticut; his forces would have been no match against dozens of amateurs carrying hand-held spark rigs.

HAM HELP

The Sinclair/Microace Amateur Users' Group has located a source for those impossible-to-find connectors for the ZX-80 computer. Amateurs wishing to trade amateur-related programs and information such as this source may contact me at the address below.

Marty Irons K2MI
46 Magic Circle Drive
Goshen NY 10924
(914)-294-9462 after 9:00 pm

I have just completed a Signetics 2650 microcomputer (2650 motherboard with S-100 expansion to 64K) and would like to send RTTY and CW with this unit. I can't, however, find anything on a demodulator from my rig to the micro. Can anybody help? Thank you.

Max Sims VK5NHM
19 Stuart Tce.
Port Lincoln, S606
Australia

LOOKING WEST

Bill Pasternak WA6ITF
c/o The Westlink Radio Network
Suite 718
7046 Hollywood Blvd.
Hollywood CA 90028

Last month, I presented the Lew Collins W1GXT letter in which he expressed his reaction to the proposed six-meter band plan. This month you can read my reply.

I finally have the time to properly answer your letter. Many apologies for the delay, but as my earlier quick note explained, the "bug had me down for a bit." Enough on that. On to six meters and your letter. I will try at this time to respond on a point-by-point basis, addressing the points on which we seem to disagree.

First, I am far from a "casual" six-meter user. Rather, I have been on that band almost constantly since 1959 when I was first licensed in New York as WA2HVK. I believe this was detailed in depth in the column. By "user," I think you mean one who engages in day-to-day two-way operation. To me, the term "user" means anyone who spends any time concerned with the band. Going with my definition, and, again referring to what I have printed on the subject in regard to my own six-meter operation, I can say with assurance that my interest is far from casual.

I see that the one major point we do agree on is that six meters is by and large a "dead band," mainly due to the TVI problem. Two meters was a good out, and most amateurs took it. I am, however, well aware of the die-hards and their DX record this past year. In fact, I make it a point to try to call Ray Clark K5ZMS at SMIRK at least once a month for news updates. The 50-to-72-MHz "across the pond" activity was something else again. I can remember back in the early 1960s when many of us were trying for such QSOs, most of the time with no success. If only "C.C. & R's" didn't exist out here! Three elements in one's attic leaves a lot to be desired, especially when your attic is surrounded by rather high hills.

I think our greatest disagreement seems to lie in the area of technical parameters. In your analysis, you view only the operation of today's "minority" who inhabit the band on FM, using some excellent equipment. Something akin to the two-meter band about 15 years ago. The era of the 80D, RCA LD-150, and alike. In that day, the FMer on two meters was a "minority." He was the technically competent amateur who had the ability to take a piece of high-quality land-mobile FM equipment and convert it to amateur use. But it was not until the amateur manufacturers came along with off-the-shelf, ready-to-use equipment that FM activity really began to grow on two meters. Radios like the Drake TR-22 and Regency HR-2 are what "made" two meters. Not the converted Motracs and Mastrs. For the average amateur, the latter were just too limited in scope of operation to gain widespread acceptance.

Keep in mind that not every amateur is a technological wizard. A goodly number of today's hams have no interest whatsoever in building or converting. Maybe it's a sad commentary, but it's true, nonetheless. Hams today want off-the-shelf, ready-to-use radios. They want the type of features that no converted land-mobile radio can ever give. They are willing to sacrifice the extreme quality found in land-mobile equipment in favor of something small enough to carry in a briefcase, yet giving them total access to an entire band. Look at the equipment marketed for two meters. What sells best? The answer is self evident.

If six meters is to grow, it must be made easy for the average amateur to gain access to the band. This means mass-appeal amateur radio equipment, available off-the-shelf. Again, it's in the same situation as two meters was back a few years ago. I remember well the way that those of us using our Big-M radios felt toward the newcomer with his rice-box special. Even today, there are amateurs in my area who will not talk with another station on two-meter FM unless he knows for sure that he is in QSO with another amateur using a converted land-mobile radio.

But for a band to grow, it takes people. For people to come onto an amateur band takes being able to walk into a local radio store, plunk down his hard-earned bucks, and buy the rig of his dreams. And, for the rig of his dreams to be made available in the first place means that we amateurs must give definite assurance to those who build the equipment we use that we will purchase their wares. The only conceivable way for this to happen in relation to the six-meter band, especially in regard to FM, is for this nation to adopt one specific bandplan—and then stick to it.

It matters not who writes the bandplan. It does matter that it be one that lends itself to the ease of manufacture of equipment directly oriented toward the general amateur populace. This, so that a lawyer, doctor, or anyone, technically oriented or not, can turn it on and get on the air. Yes, it means going against one of the traditions of amateur radio. The tradition of believing that when one's amateur license arrives in the mail, he or she is automatically elevated to the exalted position of electronic wizard, par excellence. Reality says that those days are gone and probably will never return. How often does one find a U.S. DXer operating with home-built equipment these days? Very, very seldom.

I take a simple view. The bands belong to the majority, not any specific finite minority. I foresee any mass inhabitation of six meters taking place when and only when the equipment manufacturers begin to offer the type of equipment that the average amateur wants. Equipment that operates "out of the box." This is today's world of amateur radio, for better or worse.

For six meters, or any band, to be safe from outside attack means population and use. Not just casual use by a select few, which I think you and I qualify under, but, rather, it means use by the masses, the availability of the band, on a day-to-day basis akin to today's use of two meters. It means further deregulation and internal voluntary standards from the amateur community. It means that we start today and select a bandplan. A plan that is best for Joe Ham and Joe Ham Equipment Manufacturer. It will also mean the same sort of confrontation developing between those with commercial land-mobile radios and others who will be the newcomers. The latter is but human nature. If you have something all to yourself and you know how good it is, you might not be inclined to want to share it with others. This was the way it was in regard to the early days of FM on two meters and the way it is in regard to FM on six these days.

It is not for me to argue the merits of any specific bandplan. My only call is that we stop the procrastination and move forward now, lest we wait and find that "10-4, Good Buddy" has made his move, and it's too late for us to make ours. When I published the bandplan, I invited readers to pick it apart and put it back together. Thus far, yours has been the only in-depth letter received, and I am sincerely grateful that you took the time and trouble to do so. Maybe it will encourage others to do likewise.

As to the modelers' channels, I had expected a flurry of mail on that and was surprised that little was received at first. A few weeks later, I learned the possible reason. As you are aware by now, the Academy of Model Aeronautics had requested a hearing before the Commission in the hope of gaining permission for non-amateurs to use six meters for model control, under the supervision of an amateur. I suspect that many modelers felt that this would go through as requested, so they didn't bother to write.

I began to receive very negative commentary from the modelers the week of November 12, 1980. As you are probably well aware, on November 6, 1980, the Commission not only turned the request down, but went so far as to question the rationale of permitting anyone, amateurs included, the use of six meters for radio remote control of models. While I have yet to get a copy of the proposed plain-language amateur regulations (P.R. Docket 80-279), I have heard rumors that the latter is the case. I have ordered a copy and

Continued on page 154

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 8

isn't all that difficult if you go about it the right way. I think I could set up a system which would bring in tens of thousands of technicians for the military...and it wouldn't cost all that much either.

Also, the military seems to have had some problems with winning wars in recent years. The Vietnam conflict comes to mind in this respect. If I could have gotten my ideas on the subject where they would have done some good, we might have saved 99% of the money we threw into that silly war... saved tens of thousands of lives...and beat the hell out of communism. Before you decide without a trial that I'm a nut, I might explain that I have written about my scheme in *73* and gotten compliments on it. The plan, which I'll cover again if anyone is interested, is an oriental approach to outsmarting the enemy instead of trying to outfight him. New concept.

Much of my life is spent in solving problems, so I tend to think in those terms. Often I find it helpful to take ideas from many different fields and put them together to form a new concept. My grandfather made his fortune as an inventor and I think a lot the way he did. Fantastic man. Multipledisciplinarianism, they call it.

One of the reasons that I read as widely as I do is so that I will have ideas from many fields. I whip through some 200 magazines a month, covering not only the ham, electronics, computer, CB, radio, autosound, hi-fi, radar, satellite, microwave, and other associated fields, but also things like skin diving, photography, UFOs, psychology, politics, news, skiing, cars, premiums, business, stock market, travel, and so on.

The idea for outsmarting the North Vietnamese came from a mixture of ideas which I found in New Caledonia, Yugoslavia, and Singapore. Once I had the idea, I explored it with friends when I was visiting other countries such as Burma, India, Thailand, and so on. They all thought it would have to work.

That's one of the beauties of amateur radio...anywhere you go in the world you have friends ...people you can sit down with to talk about ideas like that.

Lately, in the interests of saving time, I've been giving some of my talks at shows via video tape. I did offer to send a tape to the War College with my ideas. We'll see how that goes over.

HOW WOULD YOU LIKE TO *BE* DX?

Early on in my ham publishing career, I managed to get a taste of working from the DX end of things. I'd gotten particularly bitten by the DX bug back in 1946, immediately after the war. My first move after getting out of the Navy was to spend one summer on vacation in my home town in New Hampshire, complete with a kilowatt ham station and an enormous vee beam. What a summer *that* was!

Then, on returning to college in the fall, I moved my ham station there and set it up in the basement of the fraternity house. There was room in the yard for a pair of Twin-Three beams, so I began to set the world on fire, knocking off new countries as fast as they surfaced. I will never forget some of those exciting contacts.

One morning I was up early and heard a very weak station calling CQ. He was in the DX band, so I called him blind. It was a W7-something, portable something. I only called once because I felt so foolish calling a station when I hadn't heard the callsign. He came right back, with his signal gradually improving. It was W7IMW/C7 in Tientsin, China. He was running ten Watts and a very long wire ...and I was the *only* station he was hearing. I got the QSL card for the contact, too!

After I became the editor of *CQ*, I managed to get on a DXpedition to Navassa Island in 1958. That was an exciting trip for me, though it was a sort of last minute change from our original plan to go to Clipperton. I'd managed to get a license for Clipperton, but transportation fell through. I then got a license for Navassa...KC4AF...so we went there. Years later, when I was in Tahiti for a few days, I checked and found that my FO8AS ticket was still good, so I operated from Tahiti with it in 1966.

Down through the years, I've been on several DXpeditions... even going again to Navassa in 1972. I've also visited almost one hundred countries now and operated from over half of them ...usually using the gear of a local ham. I've been on the hot end of the pileups hundreds of times...and it *is* a thrill.

Some of the more interesting places I've operated from were Afghanistan as YA1NSD, Teheran from the American Embassy, Beirut, Damascus, Nairobi, Katmandu, Delhi, Amman, Suva, New Caledonia, Western Samoa, American Samoa, Wake Island, Korea, including the DMZ at Panmunjom, Australia, New Zealand, and many, many more. Each is a story...and I have the slides to show for most of them. I'm working toward being able to put some of these stories on video cassette, so that they may be available for club showings soon. I'll let you know.

Even with the responsibility of running four monthly magazines plus Instant Software, I still manage to get away occasionally for a visit to some relatively rare spot. During the last year I managed to visit Japan, Korea, Taiwan, Hong Kong, Macao, China, Guatemala, Hawaii, Germany, France, Belgium, Netherlands, Luxembourg, Berlin (East and West), England, Ireland, and Northern Ireland. I met with hams in most of those countries and gave talks in Wiesbaden, Paris, Hawaii, Taiwan, and Tokyo.

You may be sure that *73* will always reflect my personal interest in both working DX and DXpeditioning...as well as my other ham interests such as RTTY, SSTV, OSCAR, microwaves, VHF, repeaters...etc.

WORK WAYNE WRAGGED

After operating for a few days in the Turks and Caicos Islands in March...partly during the DX contest...I found that this was a great way to sort of keep in touch with the readers of *73*. I can do this to some degree from Peterborough, but it really takes a location in the Caribbean to reach all of the US...and, besides, it is more fun that way.

My present plans call for me to be able to get away for a few days in May...so I'm hoping to get down to St. Lucia (J6L) and get on the air for a couple of days...probably May 16-17th. Look for me around 21.380 during the day, 28.70 if 10m is open, 14.210 and 14.285 in the evenings, and 3.820 during the late evenings. I'll try to be around those frequencies so you can find me.

While I obviously am not able to talk business over the air, I will welcome any questions... on just about any subject. I'll also cook up a special QSL for the expedition. I'm going to try to arrange further such trips, so we might eventually come up with a certificate if you can work me in N-places.

That brings up an idea. I wonder how many of you have QSL cards from me from more than ten locations? We might come up with some sort of recognition for those who have managed to contact me in a number of different spots. In the past I've been on the air from something near 50 countries.

Keep in mind that I am also an avid scuba diver, so I'll be out in the mornings checking out the reefs with an underwater camera. I had a couple fine dives at Providenciales Island in the Turks and Caicos. I'll write about that more when the pictures come back.

WIN A FREE BOOK!

We are reviving the "Circuits^2" feature in *73*. Just send in your favorite circuit, along with a *brief* description of its operation or intended use. (Make sure that it works!) If we print it, you'll get your choice of a book from our Radio Bookshop. Be sure to include your book choice with your circuit.

AWARDS

Bill Gosney WB7BFK
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

COLONIAL AMERICAN AWARD

To qualify for a very beautiful red, white, and blue award, applicants must work all the original thirteen colony states. In case you need help to identify which states they are: Connecticut, Delaware, Georgia, Maryland, Massachusetts, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, South Carolina, and Virginia.

Have your list of contacts verified by at least two amateurs or a local radio club secretary. Enclose your application and $1.00 award fee to: Certificate World Awards, Rte. 2, Box 72, Fulton MS 38843.

THE OLD SOUTH AWARD

Depicting a scroll listing the eleven states of the Old South, this award is made available to amateurs of the world who make one contact with each of the states of Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia.

Have your list of contacts verified by two amateurs and enclose this list with an award fee of $1.00 or six IRCs to: Certificate World Awards, Rte. 2, Box 72, Fulton MS 38843.

VIRGINVILLE

1981 marks the 50th anniversary of the founding of the Reading Radio Club. This year, many events will be held commemorating their Golden Jubilee.

The first event is a Special Events operation with the club traveling to Berks County's foremost spot, Virginville. Station W3BN will operate on 3.950, 7.250, 14.300, 21.400, 29.500, and 146.31/.91 MHz phone and 7.125 and 14.045 MHz (alternating between phone) CW from 1300 to 2200 UTC on May 3. Special commemorative QSL cards are available—QSL club direct. For info, write Reading Radio Club, Inc., PO Box 124, Reading PA 19603.

WINDMILL ISLAND

Amateur radio station K8DAA will be operating from Windmill Island in Holland, Michigan, on Saturday, May 16, during the annual Tulip Time Festival. Certificates will be sent to amateurs contacting K8DAA between 1400 and 2300 UTC. Approximate frequencies will *be* 7.125, 7.275, 21.125, and 21.425 MHz. Please send QSL and 75¢ to Jack Van Voorst WD8RNQ, 8737 Summit Court, Zeeland MI 49464.

FIDDLERS' PICNIC

The Alamance Amateur Radio Club, K4EG, will operate a special events station at the Alamance County Historical Museum during the Fiddlers' Picnic fund-raising event for the museum. The Historical Museum building is the birthplace of Edwin M. Holt, a pioneer in textile manufacturing in the South.

Operation will be on May 16-17, 1981, from 1600 to 2300 UTC. Frequencies of operation will be 7.260 and 21.360 MHz, General phone. An attractive certificate will be issued on receipt of QSL and legal-size SASE. For information and QSL submission, contact Alamance ARC, c/o Gary Hills KA4KJI, 2416-C Huntington Rd., Burlington NC 27215.

DISAPPEARING SUN

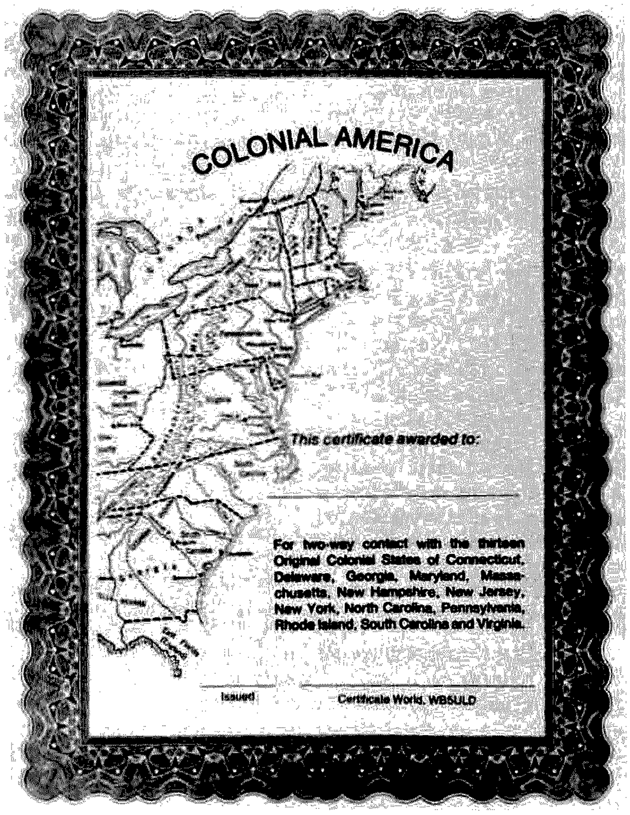
W7AQ, the Yakima Amateur Radio Club, will run a commemoration of The Day the Sun Disappeared, which occurred on May 18, 1980, when Mount St. Helens erupted. Yakima, Washington, which is 80 miles N.E. of the volcano, saw the sun disappear by 10:30 am and did not see the light of day until 7:00 am the next morning. May 18th was "black as midnight" by 12:00 noon.

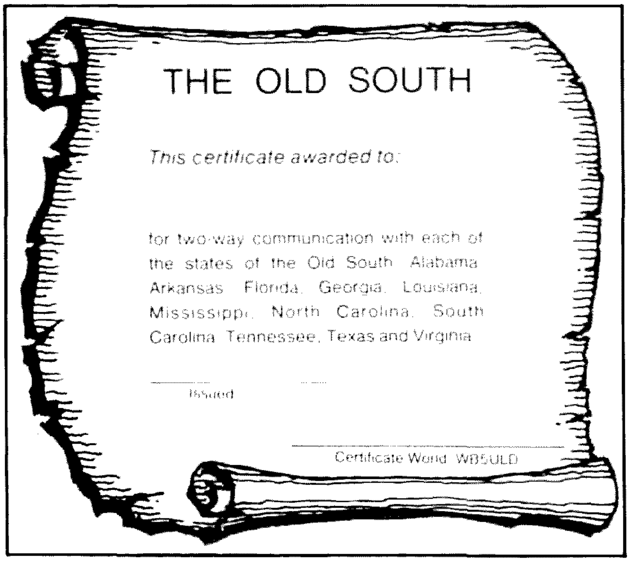
W7AQ was celebrating its 50th year of existence with its hamfest that morning. At 8:38 am, word was received that the mountain had a major eruption. Near 9:30, they watched a "thunderstorm front approach out of a clear blue sky." Then the rain of dust started. Over 600,000 tons of volcanic dust fell within the city of Yakima alone. Everything was covered with up to one inch of dust and ash. Local and visiting amateurs provided emergency communications and handled information traffic for the next three days.

Commemorate with them from 1700 to 0200 UTC on May 17-18. Listen for W7AQ on 28.660, 21.370, 14.280, 7.285, and 3.940 on SSB, and 28.120, 21.130, 14.040, 7.140, and 3.740 for CW. A special-event QSL card will be available: Send an SASE to W7AQ, Yakima Amateur Radio Club, PO Box 9211, Yakima WA 98909. For further information, contact Kenneth Sahn KA7DWH, PO Box 9211, Yakima WA 98909.

MACKINAC ISLAND

The Blossomland Amateur Radio Association will sponsor a bicentennial expedition to Mackinac Island (Mackinac





County) during the Michigan QSO Party, May 16-17. Operation on 80-10 CW and SSB, with 2-meter SSB is planned; look for W8MAI. Enclose an SASE for special certificate and mail to PO Box 175, St. Joseph MI 49085. For additional information, contact Dale H. Cole KA9FKU, 52480 Winding Waters, Elkhart IN 46514.

STORK TOWER AWARD

A new award from the Canadians in West Germany is called the Stork Tower Award. Sponsored by the Lahr Amateur Radio Club, all contacts must be made on or after July 1, 1980.

Contact 5 club members and the club station, DA2CF, using all bands or modes. Mail a list with full name, call, and US$1 or 5 IRCs to LARC, PO Box 2771, CFPO 5000, via Belleville, Ontario, Canada KOK 3R0. Remember —only members of the Lahr Amateur Radio Club count for this award.

MOSCOW OLYMPICS?

The Mid-South VHF Association will operate a special-event station on May 22-25, 1981, at the "Moscow Olympics" in Moscow, Tennessee. This event is a spoof of the Moscow, USSR, Games and will include cow-chip throwing, skillet tossing, and tobacco chewing contests, among others. Proceeds from the "Moscow Olympics" will go to the establishment of an educational fund for the children of those men killed in the attempted hostage rescue in Iran. A special QSL commemorating the event is planned. Look for the "Olympics" on 40, 20, and 15. The station call will be KU4K (closest Russian-looking call). QSL to Ervin Abies KU4K, PO Box 88, Moscow TN 38057. For further info, contact Jo Ann Wilder at (901)-523-5310.

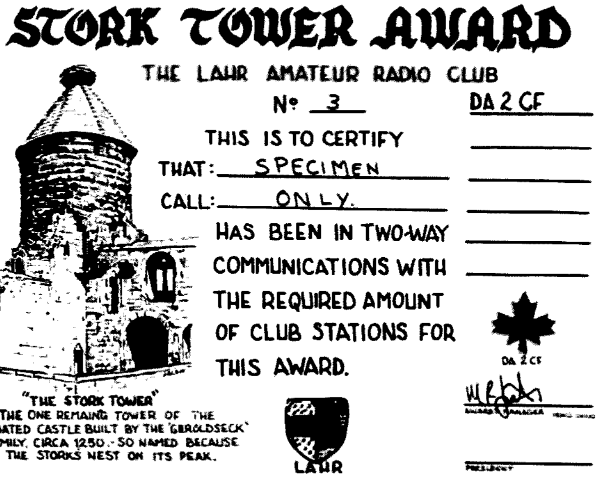
OE SERIES AUSTRIAN AWARD

WAOE. To qualify for the Worked All Austria Award, stations in OE, DL, OK, HA, YU, I, HB, and HB0 must contact all nine call areas of OE-land with three stations in each call area using at least two bands, one of which must be on either the 40- or 80-meter band. Call areas OE4 and OE9 count as one call area. Stations in other European countries require the same amount of contacts on at least two bands without the 40- and 80-meter restriction. Stations outside Europe need one contact with any eight of the nine call areas.

Awards are available for all CW, all phone, 2 × SSB, 1.8 MHz, VHF, and mixed modes. To be valid, all contacts must be made on or after April 1, 1954.

To apply, prepare a list of contacts and have it verified by a local radio club secretary. Enclose your application with an award fee of 10 IRCs to: OE1FMC, Awards Manager, Postfach 999, A-1014 Vienna, Austria.

WAOE/160. This one separates the men from the boys. Stations in Austria require two contacts in eight of the nine call areas. Stations in Europe out-



side Austria require one contact with eight of the nine call areas. Stations outside Europe need only to contact one station in four of the nine call areas. Remember, each of these contacts must be two-way communications on the 160-meter band. A real toughie for us west coast boys!

To apply, have your list of contacts verified by a local radio club secretary. Enclose this list with 10 IRCs and forward to: OE1FMC, Awards Manager, Postfach 999, A-1014 Vienna, Austria.

SAN BENITO COUNTY

The Gabilan ARC will put San Benito County, California, on the air on Sunday, May 31. Times of operation will be from 0800 to 1600 PDT, and will be extended if activity is good. Operating frequencies will be 28.775 and 21.400 USB, and 28.175 and 21.175 slow-speed CW.

A special certificate and QSL card will be sent to those who confirm with an SASE. QSL to John Daudet KB6IT, 2001 Scenic Circle, Hollister CA 95023.

LIECHTENSTEIN DXPEDITION

The Wiesbaden Amateur Radio Club will sponsor its sixth annual DXpedition to Liechtenstein during May 23-31, 1981. The callsign will be DA1WA/HB0. The QSL Manager is DJ0LC. His address, which is good in the DX *Callbook*, is Dr. Hugo Jakobljevich, Am Weinberg 10, 6200 Wiesbaden-Auringen, West Germany. Stateside QSLs, along with an enclosed SASE, may be sent to Mr. Stephen Hutchins, Box 4573, APO New York 09109.

Continued

NINE DRAGONS AWARD CORRECTION

Phil Weaver of the Hong Kong Amateur Radio Transmitting Society writes to tell us that the fee for the Nine Dragons Award is US$3 or 25 IRCs *not* the US$2 as listed in the February Awards column. Sorry for the inconvenience, Phil.

This year's operating modes will be: CW, phone (SSB), and RTTY on all bands; OSCAR Mode A; CW and SSB on 160 meters; and 6-meter/10-meter crossband operations. For American Novices, CW operations will be attempted at 3.725 and 21.120 MHz, ±5 kHz, between 1900 and 2100 hours EST.

The object of this year's DXpedition, besides having fun, is to provide amateurs around the world the opportunity to work "HBØ". For further information, contact Hugo about CW operations, Steve about 160-meter operations, or Claude R. Matchette DA1PN/WB3CEA, HHC V Corps (G-2), APO New York 09079.

A DEEP SUBJECT

The month of May provides us with the opportunity to work three submarines in *three* different locations. The *USS Croaker, USS Ling,* and *USS Cod* will be activated for at least one weekend each. Can you fathom this? Read on.

USS CROAKER

The Amateur Radio and Electronics Association of New Jersey (AREA-NJ) radio club will conduct a mini-DXpedition to Groton, Connecticut, on May 2 and 3. The club will operate from the radio room of the submarine *USS Croaker* which will be moored in the Thames River. This event will commemorate the anniversary of the sub's commission into service during WWII. A special QSL card will be issued to all amateurs establishing contact with the submarine. The following is a schedule of the activities:

Time (UTC)	Band	Frequency
1400-1600	15m phone	21.355-21.375
1600-1800	15m CW	21.035-21.045
1800-2000	15m CW	21.110-21.120
2000-2200	15m phone	21.355-21.375
2200-2400	20m CW	14.035-14.045
0000-0200	80m phone	3.900-3.920
0200-0400	80m CW	3.73-3.75
0400-0600	40m CW	7.035-7.045
0600-0800	40m phone	7.235-7.255
0800-1000	20m phone	14.300-14.320
1000-1200	40m CW	7.130-7.140
1200-1400	15m phone	21.355-21.375
1400-1600	15m CW	21.035-21.045

During the entire operation, 2-meter FM will be conducted on both local as well as simplex frequencies. For information, contact Charles Burke WA2SLK, Box 164A, RD #1, Georgia Tavern Road, Farmingdale NJ 07727.

USS LING

On May 16, Armed Forces Day, the Meadowlands Amateur Radio Association will be on board the *USS Ling* (SS 297) docked on the Hackensack River in Hackensack, New Jersey, and will be operating under club station call N2BMN. Possible frequencies are: 14,260-285, 21,360-365, and 7,230-235 kHz, and 146.520 and 146.550 MHz from 1500 to 2000 UTC. For further information, contact Ralph Francavilla N2BMN (MARA), 154 Redneck Ave, Little Ferry NJ 07643.

USS COD

Once more, the members of the Parma Radio Club will be operating from the WWII submarine *USS Cod,* using the club call, K8UZW. The *USS Cod* is on permanent display in Cleveland, Ohio. Operations will start on May 30 and run through September 6 every weekend with the exception of Field Day weekend.

An attractive certificate will be awarded for 2-way contacts from the ship upon receipt of a QSL card and 30¢ for postage. All bands will be operated, 10 to 80; band conditions will dictate band of major activity. Send QSLs to WD8RZG. For info, contact Don Winner WD8RZG, 8927 Torrance Ave, Brooklyn OH 44144.

SCHOLARSHIP INFO

The Atlanta Radio Club announces the third annual competition for two $500 cash scholarships. Each scholarship will go to a licensed amateur entering college in the fall of 1981. Deadline for completed applications is May 31, 1981; request an application from ARC Scholarship, 259 Weatherstone Parkway, Marietta GA 30067.

NEBRASKALAND DAYS

A week-long statewide celebration, Nebraskaland Days, an event held the third week of June every year in North Platte, Nebraska, the home of Buffalo Bill Cody, features the Buffalo Bill Rodeo. This rodeo is named after North Platte's famous resident, who started rodeo as we know it today in North Platte.

In honor of Buffalo Bill and to celebrate Nebraskaland Days, the North Platte Amateur Radio Club will operate a special station, WØCXH, from 1800 to 0000Z on June 13-14. Frequencies used will be 21.400, 14.290, and 7.250 MHz SSB, and 21.150 CW plus or minus QRM.

A handsome certificate will be available for contact with the station. Send a legal-size SASE to North Platte Amateur Radio Club, PO Box 994, North Platte NE 69101.

OLD MAN RIVER AWARD

A very unique award can be yours by meeting the requirements of the Old Man River achievement award. The certificate pictures the mighty Mississippi River and the ten states bordering this river. To qualify, applicants must make two-way contact with all ten states: Arkansas, Illinois, Iowa, Kentucky, Louisiana, Minnesota, Mississippi, Missouri, Tennessee, and Wisconsin.

Prepare a list of contacts and have it verified by at least two amateurs. Enclose an award fee of $1.00 or six IRCs to: Certificate World Awards, Rte. 2, Box 72, Fulton MS 38843.

PODUNK CENTER

On the weekend of May 9, Podunk Center, Iowa (yes, there is such a place!), will be back on the air. Air time not known yet, but all bands, SSB and CW, are contemplated. 146.52 FM simplex will also be monitored. Calls are WØYBV, CW; WØANZ, SSB.

A Novice band might be used. CW operation will occur 25 kHz up from bottom, split frequency. Most SSB operation should be in the General class portion of the band.

QSL requests must be accompanied by an SASE or proper postage (or IRC equivalent). A special QSL will be sent in answer to such requests. Cards should be sent to the *Callbook* address of either station.

For more information, write Charles J. Ellis WØYBV, 2304 Storm Street, Ames IA 50010.

WORKED ALL BERMUDA AWARD

Sponsored by the Radio Society of Bermuda, this award is made available to licensed amateurs throughout the world.

To qualify, applicants must work one station in each of the nine parishes of Bermuda. Only one mobile or portable station may be claimed for credit. The rest must be fixed stations. The city of Hamilton is in Pembroke Parish and not in Hamilton Parish as you would be led to believe.

WORKED ALL CHILE AWARD

Sponsored by the Radio Club of Chile, applicants who wish to meet the requirements of this award will have to confirm contact with eight of the ten call districts in Chile.

To be valid, all contacts must be made after November, 1945. While there are no band or mode restrictions, special endorsements will recognize band or mode accomplishments if request is made at the time of application.

To apply, prepare a list of contacts and submit this list with your QSL cards to the awards manager. Enclose with your application and cards an award fee of 6 IRCs to cover return postage of your cards. Forward to: Radio Club of Chile, Casilla 13630, Santiago, Chile, South America.

CE 25-P AWARD

Also sponsored by the Radio Club of Chile, this award requires South American applicants to make contact with 25 of the 31 divisions of Chile. Ap-

plicants outside South America need only to contact 20 out of the maximum 31 divisions.

Do not send QSL cards! Have your list of contacts verified by at least two fellow amateurs. Enclose your list with 3 IRCs to: Radio Club of Chile, Casilla 13630, Santiago, Chile, South America.

The Divisions for the CE 25-P Award are: CE1—Tarapaca, Antofagasta, Atacama; CE2—Coquimbo, Aconoagua, Valparaiso; CE3—Santiago; CE4—Taloa, O'Higgins, Colchagua, Curico, Linares, Maule, Nuble; CE5—Concepcion, Arauco, Bio Bio, Malleco; CE6—Cautin, Valvidia, Osborno; CE7—Llanquihue,Chiloe, Aysen; CE8—Magel Lanes, Tierra Del Fuego; CE9—AA-AM Antarctica, AN-AZ South Shetland Islands; CE0Z—Juan Fernandez Archipelago; CE0A—Easter Island; and CE0X—San Felix and San Ambrosio Islands.

ISLAND DX AWARD

On the DX scene, the Whidbey Island DX Club is proud to announce the continuation of the world renowned Island DX Award.

Sponsored by the Whidbey Island DX club, the Island DX Award is available to all licensed amateurs and SWL stations throughout the world.

This award is offered for CW, SSB, SSTV, RTTY, OSCAR, and single and multiband accomplishments. A total of 50 islands is required for the basic award. Endorsements are given in increments of 50 islands, up to and including the maximum number of islands possible.

The *73 Magazine* Work the World DX Listing is used as the basis for determining what is or what is not a DX country. Only DX countries which are bonafide islands will count. See the list of countries.

To be valid, all contacts must be made after October 1, 1977. There is no mode or band restriction but endorsements will be recognized if requested at the time of application.

To apply, prepare a list of contacts in prefix order. Applications received in any other order will be returned to sender. Include on your list, the station callsign, IDX island name, band, mode, date, and GMT. Do not send QSL cards! Have your list verified by at least two amateurs or a radio club secretary. You must have QSL cards in your possession at the time application is made.

Forward your verified list, an award fee of $3.00, and a business-size SASE to: Whidbey Island DX Club, 2665 North Busby Road, Oak Harbor WA 98277.

NORTH DAKOTA/ SOUTH DAKOTA

Two activities are made available courtesy of the Central Iowa DX Association.

On the weekend of 30 May, two special-event stations will be on the air from one or the other or both of these states. Which one (or both) will not be known until the day of operation. 80-10-meter operation is

A3	HKB (Bajo)	S9,CR5	VS6
A9X	HK8 (Malp)	SV (Crete)	VS9 (See 8Q)
BV	HK0 (San An)	SV (Dodecanese)	VS9K
C2	IS	T2,VR8	VU7 (Andaman)
C6	J3,VP2G	TF	VU7 (Laccadive)
CE8A	JA-JR-KA	TI9	XF4
CE0X	JD,KA1 (Mina)	UA1,UK1 (Franz Jo)	XP
CE0Z	JD,KA1 (Ogasa)	VE1 (Sable)	YB,YC,YD
CO,CM,KG4	JD,7J1 (Okino)	VE1 (St. Paul)	YJ
CT2	JW	VK (Lord Howe)	YV0
CT3	JX	VK9 (Willis)	ZD7
D4	KG4 (See CO)	VK9 (Christmas)	ZD8
D6	KH1,KB (Baker)	VK9 (Cocos)	ZD9
DU	KH2,KG6 (Guam)	VK9 (Mellish)	ZF
EA6	KH3,KJ	VK9 (Norfolk)	ZK1 (North)
EA8	KH4,KM	VK9 (Heard)	ZK1 (South)
EI, GI	KH5K,KP6 (King)	VK9 (Macquarie)	ZK2
FB8W	KH5,KP6 (Palmy)	VP2A	ZL
FB8X	KH6,WH8,AH6,NH6	VP2D	ZL (Auck-Camp)
FB8Z	KH6,KH7 (Kure)	VP2E	ZL (Chatham)
FC	KH8,KS6	VP2G (See J3)	ZL (Kermadec)
FG (Gaud)	KH9,KW	VP2K	ZM7
FG,FS	KH8,KH2,KG6 (Mari)	VP2L	ZS2 (Marion)
FH8	KC6 (West)	VP2M	1S
FK	KC6 (East)	VP2S	3B6,3B7
FM	KP (Desoth)	VP2V	3B8
FO (Clip)	KP1 (Navassa)	VP5	3B9
FO	KP2,KV	VP8 (Falkland)	3C0
FP	KP3,KS4,HK8 (Ran-Ser)	VP8,LU (Ork)	3D2
FR (Glor)	KP4,NP4	VP8,LU (Geo)	3Y
FR (Juan)	KX	VP8,LU (Shet)	4S
FR (Reun)	OH0	VP8,LU (Sand)	5B,ZC
FR (Trom)	OJ0	VP9	5R
FW	OX,XP	VG9	5W
G,GM,GW	OY	VR1 (Br. Phoenix)	6Y
GC,GU	P29	VR1 (Gilbert)	8P
GC,GJ	PJ (Neth Ant)	VR3	8Q,VS9
GD	PJ (St. Martin)	VR4 (See H4)	9H
GI,EI	PY8 (Fernando)	VR6	9M6,9M8 (See VS5)
H4,VR4	PY8 (Peter & Paul)	VR7	9V
HC8	PY8 (Trinkiade)	VR8 (See T2)	8Y
HH,HI	S7	VS5,9M6,9M8	

Island DX Listing. The IDX Award program depicts DXCC countries which are bona-fide "islands" as recognized by the National Geographic Society. First criterion, however: They must be a DXCC country as stated on the ARRL DX Countries List. Any qualifying DXCC countries either omitted from this list by error or those which have been recognized for DXCC after the release of this listing will be added to the IDX List when it is printed next.

contemplated. SSB and CW modes will be used and 144.52 simplex FM will be monitored. Calls will be WØYBV, CW, and WØANZ, SSB.

Novice band operation is possible. Most CW operation will occur 25 kHz from the low end of the band and split frequencies will be used. Most SSB operation will occur in the General class band.

QSLs will not be sent to stations flagrantly violating ethics of good operating or failing to respond positively to suggestions made by these special event stations. Stations calling on the transmitting frequency will not be answered. QSL requests must be accompanied by an SASE or proper postage (or IRC equivalent). Cards should be sent to the *Callbook* address or either station.

County Hunters—Attention! En route to the site, these two stations will operate mobile. The route will pass through several Iowa counties from Des Moines to I-29. From there, I-29 will be followed to the North Dakota/South Dakota line.

WORKED ZAMBIA AWARD

Available to licensed amateurs of the world, the Worked All Zambia Award is sponsored by the Radio Society of Zambia.

To qualify for the award, applicants in zones 36, 37, and 38 require 20 points while all other stations need to accumulate a total of 10 points. Each 9J2 station counts 1 point on 7, 14, 21, and 28 MHz. On 1.8 and 3.5 MHz, 9J2 contacts will count 2 points. The same station may be worked on different bands for award credit. Other prefixes used by Zambian stations will count double points.

To apply, do not send QSL cards! Have your list of confirmed contacts verified by at least two fellow amateurs or a local radio club secretary. It should be mentioned that separate award classes are available for all CW, all phone, all AM, and mixed modes.

Enclose your verified list of contacts with an award fee of $2.00 or 7 IRCs to Awards Manager, RSZ, Daniel Soko, Box 1831, Ndola, Zambia.

EL GULFO DE MEXICO AWARD

This award, in the form of an old map showing the Gulf and Spanish exploration, is available to those amateurs making contact with the states of Alabama, Florida, Louisiana, Mississippi, and Texas. There are no band or mode restrictions nor any time limit.

To apply for the El Gulfo de Mexico Award, have your list of contacts verified by two amateurs or a local radio club secretary. Enclose your application along with an award fee of $1.00 or six IRCs to: Certificate World Awards, Rte. 2, Box 72, Fulton MS 38843.

WORKED ALL YUGOSLAVIA AWARD

To be valid, all contacts must be made on and after February 1, 1950. To qualify, YU applicants must confirm contact with 10 stations in each of the six YU republics. European stations require confirmation for contact with three stations in each of the six republics, while all other stations require two station contacts within each of the six Yugoslav republics. In all three categories, applicants must utilize at least two amateur bands. YU7, YUØ, 4N, 4O, and YT count for the republic from which the QSO was made.

To apply for this award, prepare a list of contacts and have it authenticated by a radio club secretary. Enclose this verified list and award fee of 5 IRCs to Awards Manager, SRJ, Box 48, 11001 Belgrade, Yugoslavia.

ESPANA DIPLOMA

From Spain comes word of the Worked All Spain Award. To be valid, all contacts must be made on or after January 1, 1952.

To qualify, award applicants must work 125 different EA stations in eight call districts and have a minimim of three contacts from each of the eight districts. The same station may be worked only once regardless of band or mode. The Spanish provinces and call areas include: EA1, EA2, EA3, EA4, EA5, EA6, EA7, and EA8.

To apply, have your list of contacts verified by a local radio club official. Do not send QSL cards! Forward your verified list and the award fee of 10 IRCS to URE, PO Box 220, Madrid, Spain. We are told that SWL stations may also apply under the same award requirements on a heard basis.

MOUNT ST. HELENS AWARD

The Clark County Amateur Radio Club, W7AIA, announces the Mount St. Helens Award to commemorate the 1980 eruption of this active volcano in the Cascade range of North America. A unique full-color photographic award of the awesome eruption on May 18, 1980, is available to all radio amateurs throughout the world. Two opportunities, with no mode or band restrictions, are provided to qualify for the award.

1) Contact eight or more stations in the Mount St. Helens area of southwest Washington State (Clark, Cowlitz, Skamania, or Lewis counties) after March 27, 1980, the date of the mountain's first eruption in the past 123 years.

2) Make one contact with W7AIA (Clark County Amateur Radio Club) during its operation from 0200 UTC May 16 until 0200 May 18, 1981, to mark the first anniversary of the disastrous eruption which took the life of Reid Blackburn KA7AMF who was a member of this club.

Send log information (no QSLs, please) including call of station worked, date, signal report, and $2.00 or 9 IRCs to Award Manager, CCARC, PO Box 1424, Vancouver WA 98668.

Proceeds from this fund will go to the Reid Blackburn Memorial Scholarship Fund which has been established by *The Columbian*, a Vancouver newspaper. A brief resume of the mountain's volcanic activity and a short report of Mr. Blackburn's involvement will be included with the award.

LION CITY AWARD

Available to amateurs worldwide, this DX award requires that contacts be made on and after September 10, 1969, to be valid. Stations in zone 28 require a minimum of 40 station contacts in Singapore. All other stations in the world require only 20 individual contacts with Singapore.

Once confirmation is received, have your contacts verified by at least two amateurs and forward this list with 10 IRCs to the award manager: MARTS, PO Box 725, Penang, Malaysia.

WORKED ALL MALAYSIA AWARD

Also sponsored by the Malaysian Amateur Radio Transmitting Society (MARTS), the requirements of the Worked All Malaysia Award are quite challenging. Applicants must work 10 9M2 stations, 10 9V1 stations, 1 VS5 station, 1 9M6 station and 1 9M8 station. There are on band or mode requirements but endorsements are available.

To apply, forward a verified list of contacts and an award fee of 5 IRCs to: MARTS, PO Box 725, Penang, Malaysia.

SAMUEL F. B. MORSE ANNIVERSARY

The Chelsa Communications Club of Chelsea, Michigan, is sponsoring a special event from May 18 to May 24, 1981, to celebrate the anniversary of Samuel F. B. Morse's first coded telegraph message. The message was sent in 1844 between Baltimore, Maryland, and Washington, DC, a distance of 41 miles.

Frequencies of operation are: phone 3.900, 7.235, 14.285, 21.360, and 28.510, and CW 15 kHz up from top of all Novice frequencies.

A special certificate will be sent to all those who send a QSL card with contact number and a #10 SASE envelope to Chelsea ARC Manager N8AYY, 5191 Esch Road, Manchester MI 48158.

ALL BAND TRAP ANTENNAS!

LEAKY LINES

Dave Mann K2AGZ
3 Daniel Lane
Kinnelon NJ 07405

The traditional concept of avoiding controversial subject matter while on the air is becoming markedly weakened; people seem to feel that because standards have become measurably looser in other areas of public communications (television, films, books, theater, etc.), there is no need to preserve those taboos which, after all, are no longer consistent with our present level of sophistication and are relics of a bygone puritanical age.

As strong as the ham liberationists have become, however, there is still a sizable number of amateurs who feel that we must not drop certain standards of morality. Those who have allowed a loosening to occur in their own operations are frequently importuned by anonymous fellow amateurs (who rarely identify themselves by callsigns) to steer clear of touchy subject matter. The proscribed topics, usually, are politics, religion, and sex, not necessarily in that order.

Of course, when dealing with large numbers of individuals of varying backgrounds, one finds an enormous range of opinion stretching from one extreme to the other. What you consider acceptable may only raise my hackles, and what I may find perfectly innocent may give you apoplexy! If this is carried far enough, you come to the inevitable conclusion that there is no such thing as a topic that is not anathema to someone or other. Thus, if you were to accede to all the demands of the self-styled censors, you would scarcely be able to discuss anything at all!

We live in an era with fewer restrictions on speech and behavior than ever before. At no former time can I recall such phenomena as "streakers" and people "mooning" in the windows of automobiles. And the language that spews forth into the living rooms from TV sets is unprecedented. It is not difficult for the impressionable to infer that nowadays anything goes, bar nothing.

But just because there is a plenitude of foul four-letter Anglo-Saxonisms in books, movies, magazines, and television, it doesn't mean that they have now taken their place alongside of mother, apple pie, and Old Glory!

A writing colleague recently sent me some cassettes, transcribed off the air. I believe they were recorded on the frequency of one specific repeater in a large city on the west coast. I have listened to them carefully and have come to the conclusion that even though I am a strong proponent of free speech, I have to take a firm stand against the sort of unbridled filth on those cassettes. Just because Oliver Wendell Holmes' famous quotation on this subject is restricted to the hollering of "Fire!" in a crowded theater, some bubble-heads have concluded that it's perfectly legitimate to say anything else. They have also concluded that civil rights gains of recent decades have validated the theory that an individual has the right to do practically anything, and that this right must be defended against the "tyranny of the majority." They hold that individual freedoms are more precious than collective rights.

This view is quite a distortion, to say the least.

But let's not talk about obscene language alone. After all, foul language is nothing new; it has been on the scene almost as long as language itself. I can recall that when I was in the Army there was a certain universally applied adjective. It was so common that nobody paid any attention to it.

"Pass the ——butter, willya buddy?"

"Sure. Watcha doin' this ——weekend?"

"Gonna go home and see my ——family. How about you?"

"Nah! I'm gonna stay on the ——base."

As I say, it became so ubiquitous that it lost its offensiveness. And perhaps that is what has happened while we weren't looking. Someone once said that eternal vigilance is the price of liberty. Well, obviously, it is also the price of the maintenance of high behavioral standards. If they are not watched and guarded, they can deteriorate right under our very noses.

There is another element, *however, that* may be a good deal worse than foul language, something that has been building for a long time. Like dry rot in foundation timbers, it has spread virtually unnoticed, and it could threaten not only the microcosm of ham radio, but the entire society itself.

Someone has passed along a letter written by a licensed amateur, a diatribe which he sends as his QSL. It is one of the most scurrilous pieces of racist propaganda and filth that I have ever seen, and believe me, I have seen plenty! Like most of its type, this one masks its venomous poison behind a facade of phony patriotism and religiosity. It uses well-documented deliberate slanders to construct a tissue of mendacious and malicious lies, and propagandizes in exactly the same way that similar pieces of fascist material were spread during the height of the fifth column activity immediately preceding our entry into World War II. The line is the same old Hitlerite garbage that once plunged humanity into a global conflict that snuffed out millions of lives before it was quelled!

The letter itself is awful enough. But the disclosure that this same vile filth is being regularly transmitted on our amateur frequencies is an abomination! Apparently there are nets being operated by this seditionist and his confederates. According to the letter there are also two publications which are pushed by these people as well, tracts designed for the purpose of spreading the false gospel of racism and religious intolerance. And in the classic manner of most such groups, this one relies upon the traditional fear and distrust of communism to whip up the passions.

Steps have been initiated to bring the matter to the attention of authorities so that it can be determined whether radio regulations are being violated. But I fully expect that when and if a hearing takes place, these extremist lunatics will bombard the FCC with all sorts of arguments claiming that their civil rights are being violated. They will accuse their adversaries of persecution and will righteously and piously scream that they are victims of a communist plot. And they will call upon "real Americans" to join them in a common crusade against the forces of Satanic bolshevism.

The question poses a paradox. We who believe in freedom of speech generally oppose all limits and boundaries. Yet, there is such a thing as a "clear and present danger." Much to our disadvantage we learned that no matter how small and seemingly weak such groups may seem, they can gain unbelievable strength and power. Hitler began with a small group of tavern rowdies. Castro's insurgence started with just a few revolutionaries, perhaps fifteen or twenty. Khomeini's circle consisted of a few fanatics quartered in a cheap *room in* Paris, thousands of miles away from Teheran!

Let no one dismiss such carryings-on as inconsequential trifles simply because they seem ineffectual and their advocates are few in number. At the same time, we can rely, I feel, on the common sense of the overwhelming majority of our ham colleagues, and can be confident that such appeals to prejudice will fall on deaf ears. There is little to suggest that any but the most ignorant and those already infected with the virus of racism would be foolish enough to be swayed by such arrant nonsense.

It does present us with a dilemma, however, and that is simply this. Should the amateur frequencies be available as a base of operations and a sanctuary for those whose ultimate aim is the destruction of traditional democratic concepts? Do we want our ham bands used as an avenue for alien propaganda programs, and if we do not, how can they be stopped without we ourselves violating the principles of free speech which we hold dear?

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
4006 Winlee Road
Randallstown MD 21133

A couple of years back, I acquired something called an "EPUT meter." Taking up about a foot of vertical space in a nineteen-inch rack, it had over a score of tubes and sported its own cooling fan. Its face was adorned with many knobs and switches, central to which were six columns, each composed of ten neon bulbs which shone through a mask to display the numerals zero through nine. EPUT? That stood for Events Per Unit Time. Yes, this power-hungry monster was my first frequency counter, able to count up to 100 kHz, and originally costing several thousand dollars.

Despite its limitations, the EPUT meter proved invaluable when setting up my RTTY station. AFSK tones, filters, an ST-6, and countless other projects were aligned with its help. But it was big and power-hungry, and its 100-kHz frequency limit put quite a crimp in its applications.

Then, at a hamfest, I saw a little box for sale, the likes of which I just could not believe. A frequency counter the size of one of the EPUT meter's readout modules, that could literally run rings around the old unit.

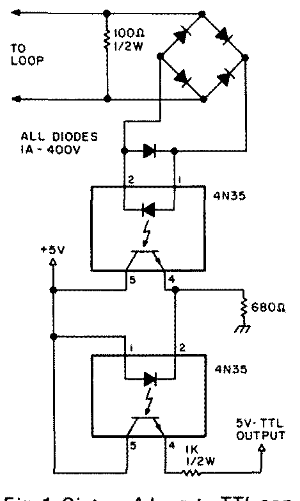


Fig. 1. Sixty-mA loop-to-TTL conversion. . . with inversion.

The Ramsey Electronics Model CT-70 frequency counter, advertised right here in the pages of *73*, was what caught my eye. Let's take a look at what it does. The basic counter's range is from 10 Hz to 5.5 MHz. Within that range, sensitivity is under 50 mV and resolution with a one-second gate is to one Hertz. The stated accuracy of the straight counter is to within one part per million at normal operating temperatures. That is the equivalent of .0025 Hz at a 2500-Hz tone frequency, or 3.6 Hz when tuning up on 3620-kHz RTTY. Close enough for my standards.

A shift in the input circuit extends the range ten times to 55 MHz with the loss of only one digit of resolution. Sensitivity and accuracy stay the same, only now the readout is within 10 Hz. Since the stated accuracy at, say, 50 MHz would be within 50 Hz, the units digit would not be significant and it would make little sense to show one.

As if all that were not enough, at the flick of a switch a divide-by-ten prescaler is placed in the line. This extends the range through 550 MHz, with a stated sensitivity under 150 mV. Now the resolution is to within 100 Hz, again consistent with the accuracy of the device.

If you need faster updates than once per second and are willing to take a ten-percent penalty for doing it, a one-tenth-second gate is available. Some math will show that with a one-tenth-second gate what you gain in time you lose in accuracy, so no useful information is lost when the display is truncated to a bottom limit of 10 Hz, 100 Hz, and 1000 Hz on each of the three ranges, respectively.

Input to the counter is through a front-panel BNC jack; very convenient and easy to get to. Power is supplied by four internal AA-size cells. I chose to purchase the counter equipped with nickel-cadmium rechargeable cells and a wall-plug charger. Makes a very convenient package.

Also, a couple of accessories are available to make life easier. A short antenna mounted on a swivel-BNC plug allows easy rf monitoring. I didn't get one and, after the third antenna I jury-rigged fell apart, I wished I had. Several probes also are offered, all of which look like good deals.

How much, you wonder? The counter itself comes in just under $100, assembled and tested. If you are on a tight budget, you can order it as a kit and save fifteen bucks. The nicads and charger will run another thirteen dollars, and the antenna another eight. All in all, a very good value for the money. (Ramsey offers several other counters, by the way, both higher and lower in price. Check their ad in the back of the book for current details. If you write them, be sure to mention RTTY Loop, OK?)

So, why am I so hepped up on a counter, here in a RTTY column? Do you have an idea how many ways a counter can be used in a RTTY station? We can start with the obvious, measuring the tones put out by the AFSK generator to be sure it is accurate. Are you using direct rf FSK? Put the counter on the speaker leads of your receiver and zero beat your mark signal. Now send a space, and will you look at that! The counter shows your shift, directly!

Are you involved in nets? I have been, and there is nothing so aggravating to a net control of a RTTY station than to see stations spread up and down a few hundred Hertz. Boy, it really does! Hurt, that is. Now when I am on a MARS net where the mean frequency is 4035 kHz and the control station says to put your mark on 4035.085 kHz, straddling the center frequency with 170-Hz shift, that is exactly where I am.

Digitally inclined? An easy way to set up the baud rate of the RTTY program you have been working on is to run a bit chain to the counter. Remember that bit rate is related to baud rate, and that means frequency. Sixty words per minute is 45.45 baud; see if yours comes close.

Need more ideas? Just look at the number of counter-related articles in the pages of *73* over the past few years and you may get more of a feel for it.

Our circuit this month comes from Vince Vielhaber KA8CSH and Joe Stragea KA8GOS. They needed a TTL-level signal to key an AFSK generator off a 60-mA loop. Only one problem—the logic high, +5 volts, needed to be present during space rather than mark. The need to isolate the AFSK unit from the line, as well as the unusual biasing requirement, resulted in the circuit in Fig. 1. Two optoisolators are cascaded, with the second one operating as an inverter to the first. If you need the signal out in the conventional, mark-high fashion, the second optoisolator could be eliminated and the signal derived only from the first. Looks like a nice piece of work, fellows, and thanks.

Regards also to Alfred Giuiiano K3QJO, who passes along his interest in the 6800-related RTTY articles. More are certainly on the way, both here and in the rest of the magazine. Remember, *73* is the leader in articles of technical interest to the active amateur, and the place to start for RTTY is right here, in RTTY Loop.

LETTERS

RADIO SHACK CLASSES

I had to write to congratulate you on your great idea for ham classes through Radio Shack. I have often wondered why more stores don't use this as a valuable advertising tool as well as a way to gain numerous new customers. I have taught Novice classes at a local community college with good results, but I think your idea is by far a better approach.

I would like to offer any support or services I could to help this idea advance. I will approach the local owner of the 5-6 Radio Shack stores in the Spokane area with the idea or will let you approach the company as a whole.

I am looking forward to hearing how this idea develops. If the company isn't interested for its 6000+ stores, how about its computer centers in many large cities? These already have training facilities for use so would be ideal with no new expense to the company.

For ease in starting, the Radio Shack book *From 5 Watts to 1000 Watts*, their code oscillator on a board, plus a cheap speaker and code key could be put together in a small package. I think a $25 fee would be plenty unless you anticipate paying the instructor. If so, I would say not more than $100 for a 10-week class.

Again, it's a great idea, and let me know if I can be of any help in making it a success.

Dan Robinson WB7PSO
Spokane WA

ARRL SWINDLE

To All Indiana Amateur Radio Clubs and Interested Hams:

As you probably are aware by now, the present leadership of the ARRL has swindled Central Division League members out of their right to be represented on the ARRL Board by the candidate of their choice. In good faith, Central Division League members recently cast secret ballots for their choice to serve as Central Division Director for the next two years. However, two days before the votes were to be counted, one of the candidates, Director Don C. Miller W9NTP, was summoned to appear before the ARRL Executive Committee the following day to answer charges of alleged election misconduct. Upon his arrival at League headquarters on this incredibly short notice, Don was ushered into a private meeting with President Harry Dannals. After being browbeaten and verbally abused by Dannals, and other League officials for over two hours, Don, at Dannals' direction, signed a letter of resignation as Director for the term ending December 31, 1980. Two other points about this meeting should be noted. First, prior to his signing the resignation, but unbeknownst to Don, the League's Executive Committee (out of Don's presence) had reviewed all of the various allegations of misconduct that had been made and voted to dismiss them and to proceed with the previously scheduled November 20 ballot count. The second and most significant is that Don Miller never withdrew as a candidate in the pending election nor was given a hearing on the question of his alleged disqualification.

Upon his return from Connecticut, Don reported the above cited events to the Officers and Directors of the IRCC. The undersigned then directed our attorneys to conduct a complete investigation of the situation. A report of that investigation and advice on potential future action was delivered to a special meeting of the IRCC Directors held on December 16, 1980, in Indianapolis. The two conclusions reached at that meeting were, one, that Don was clearly not guilty of any wrongdoing that would disqualify him from office, and two, that if Don was willing to participate in any necessary legal action, the IRCC would raise the necessary funds and sue to vindicate our members' rights to have their votes counted and results certified. Several phone calls and letters to the ARRL and their attorneys made it absolutely clear that they would not accede to our demand unless ordered to do so by a court. If ordered by a court to seat Don Miller as Director, they would then initiate proceedings to oust him as a Director on frivolous charges. When Don was notified of this situation, he advised the IRCC that he appreciated our efforts but did not wish to become a party to the lawsuit. Our attorneys have advised us that without Don, we have no real chance to win a case. So, reluctantly for this term, our hands are tied—legally at least.

Although the League has apparently won the battle, the war is not over; in fact, it has just begun. By their patent disregard for the rights of our members in the Central Division, the current League leadership demonstrated to us the acute necessity to take immediate action to protect our rights from this type of outrage in the future. Our first task is obvious: We must do everything we can to strengthen the one statewide organization that can and will speak for the interests of hams in our state and in the entire Division. We must not be cheated again—our strength lies in numbers. If you are presently a member of a Radio Club or know of *any* Indiana radio club or organization who is not yet a member of the IRCC, please seek their support in becoming a constituent member of the Council. The annual dues for clubs is $7.50. Individual members may subscribe to the *Bison*, the Council publication, for $5.00 annually. Our membership chairman is George Ransford W9VMT, 6015 Forest View Drive, Indianapolis IN 46208, phone (317)-255-6180. Remember, your right to have anything is solely dependent on your resolve to do something about it. Help us help all Indiana hams.

T. James Barnes K9TFJ
Indiana Radio Club Council
Secretary/Treasurer
Greenwood IN

GETTING A JOB

Last week I sent your personnel department a resume describing my virtues, but this week I have second thoughts and wonder if I would be a good staff member considering my experience of the last two weeks.

I thought I would write and give you a few facts which have been evident to me during the last few days regarding the hiring of middle-aged technicians in their fifties. Do they retire? Do they start new careers? Or do they just fade away like WWII surplus until there just ain't no more?

I'm pretty typical. I worked in radio stations and two-way shops most of my life, and finally started my own shop in 1962. After 18 years of grappling with the pressure of customers, government, and raising children, I sold my shop to a young man who is now doing real well with it. I realized enough from the deal to retire—for one year.

The relief from the pressure is great, but the not working is awful. Some began to say, "If he would eat, let him also work." This is a true saying, so I hit the streets, made phone calls, and filled the mail boxes with resumes. My goal was to connect with an industrial outfit who needed a competent electronics man.

Now, when I say competent, I don't mean brilliant, but rather consistent, loyal, and industrious. The kind of fellow I would hire would also be imaginative and empathetic to his fellow workers, not necessarily brilliant. The brilliant technicians are called "hot shots" around here, and, though having more smarts than Bill Buckley, they cannot be trusted to come in from a hail of halavah or to wipe when finished. Additionally, the really bright technicians have a kink somewhere and either ride fast bikes, fly planes, collect poisonous snakes, chase women (or men), are super religious or super atheist, or live in filth that would rival the ghettos of Babylon.

So, being competent (but not brilliant) and with a good record that stretches back 35 years, I began to collect rejection slips from the job market. After contacting many electronic firms, I can say, without false modesty, that my resumes have entered the finest companies in the state and exited in a dumpster.

Interesting results of the experience: Technical jobs come in four categories. First, the standard technician (tv, audio, two-way, industrial) can make $135 to $175 in forty hours but

must climb towers, pull stubborn coax through conduits, pull control cables under trucks with greasy dirt falling in his face, and repair his supervisor's stereo on his day off. The next step is the experienced technician of 10 to 20 years who makes $200 to $275 a week and has majored in the local technology of his company while taking a healthy minor in its politics. The $275 to $400 slot is filled with Phi Beta Kappa double-Es who are willing to work 15 hours a day and will relocate in Nome, Rome, or Khomeini's home.

Above $400 a week is reserved for a unique group of technicians who must be led to work, told when to breathe and how, wound up in the morning and pointed toward their simple tasks, and escorted to the john when they begin to wear a pained expression, wave their arms aimlessly, and grunt urgently. This seeming contradiction of classification is understandable when you realize that the above $400 category is reserved for the boss's kin and buddies, the kin and buddies of his Secretary of Carnal Knowledge, minority groups he is compelled to hire, and individuals skilled in sexual perversion and narrowly specialized in the kissing of feet. Result: many staff positions filled by LPNs (Limited Productivity Nuisances).

A lot of people think I am retired, and, temporarily, they are right. It's like the business that didn't intend to be nonprofit. Strangely, I couldn't find technicians when I was hiring and now, from the other side of the situation, jobs are as scarce as virgins in the brothels of Hong Kong. Uncle Wayne, why are there no tooth fairies, Santas, and jobs for old radio men?

For a moment, accessing the real world, I can answer my own question. Picture, if you will, a large balance scale such as the one held aloft by Blind Justice (sister of Talmage Justice, pickpocket, porn dealer, and CB operator); in the left pan picture a neat stack of attractively wrapped parcels labeled Experience, Morality, Integrity, Imagination, and Good Record, which represent the offerings I make to the labor market. In the other pan imagine a dimunitive box labeled simply "54 *and* choosy." Now, to complete the picture, imagine the left pan with its burden of many boxes high in the air while the right pan with its single box is flat on the ground, heavy as neutronium from a dwarf star.

There are several options for a rejected technician: I could join IRTRTFSFMALAIPT, or "I reserve the right to feel sorry for myself as long as I pay taxes." Feeling sorry for myself is a valley I like to visit, but I don't want to live there. Another option is to run away with the fat lady across the street who makes obscene gestures at me from her front window, a result of identifying me with the phallic-symbol antennas on my old Ford. But if I can't afford the tastes of my little cute present wife, how can I afford a king-sized one? Besides, summer is coming on and poverty precludes either air conditioning or Arrid, both necessary when living with a blimp. So I stay put with my little cute XYL who has geography like Dolly Parton, cooks like a French chef, and thinks hams are cute.

While pondering these alternatives the other day, a still, quiet voice said, "Well, isn't this what you wanted—freedom from pressure?" I said, "Yes." The still quiet voice said, "Why not be satisfied?" I said, "Say, who are you, still, quiet voice? Where is your QTH. What mode? FM, SSB, or AM?" And the voice said, "I am the Spirit of Things Put Off, Sotpo to you, fellow." And I said, "So send me a resume, yet," and it said, "I am all the great books you were going to write but flunked senior English ogling at Theresa Higgens low neckline. I am all the splendid music you were going to write but didn't know your A flat from first base. I am all the marvelous inventions you were going to birth, anti-gravity, fusion power, humanoid robots, a decent domestic automobile. I am all these things you neglected while you were rag-chewing on 3930. I am all the businesses you were going to start, but found that mongoloids scored better on management skills. I am..."

"Spare me, spirit," I said. "I am indeed guilty of all you say, and more. But don't tell me what I really am."

Relentlessly the spirit continued, "You are," it thundered, if indeed a still quiet voice can thunder, "You are a tinker."

So I replied, as did Abou ben Adhem when waking from his dream, "Shade, I dig thee not, for thou hast come so close to the truth that I must now close my ears. A human trait, I am afraid."

I told the spirit to split and pondered this revelation. It was true: With all my good traits, I am a tinker and, as such, have probably tinkered my way into a tough situation—unemployment.

Warn your readers, Wayne—a good job is hard to find.

I hope this letter will repay you for the many fine editorials over the years. I feel a little indebted for the good thoughts you share with us.

John Townsend
Wilson NC

John, you have been caught up in the fruitless job-hunting syndrome. It is all too easy to do, spurred on by the stupid system set up by the government employment service (and most firms), which thinks in terms of jobs they have open. The middle-aged person has a difficult time breaking through the usual personnel departments. They don't want youngsters because they have neither the specific needed training nor the experience in how to work. And older people are not appreciated because their training is seldom exactly what is wanted and they have a strong tendency to want to do what they already know how to do, whether it is really appropriate or not in their new job.

Rather than fight this situation, I would suggest not even trying to find a job opening. Rather, you decide what it is you are best at doing. Then you figure what firm might be able to use your abilities and talents. The next step is to do some detective work and find out what the company needs... what things are not being done for them that would help. Then you can go in and show how you can benefit them if they create the job you want to fill. It is far easier and better to create a job which calls for your abilities than to try to find the open job which fits you.

To give you an idea of this, let me say that almost without exception when I get letters asking for work, they always are wanting to know what jobs I have open. Never do they write and tell me that if I hire them they will be able to do thus and so for me, a job which will easily pay for itself in added income or savings to the firm.

My publishing firm is growing and I have a serious need for a lot of new people. For example, at this writing I need an experienced PR man, an ad manager to create and produce our in-house ads, ad salesmen for the magazines, a DP manager, a general manager, and a statistical department manager to get data and prepare reports for the computer industry which we would sell. I need several more people to work in our book department, some for the two new magazines we will be starting this year, a couple of electronic draftsmen, a good photographer to help us prepare our covers, people with video experience to help us prepare video training programs, more staffers for 80, which is growing incredibly, people to help us get amateur radio growing again as we did ten years ago, programmers to help us convert programs from one computer system to another, more staffers for Instant Software which has a projected 500% growth over the next year, marketing people, programmers to write in-house needed programs, technicians to keep our computer equipment working and set up new systems, lab people to work on prototypes of new equipment for articles and for industry, teachers to help train our people in all phases of publishing and computing, school administrators to help us found a college of computing, a financial advisor to help us pay for all this... and so on.

Jobs? I've got plenty, if I can find the people. And I think we can provide a lot of benefit by this growth. A school to teach computing would help the micro industry to grow. It would also help American computer firms compete with Japan. An electronic school would also help American industry to compete with Japan. A growth of Instant Software in the international markets could bring millions or even billions of dollars to the U.S. as this market grows.

Getting amateur radio into a strong growth mode, which I am convinced we could do if I had a few enthusiastic people to help me, might even reverse the technological advantages that

Japan has over America at present. There are so many fantastic possibilities for amateur radio over the next few years that it is incredible that we are just standing still, rag-chewing and working DX as usual instead of getting ourselves busy with inventing the next generation of ham gear...and bringing in hundreds of thousands of new hams. We can do it, if we decide it is important. I will be delighted to help...but I sure can't do it alone.

Does that answer you, John?—Wayne.

FACE THE WALL

The Wayne Green view of the ARRL makes a lot more sense since the Don Miller fiasco. I never did find out the real reasons behind this mess, only that Dannals and Baldwin appeared to be afraid of him. As I suppose you have detected, many of us in Indiana consider Don Miller a giant, as a man, a ham, and an engineer. He has helped scores of people get started. Many ATVers and slow scanners have received good advice from Don. He has the delightful facility of being able to deal with skilled technical people at their level of understanding and also help some rank beginner grasp the mysteries of Ohm's Law without putting him down. I contributed to the ARRL building fund and sent in a check for the WARC fund. However, after this distasteful display of power politics on Don Miller, I have turned my ARRL Life Membership plaque to face the wall.

Ronald C. Williams
W9JVF/ZB2CS
Indianapolis IN

Fair-weather friend.—Wayne.

YES ON CW

Just dropping a line to say hi and keep up the good work. I may not agree with all of your comments and opinions, but I keep an open mind to them. I can always change.

One of the things bugging me lately is the outcry for eliminating the CW requirements for amateur licensing. I cast my vote to keep CW as a requirement for *all* amateur license classes.

For those who wish to get rid of the CW, I ask this: Just why do you wish to get rid of the CW requirement? Is it so someone you know can get on amateur radio? Is this "someone" a person who shows no interest in learning CW? I can't buy the "I can't learn" line. I had all sorts of problems learning CW, and still do. I am at about 16 wpm now, slowly working up to 22.

If that is your basis for eliminating CW, get on your feet and teach the code. If you have to, learn it well yourself. Teaching a class will do wonders for your CW, as well as theory. It is easy to sit back and complain about how hard it is to get people interested in our hobby, but to get out and do something about it is not so easy. I have taught one class, onboard the Coast Guard Cutter *Sherman*, while on patrol in Alaska (sort of a captive class!). The schedule we had and my transfer did not allow me to see the people in the class to their Novice, but I did get one person to get his General (N6DDF). I realize one is not enough, but it is a start. So, instead of complaining about the code, go and teach it. I find very few people with General class or above who hate the code to the point of wanting it eliminated.

Rick Malnhart WB3EXR/6
San Francisco CA

HAM SCHOLARSHIPS

The Foundation for Amateur Radio, Inc., a non-profit organization with its headquarters in Washington DC, plans to award eight scholarships for the academic year 1981-82. All amateurs holding a license of at least the FCC General class or equivalent can compete for one or more of the awards if they plan to pursue a full-time course of studies beyond high school and are enrolled or have been accepted for enrollment in an accredited university, college, or technical school. The scholarship awards range from $300 to $900, with preference given in some of them to residents of various areas.

Additional information and application forms can be requested by a letter or postcard, postmarked prior to May 31, 1981, from: FAR Scholarships, 8101 Hampden Lane, Bethesda MD 20014.

The Foundation is devoted exclusively to promoting the interests of amateur radio and to scientific, literary, and educational pursuits that advance the purposes of amateur radio.

Foundation for Amateur Radio
Washington DC

A NEW PROPOSAL

This letter is in response to the appeal in the December issue of *73* for a code-free licensing proposal. I have been a subscriber to *73* for a few years now and have enjoyed and kept every issue and have built dozens of projects from your construction articles.

If there ever was a victim of the Incentive Licensing plan, I am one. I built my first broadcast band receiver from instructions in a Cub Scout handbook at age 9 in 1958. Over the next few years, I followed my new hobby through *Popular Electronics* and borrowed electronics books (I had not heard of *73* until the late 1970s). In the early 1960s, I met my first amateur, the father of a school classmate. I'll never forget being mesmerized while listening to him talk to the end of the universe (to me), some foreign country called Argentina.

I began visiting the father more than my classmate and began studying to get my license, but a strange thing happened to my amateur friend. Something new he called Incentive Licensing had just been approved, and he went on and on about everything that had been lost and how some of his amateur friends couldn't operate as before. I never did quite understand what he was talking about until I subscribed to *73*. He lost considerable interest in his station and turned more and more to public and Civil Defense type weather radar and police communications. I quit going over so much, and I soon moved to Kansas City where I built my first three-band tube receiver from a kit I bought at a local store I had been using as a mail-order house when I lived out of state. B/A had all kinds of electronic goodies, including my favorite device at the time, the CK722. It is hard for me to realize that in the last 22 years of my life, I have experimented with everything from blue razor blades and a pencil lead for a detector through tubes and now microprocessors and am still just 31 years old.

I have started but never received my amateur's license for almost 20 years now, all because of the code requirements on the exam. I never had the feeling of mystique or curiosity about the Morse code and never saw any need for it, as voice made for a more personal contact and teletype was a perfect form of data-coded messages, not to mention the ASCII of late.

I feel that without the code requirement, I could have become a radio amateur long ago, and by now would know the code and could have possibly helped with development of some form of communication through the amateur bands. Instead, I teach basic electronics and kit building at my daughter's school through a community education program that pays me less than $8.00 a course, but is worth a million dollars when I see the kids' eyes light up when they turn the switch on and their first hand-made project works.

My proposal for a code-free licensing program would be to select some band or bands where no commercially available rigs are built, making admission to the band possible only through building or altering equipment that is available on a nearby band. FCC-type theory and rules tests should be used, but not even a code recognition test. This would defeat the point, as code recognition is about 5 wpm, which can get you a Tech license after taking the General theory test now.

Have a small portion of each band code only, and this portion of the band would be the only portion of the band where General class or above incentive ticket holders could use the otherwise closed band. This would give the non-coders a desire to try to learn the code to contact needed areas and possibly to upgrade to General or higher tickets later on. Power should be limited to 250 Watts or less, and all forms of emissions could be used or leave several small bands with one or two emission forms in each.

Now I realize that this proposal is a little offbeat, but I feel that the basic idea could be used to form a new class of electronic experimenter amateurs that would more than likely

learn the code and upgrade much faster and in greater numbers than what we have now.

I don't know whether or not we should keep the present form of licensing also so that non-electronically-inclined people can memorize the theory and practice in groups until they become programmed to take and pass their incentive plan and become appliance operators. These people don't know the difference between a microprocessor and an op amp; maybe so, we could always use a few more good net controllers. If you don't believe this, listen in on some of the "technical" discussions on the air, and listen to the cries for help on simple modifications to modern-day CB rigs to go onto 10 meters to enjoy an almost vacant band.

I've read letters condemning CBers in your letters column, and then tuned in on a DX contest only to hear the same CB type of operators, only on legal amateur bands with amateur call letters, full FCC support, and League encouragement. There is no wonder that the amateur ranks are falling; after all, so did the CBers. It is too easy to just buy a rig, plug it in, and know nothing about how it works or even how to make simple repairs or modifications.

I have the *73* 5 wpm tape and the 6+ tape and have loaned them to people that express an interest in amateur radio. I even helped a man at work with his theory so that now he is an amateur. The main thing is, he is starting (because of my insistence) to experiment with kits so that now he knows the difference between a diode and a resistor. He didn't have to know it to get his ticket, he just had to know the code and a few rules. Is this the way to keep the undesirables out of the ranks of radio amateurs and off the air? Somehow I think it would be better to build your way up to be an amateur instead of memorizing the present system.

J. Olsen
St. Louis MO

Olsen... no clickee, no tickee. —Wayne.

ANY YO-YO

With regard to the letter from Verle D. Francis WØSZF (March, 1981): Just wait a minute! Mr. Francis "proposes" to allow "code-free, test-free licensees" to use all amateur phone bands with a code test the only requirement for CW operation. I think that no regulations is carrying deregulation a bit far.

I also suggest that if my wife, who is about as technically competent as a flashlight, can earn, yes, earn, her Technician class license (that's the General written test, group), then any yo-yo can, Mr. Francis included.

Bill Hocutt KC4P
Birmingham AL

Right, Bill; let's go to Novice at 50 wpm and see if we don't get a better class of ham.—Wayne.

LIKES THE PRICES

I, too, dislike advertisements which fail to mention an item's price, and as much as possible I refuse to buy anything from a manufacturer or distributor who is so ashamed of his prices that he will not print them. You, as editor of the amateur radio magazine with the most advertising copy, could do all amateurs a great service by refusing ad copy which didn't contain prices.

Also, you have been singing the praises of Casio watches in recent issues. I own a Casio F-80 which I bought in September. Two months later, several functions failed. I returned the watch for in-warranty service to the manufacturer's service center. I received the watch back yesterday, well scratched, a prompt 83 days after I sent it for repairs.

Blair Bates K3YD
Hazleton PA

Okay, phooey on Casio.—Wayne.

CALL FOR PAPERS

For the past 26 years we have held an amateur VHF conference at Western Michigan University. It started when Emeriti Professor of Physics, Walter Marburger W8CVQ, recognized the need for a radio amateur conference to promote VHF activity.

Through the years we have had some outstanding presentations of new designs and techniques, construction, testing, and the announcements of new products. Ed Tilton W1HDQ ("The World Above 50 MHz"), Doug DeMaw W1CER; Dave Hallock (Collins on FET Front Ends), Dr. D. M. Chen ("Free Space Antennas"), Dr. John Lyons ("Ferrite Antennas"), Dr. J. McMechan ("Two Meter Antenna Systems"), Dr. Gooch ("Three Phase SSB on Two Meters"), Chris Frank (Hallicrafters), Robert Groh (Heathkit "Microprocessors in VHF Transceivers"), Jim Kearman, Tom McMullen, Ted Hartson, Clarke Green, and many others have all contributed. To them we give our thanks.

Now we are endeavoring to go a step further. For the past two years the conference non-amateur attendance has increased while the amateur attendance has decreased. We are now appealing to the practicing radio engineer as well as the amateur who is interested in an educational conference rather than a social swap-and-shop session. We are getting the technical-minded *amateur and* professional rather than "operator-types."

As a university sponsorer, this is as it should be; we would like to raise the quality of the conference and at the same time give young pre-professionals experience in paper presentation. One way to do this is to call for papers. We may still have to invite papers, as we have done in the past, but we still feel that a call for papers to all sectors, both amateurs and other VHFers, will produce some results.

The 27th Annual VHF Conference will be held on Saturday, October 17, 1981, from 2:00-5:00 pm at Western Michigan University, Kalamazoo MI. Papers are invited for the 1981 Annual VHF Conference sponsored by the Electrical Engineering Department. Principal emphasis will be placed on engineering developments applied to radio communication, design, and construction on the frequencies of 30 to 1200 MHz.

Papers are solicited from a wide range of areas including, but not necessarily limited to, those listed below:

- Antennas and Transmission Lines
- Audio Frequency Equipment Used With VHF Transmitters and Receivers
- Beginner and Novice Topics
- Contests and Operating Activities
- Emergency Operation and Gear
- Grounding and Shielding
- Keying, Break-in, and Control Circuits
- Measurements and Test Equipment for VHF
- Mobile and Portable Equipment and Operating
- Picture Transmission and Reception
- Power Supplies
- Propagation
- Receiving
- Recent Equipment/New Apparatus
- Regulations
- RTTY
- Satellites
- Transceivers
- Transmitting

One of the basic purposes of this conference is to provide a maximum opportunity to present findings by those experimenting, designing, constructing, testing, and inquiring into problems and methods applicable to VHF radio.

This is an opportunity for beginning or mature researchers to report their findings to their peers. We especially encourage the unexperienced inquirers to obtain some experience by presenting a paper at our VHF Conference.

Authors wishing to present papers should send a synopsis (typically one or two pages with diagrams) describing the paper to: Dr. Glade Wilcox W9UHF/8, Program Chairman, VHF Conference, Department of Electrical Engineering, Western Michigan University, Kalamazoo MI 49008.

Deadline for submission of synopses is June 30, 1981. Speakers will be notified of acceptance by October 1, 1981. Final drafts may be given to the Chairman the day of the Conference. Awards of papers and the possibility of publication are being explored.

Glade Wilcox W9UHF/8
Kalamazoo MI

Well, Glade, while I'm all for your conference, I suspect that one of the reasons your attendance and participation have been dropping on the ham end has to do with the lack of media attention. Advertising still pays. You don't have to pay for ads for such a conference, just see that some of the more interesting papers are made available for publication. There are thousands of hams who would be interested in some of the material presented at your conferences, but they have no way to get it. I attended a similar conference at the University of New Hampshire and I was dismayed at the

wealth of material presented which never really reached more than the few attending the conference. Pity. Perhaps your letter will bring in some ham response. I suspect that if you were to make arrangements for some of the material to reach us for publication, you'd soon be getting a lot more interest.—Wayne.

FCC COMMISSIONER?

It has occurred to me that there has never been an FCC Commissioner who has been an amateur. We have never had a voice in the inner circle of that agency. As it happens, there will be several appointments to the FCC by June of 1981. I am an amateur as well as a working broadcast engineer. I think I have a feel for both broadcasting and amateurs. In considering who usually occupies those offices on "M" Street, I am reminded of the old Mexican curse —"May your life be filled with lawyers." We need a change from that.

I have communicated my idea to both Senator Tower because he is my Senator and to Senator Goldwater for three reasons. First, he is an amateur; second, he will be Chairman of the Subcommittee on Communications; and third, because I have a special, non-obligatory, relationship with him since in 1964 I was a member of a slate of electors pledged to Goldwater/Miller which was elected in Mississippi. Also, I wrote to both because they are influential members of the Republican Party. As yet, there has been no response, but that is not unusual; they get so much mail.

Perhaps a few letters from your readers on the subject to either or both would bring this idea more forcefully to their attention. Of course, if there are readers who know other persons high in the party, letters to them, too, would help.

While I am putting myself forward, I must, in all honesty, admit that there are others in the broadcasting and amateur fraternity who are more qualified than I. If anyone has others to propose, I would be happy to support them because I feel we should have a voice—mine or another amateur's.

Should anyone want to know where I stand philosophically on the specific issues, amateur or otherwise, facing the FCC, I would be most happy to correspond with them.

G. D. Causey
3641 North 11th Street
Abilene TX 79603

Wrong, GD...we did have a ham commissioner and it was he who got us the Novice license, over the badly wounded body of the ARRL. Up until George Sterling, the ARRL had its own way with the FCC.—Wayne.

VIDEO TRAINING

I've just read your editorial goal of gearing up a quarter-million hams in the near future. I am impressed, and excited. I am a high school chemistry teacher, and I have been looking for some assistance in setting up a ham station at the school.

We have over 500 students, including three active hams, all capable and interested. They all get over three hours a week on Apple II computers, of which we drive eight, with double disk. I believe I can interest at least 10% of these kids to try amateur radio, and surely half of those would get their ticket.

The notion of video training sessions seems to me a godsend. I have had a Technician license for two years, but have not been active enough to consider myself a good model of operation. Having video tapes for training would overcome this problem. I am already familiar with your code tapes, and consider them excellent.

Please let us all know when the video tapes are ready. My check for a course set would be in the next post. Other high school teachers I know would do the same.

Jim McSherry N3AMF
Philadelphia PA

ENJOYS EVERYTHING

I would sure like to see you blast the ARRL contest organization in your Never Say Die editorial.

When a contest is on—for example, the Novice Roundup—all of the Novice band sections are pure QRM, teaching and encouraging complete disregard for courtesy on the air. A *small* portion of the entire Novice/Technician population hogs all parts of the bands and creates havoc for those with skeds, etc.

Why can't contests be limited to a portion of each band where they can enjoy(?) the QRM and know where to find their other contestants? I bet that if you were an official in the ARRL, you would do something like I suggest.

Sel Carlson KA6ERF
Napa CA

No, I'd only make it worse. I happen to enjoy contests, QRM, frustration, aggravation, and such, while not liking skeds.—Wayne.

HAM HELP

I am trying to locate anyone having back issues of *Kilobaud*, *73*, *Ham Radio*, or other similar magazines who would be willing to either donate or sell them to a young Indian ham.

Raj VU2UT is a college student in India, and is very interested in radio and microcomputers. He currently has a 6502-based micro called the Junior Computer, with a 1K RAM made by the publishers of *Elecktor* in Germany. Any information and help for him with this unit would also be appreciated.

H. Christopher Ayers WB7TXY
2914 SW 116th
Seattle WA 98146

I'm looking for paperwork or an actual working model of a digital readout for the HW-101. Thanks.

L.D. Dickerson N4DBS
12453 Northwood Road
Savannah GA 31406

I need a schematic and/or other info on a 450-MHz solid-state transceiver, "Trans-Com" model 940, manufactured by Communications Company, Coral Gables FL (no longer in business). I will pay for a Xerox, etc. Thanks.

Harlan Goodsell W7LTH
70 South 2nd East
Hyrum UT 84319

I need a manual or schematic for an Omron Systems Model 8025 CRT terminal. A photocopy is fine. I will be glad to pay for any copying costs.

Roger Eslick KB4VT
29 Elmora Avenue
Goose Creek SC 29445

I am looking for anyone interested in forming an 1802 users net on 20 meters. Any info, comments, or suggestions about this would be welcomed.

Bernie Murphy
102 McCraney Street
Oakville, Ontario
Canada L6H 1H6

Would someone be willing to help a lad who is working his way through high school as well as helping a widowed mother, younger sister, and brother? An uncle gave a several years subscription to *73* as a birthday present to help future ham exam aspirations, but the lad's hatred of scrounging keeps him quiet on a further wish. If someone has no further use for a set of *Callbooks* (one issue) from last year, these would be gratefully received, as his own homebuilt receiver is in use. In return, postcards or a souvenir of ZL-land, or your requirements, could be sent. Please sent to:

B. Wilson
PO Box 1082
Hamilton, Walkato
New Zealand

I want to thank you for your help in getting a much needed schematic for a frequency counter I have. One week after I received my copy of *73*, I received a letter from Gil Desvernine W2PKZ who offered to copy it for me. Thanks again.

Dennis Cornell WD4HRO
Millington TN

KAHANER REPORT

Larry Kahaner WB2NEL
2301 Cathedral Ave. NW
Washington DC 20008

PLAIN TRUTH ABOUT PLAIN RULES

Highlighting my first column from Washington DC, the center of the empire, is perhaps the most important FCC action since ham radio began. The Commission has chosen amateur radio rules and regulations for plain-language revision. Following the FCC's success with the plain-language rewrite of Citizens Band rules—which, incidentally, changed the name to Personal Radio Service—it decided to continue the process with amateur radio.

The legal stuff happened last year. A notice of proposed rulemaking was adopted by the Commission in November and released the following month. That NPRM laid the groundwork and said, in part, "We chose the Amateur Radio Service rules as our latest plain language revision because the existing rules are unnecessarily complex and difficult to understand. This is especially a problem in the Amateur Radio Service since many of our applicants and licensees are young persons."

Amateurs will benefit from the rewrite in many ways. The darn rules will be written in English, so we can all understand them. In fact, the format will be question and answer. It's not beautiful prose, but it's easy to understand. In addition, some rules will be relaxed, others brought up to date.

First of all, the Service's new name is "Amateur Telecommunications Service." In its own subtle way, the Commission hopes that this will make us think of ourselves as more than just voice and Morse code people. The name change reflects growing interest in digital communications.

Second, good old Part 97 will be divided into four sections: (a) Amateur Radio rules, (b) RACES rules, (c) Amateur Satellite rules, and (d) Standards, for all three.

Now the good part. Most changes are just in wording, altering lawyerese to American. But while the FCC clutched its pen, some deregulation crept in. Here are some bright points.

The FCC proposes eliminating all logging requirements. In its place, you must keep the following when you operate: your license or photocopy, copies of letters in which you informed the FCC of address changes, copy of the Amateur Telecommunications Service rules, any written permission you received from the Commission, and copies of letters from the FCC about your station or operator's license.

Radio District	Group A	Group B	Group C	Group D
0	KIØH	KBØVU	NØCIH	KAØKJK
1	KC1F	KA1NX	N1BIM	KA1GOB
2	KK2H	KB2WU	N2CHL	KA2LHO
3	KC3L	KB3NS	N3BQZ	KA3HAU
4	NJ4C	KC4WP	N4EEF	KA4TJL
5	KO5X	KC5GT	N5CTW	KA5KXS
6	KV6F	KD6QO	N6DYT	KA6OMB
7	KG7A	KB7TT	N7CHS	KA7JQJ
8	KK8L	KC8AI	N8CJW	KA8MCJ
9	KE9H	KB9VC	N9BYW	KA9KEG
N. Marina Island	AHØA	AHØAA	KHØAC	WHØAAE
Guam	AH2K	AH2AH	KH2AO	WH2ACT
Johnston Island	None	None	KH3AB	WH3AAB
Midway Island	None	AH4AA	KH4AC	WH4AAF
Hawaii	NH6I	AH6CK	KH6LN	WH6ANX
American Samoa	AH8A	None	None	WH8AAK
Wake, Wilkes, Peale	None	None	None	WH9AAA
Alaska	NL7T	AL7BS	KL7LU	WL7APC
Virgin Islands	KP2B	KP2AC	NP2AH	WP2ACK
Puerto Rico	NP4E	KP4BZ	NP4BV	WP4BTG

Table 1. Callsigns issued February 1, 1981. Group A = Extras; B = Advanceds; C = Techs and Generals; D = Novices.

For repeaters, you must keep these items: computations for average height above average terrain and external power. For remote control operations, you need: control operators' names, calls, and addresses, block diagram and technical explanation of link, description of measures for shutting down the station if control link fails, and, finally, measures for monitoring transmission frequency.

You must retain these records for your license term.

Not bad. The FCC shows a lot of class with these changes. And not only are the new rules easier to understand, they're easier to read. The old rules were written in super-small type that looked like a cut-rate washing machine warranty. New rules are in typewriter-size type.

The FCC isn't doing this in a vacuum, mind you. If you harbor comments about plain language rules, let the Commission know. You may respond to the proposal by reading the text, or just the parts you're hot about, and letting them know if they're on the right track. Positive comments carry as much weight as negative ones.

For information on how to contact the FCC about Docket PR 80-79 (the PR means Private Radio Bureau, 80 is the year it was written, and 79 means it was the 79th issue from the bureau), call John Johnston at (202)-254-6884. Or you can write him at FCC, Private Radio Bureau, 1919 M St., Washington DC 20554.

Comments are due by June 19. Replies to those comments must be in by August 19. And, if you believe, or your group believes, that the Commission is making a huge mistake and you have some ideas of your own but need more time to get them organized, you may ask for a deadline extension. If the reason is important enough, the FCC will grant extra time.

NO NEW LICENSES FOR CLUBS, SO FORGET IT

On occasion, the FCC will issue statements on subjects that seem to cause a lot of concern or misunderstanding. Sometimes they are just rehashes, sometimes gentle reminders, sometimes clarifications.

The FCC has received loads of queries about new licenses for clubs, military recreation, and RACES stations. Last May, the Commission amended rules pertaining to these stations, and the folks in Washington want you to know they haven't changed their minds. No new licenses for clubs, military recreation, or RACES stations will be issued. Period.

Only renewals or modifications are allowed. However, changing a trustee or club name is considered a modification, and that is allowed. If you still don't believe it or you want to argue, call the Consumer Assistance Staff in Gettysburg PA at (717)-334-9167.

CALLSIGNS: CAN'T SEEM TO GET ENOUGH

In keeping with hams' insatiable hunger for call-letter roulette, the FCC published a chart of issued call letters. Callsigns listed in Table 1 are the *last* ones mailed, as of February 1.

MARINE GRAB FOR 220?

Contrary to rumors floating around in ham circles, the FCC never seriously considered placing the automated inland waterways communications system in the 220-MHz band. The system, which will be used for ship-to-shore communications only, was slated for 216-220 MHz or 806-890 MHz.

Similar to the proposed cellular mobile-telephone service, the inland waterways service places repeaters all along the Mississippi River and its major tributaries. To contact a boat, you dial a central number and it connects to the repeaters. Instead of the old system of trying to find the marine operator nearest your vessel—and maybe taking several radio calls from various operators—it takes only one dialing. It works the other way, too. Instead of vessels calling the nearest marine operator, the crew simply dials a conventional telephone and the nearest repeater is keyed up. The system also transmits data and facsimile and will be used mostly by commercial vessels such as barges and tugs.

The FCC decided to allot 216-220 MHz for the service.

WELL, THERE GOES THE NEIGHBORHOOD

Whether the FCC is definitely moving across the Potomac to Rosslyn VA is still a tough one to call. In the long run, the FCC could save money, and instead of being spread out over three downtown buildings, they would be in one. Amid all the controversy and alleged under-the-table dealings, Congress is balking at the move because it's never happy when federal agencies leave the District.

ONE OF THE OK GUYS LEAVES

Charles Ferris, FCC top banana, retired last month. Heavy-duty broadcasters didn't like Ferris because of his yearning for broadcast deregulation.

Under Ferris' rule, low-power TV was proposed, cable companies flourished, and satellite superstations grew. Networks, which for years had the only wheel in town, wanted to keep it spinning their way. The more players in the game, the less each player gets. And the big guys couldn't handle it.

At presstime, his replacement wasn't named, but smart money is on Mark Fowler, a communications lawyer. To be an FCC commissioner (the chairman is also a commissioner), you don't need a high-school diploma or any discernible skills. It's strictly by presidential appointment. Even money won't help you get the job unless it finds its way into the right politician's pocket.

FCC

Reprinted from the Federal Register

Changes in Procedures for Approval of Proposed Antenna Structures in the Amateur Radio Service

AGENCY: Federal Communications Commission.

ACTION: Final rule.

SUMMARY: The Commission is amending Parts 17 and 97 of its rules to simplify its procedure for processing requests for approval of Amateur Radio station antenna structures with regard to possible hazard to air navigation. The Commission is also making an editorial change to conform a rule section in Part 97 to a parallel rule section in Part 17.

EFFECTIVE DATE: The amendments being adopted are subject to the clearance of reporting requirements by the General Accounting Office, the effective date of this action will be announced by public notice in the near future.

ADDRESS: Federal Communications Commission, Washington, D.C. 20554.

FOR FURTHER INFORMATION CONTACT: John B. Johnston, Private Radio Bureau (202) 632–4964.

SUPPLEMENTARY INFORMATION:

In the matter of changes in procedures for approval of proposed antenna structures in the Amateur Radio Service.

Adopted: January 6, 1981.

Released: January 21, 1981.

By the Commission: Chairman Ferris absent.

1. Section 303(q) of the Communications Act of 1934, as amended, provides that the Commission shall "have authority to require the painting and/or illumination of radio towers if and when in its judgment * * * there is a reasonable possibility that they may constitute a menace to air navigation." Part 17 of the Commission's rules sets forth criteria and procedures by which the Commission exercises this authority.

2. In the Amateur Radio Service, an antenna structure which would exceed certain height limitations (set forth in § 97.45) may not be erected or used unless prior approval by the Commission has been obtained. Currently, amateur radio operators obtain this approval by filing FCC Forms 610 and 714 with the Commission and FAA Form 7460–1 with the FAA. These requests for antenna structure approval are processed partially at the Private Radio Bureau licensing facility in Gettysburg, Pa. and partially at FOB Antenna Survey Branch in Washington, D.C.

3. We are amending Parts 17 and 97 of our rules to allow amateur radio operators to file a single form to obtain approval of proposed antenna structures, instead of the two forms (610 and 714) currently required. By this action, we are simplifying the antenna approval process for both Amateur Radio licensees and the Commission. All antenna structure approval requests filed on the new form will be processed entirely in Washington, D.C. by the Antenna Survey Branch.

4. We are also amending paragraph (a) of § 97.45 to agree with the current wording of § 17.7 of the rules. Since Amateur Radio Service licensees are subject to the provisions of Part 17, this amendment is editorial in nature and imposes no new requirements.

5. Since the rule changes herein ordered concern the Commission's antenna approval procedures and practices, and also involve an editorial amendment to conform Part 97 Amateur Radio Service Rules to Part 17 antenna requirements, we are dispensing with the prior notice and public procedure provisions of the Administrative Procedure Act (see 5 U.S.C. 553(b) (A) and (B)). However, as the amendments being adopted are subject to the clearance of reporting requirements by the General Accounting Office, the effective date of this action will be announced by public notice in the near future.

6. For information on these rule changes contact John B. Johnston, (202) 632–4964.

(Secs. 4, 303, 307, 48 Stat., as amended, 1066, 1082, 1083; 47 U.S.C. 154, 303, 307).

Federal Communications Commission.

William J. Tricarico,

Secretary.

Appendix

PART 17—CONSTRUCTION, MARKING, AND LIGHTING OF ANTENNA STRUCTURES

I. Part 17 of Chapter I of Title 47 of the Code of Federal Regulations is amended, as follows:

In § 17.4, paragraph (a) is revised, and a new paragraph (h) is added:

§ 17.4 Commission consideration of proposed antenna structure with respect to possible hazard to air navigation.

(a) Except as provided in paragraph (h) of this section, all applications are reviewed to determine whether there is a requirement that the applicant file a Notice of Proposed Construction or Alteration (FAA Form 7460–1) with the Federal Aviation Administration.

* * * * *

(h) Applications for amateur radio station licenses and RACES station licenses are not reviewed for antenna structure approval. Applicants and licensees in those services may not erect or use an antenna which exceeds the height limitations contained in §§ 17.7 and 17.14 of this chapter unless notice has been filed with both the FAA on FAA Form 7460–1 and with the Commission on FCC Form —— and prior approval by the Commission has been obtained.

PART 97—AMATEUR RADIO SERVICE

II. Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended, as follows:

In § 97.45 paragraph (a) introductory text and subparagraph (3) thereof are revised as follows. Also, a new subparagraph (4) is added to paragraph (a).

§ 97.45 Limitations on antenna structures.

(a) Except as provided in paragraph (b) of this section, an antenna for a station in the Amateur Radio Service which exceeds the following height limitations may not be erected or used unless notice has been filed with both the FAA on FAA Form 7460–1 and with the Commission on FCC Form ——, and prior approval by the Commission has been obtained for:

(1) * * *

(2) * * *

(3) When requested by the FAA, any construction or alteration that would be in an instrument approach area (defined in the FAA standards governing instrument approach procedures) and available information indicates it might exceed an obstruction standard of the FAA (§ 17.7(c) of this chapter).

(4) Any construction or alteration on any of the following airports, including heliports (§ 17.7(d) of this chapter).

(i) An airport that is available for public use and is listed in the Airport Directory of the current Airman's Information Manual or in either the Alaska or Pacific Airman's Guide and Chart Supplement.

(ii) An airport under construction, that is the subject of a notice or proposal on file with the Federal Aviation Administration, and except for military airports, it is clearly indicated that the airport will be available for public use.

(iii) An airport that is operated by an armed force of the United States.

LOOKING WEST

from page 138

hope to be able to discuss the important points of the proposed rules in the column the next few months. At this time, everything is just innuendo and rumor except the already well-publicized points. I guess there will be some who say that this latest "bug" in the FCC's eye was caused by the modelers. I doubt it. If there is anything to it, and if amateurs eventually lose R/C privileges on six meters, it will probably be the result of internal FCC policy more than anything else.

Oh, yes, lest I forget: It seems that there are many differing interpretations of Carson's Rule as there are engineers. I suspect that all are correct in some way. Not being an engineer myself, I hazard to venture any further guesses. I learned of the existence of Carson's Rule during the time I was heavily involved in two-meter repeater coordination activities here in the southwest, this during the time we were considering whether to go upright or invert the 15-kHz tertiary channels. When applied, both the definition you give and that utilized by the then SCRA seem applicable. Another result of the bandplan article has been a myriad of interpretations of the aforementioned Carson's Rule. The basic differences are semantic in nature.

Again, Lew, thanks very much for taking the time for writing the detailed letter. As I said in the note of two weeks back, I will endeavor to see that it appears in print.

The last two Looking West columns might be described best as a discourse between two amateurs who have sincere concern for the future of an important amateur band. There is no doubt that our end objectives are the same. We differ only in the way we approach solving the dilemma.

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received two months prior to the month in which the event takes place. They should be sent directly to Editorial Offices, 73 Magazine, Pine Street, Peterborough NH 03458, Attn: Social Events.

SUNNYVALE CA
MAY 1-3

The West Coast UHF Society and Project OSCAR, Inc., will hold the 26th Annual West Coast UHF Conference on May 1-3, 1981, at the Sunnyvale Hilton, 1250 Lakeside Drive, Sunnyvale CA 94086. There will be registration Friday night and a social in the hospitality room. Saturday registration will begin at 8:15 am and be followed by orientation, technical sessions, a barbeque cookout luncheon, prize drawings in the afternoon, and dinner. Saturday night will also include noise figure measurements. Sunday morning will feature a show-and-tell of homebrew projects, as well as antenna measurements tests. Pre-registration is $5.00; cost at the door will be $8.00. For more information or pre-registration send an SASE to West Coast UHF Conference, PO Box 5283, San Mateo CA 94402.

GRAY TN
MAY 2-3

The Bristol Amateur Radio Club, the Johnson City Amateur Radio Association, and the Kingsport Amateur Radio Club will hold their first annual Tri-Cities Hamfest on May 2-3, 1981, at the Appalachian Fairgrounds, north of Johnson City (off Highway 137), Gray TN, from 9:00 am to 5:00 pm on Saturday and from 8:00 am to 4:00 pm on Sunday. The dealer space charge at the door is $30.00 for the weekend for a 10 × 12 space. The dealer charge also includes security and admission for five employees. There are approximately 40 RV spaces with complete hookups renting for $5.00 per night inside the fairgrounds. Motels are available nearby. Dealers can set up anytime after Friday noon or after 6:00 am Saturday and Sunday. Further information can be obtained by writing Mary S. Biggs KA4EXP, Secretary-Treasurer, Tri-Cities Hamfest, PO Box 3682 CRS, Johnson City TN 37601, or phoning either (615)-928-1818 or (615)-282-1711-x380.

GREENVILLE SC
MAY 2-3

The Blue Ridge Amateur Radio Society will hold its annual hamfest on May 2-3, 1981, at the American Legion Fairgrounds, Highway 25 bypass, Greenville SC. On Saturday, FCC exams will be given at Greenville Tech from 10:00 am till 3:00 pm. Other features will include dealer exhibits, inside flea markets, chicken/pork plates, prizes, overnight RV parking, and motel rooms available at the Ramada Inn (1-800-228-2000).

WOODBRIDGE NJ
MAY 2

The DeVry Technical Institute Amateur Radio Club (WA2MDT) will hold its fifth annual amateur radio and computer flea market on May 2, 1981, at DeVry Technical Institute, 479 Green Street, Woodbridge NJ. The flea market will begin at 9:00 am and for those who wish to set up tables, a fee of $3.00 will be charged. Talk-in on 146.520 beginning at 8:00 am. For further information, call Frank Koempel WB2JKU at 634-3460 or Steve Hajducek KA2IFX at 727-5962.

MEADVILLE PA
MAY 2

The seventh annual Northwestern Pennsylvania Hamfest will be held on May 2, 1961, at the Crawford County Fairgrounds, Meadville PA. The gates will open at 8:00 am. Admission is $3.00; children under 12 will be admitted free. Indoor table spaces are $5.00 per space and outdoor car spaces are $2.00. Bring your own tables. Refreshments will be available. Commercial displays are welcome. Talk-in on .04/.64, .81/.21, and .63/.03. For information, write CARS, PO Box 653, Meadville PA 16335, Attention: Hamfest Committee.

LYNCHBURG
MAY 3

The Lynchburg Amateur Radio Club will hold its third annual swapfest at Brookville High School in Lynchburg on Sunday, May 3, beginning at 10:00 am. Tables, food service, and plenty of free parking will be available. Talk-in on 146.01/.61 and 146.52 simplex. For further information, contact Kenneth D. Grimm K4XL, 505 Hayes Dr., Lynchburg VA 24502.

STIRLING NJ
MAY 3

The Tri-County Radio Association will hold its annual indoor hamfest flea market on May 3, 1981, at the Passaic Township Youth Center, Valley Road, Stirling NJ, from 9:00 am to 4:00 pm. A donation is $2.00 and the tables are $5.00. Hot food and refreshments will be served. An Icom IC-2AT will be one of the many door prizes. Talk-in on 147.855/.255 or 146.52. For information, write TCRA, Box 412, Scotch Plains NJ 07076, or call Herb Klawunn W2CHA at (201)-647-3461.

PENNS PARK PA
MAY 3

The Warminster Amateur Radio Club will hold the 7th annual Ham-Mart on Sunday, May 3, 1981, from 9:00 am to 4:00 pm (rain or shine) at a new location, Middleton Grange Fairgrounds, just minutes from I-95 or the Pennsylvania Turnpike on Penns Park Road, Penns Park PA. Featured will be door prizes, plus a grand prize to be drawn at 3:00 pm, a flea market, a free FM Clinic, and an auction. There will be refreshments, rest rooms, and shelter available. Registra-

tion is $3.00 per person, which includes one ticket for door prizes. YLs, XYLs, and children under 14 will be admitted free. Seller (tailgater) spaces are $2.00 (with tables available). Talk-in on 146.52 or WARC 147.69/.09. For additional information, write WARC, PO Box 113, Warminster PA 18974, or call Mark Hinkel WA3QVU at (215)-657-7295.

SULLIVAN IL
MAY 3

The 20th annual Moultrie Amateur Radio Klub Hamfest will be held on May 3, 1981, at the Moultrie County 4-H Center Fairgrounds, located 5 miles east of Sullivan IL, on Cadwell Road. There will be a heated indoor and a large, covered outdoor flea market. There is no charge to vendors. Space is available on a first-come, first-served basis. Talk-in on 146.94 and 146.055/.655. For more information, write MARK, PO Box 327, Mattoon IL 61938.

EAST HARTFORD CT
MAY 3

The Pioneer Valley Radio Association will sponsor its fourth annual flea market on Sunday, May 3, 1981, at a new location in the George Penny High School, East Hartford CT, from 10:00 am to 4:00 pm. The admission donation is $1.00 and tables are $8.50. For advance table reservations or information, contact Arnie K1NFE, PO Drawer M, Plainville CT 06062.

DEERFIELD NH
MAY 9

The Hosstraders will hold their eighth annual tailgate swapfest all day on Saturday, May 9, 1981, at the Deerfield Fairgrounds, Deerfield NH. Admission is $1.00, which includes tailgating and commercial dealers. Profits will benefit the Boston Burn Unit of the Shriners' Hospital for Crippled Children. Last year we donated $2,058.16. Talk-in on .52 and 146.40/147.00. For more information, send an SASE to Joe K1RQG, Star Route, Box 56, Bucksport ME 04416; Norm WA1IVB, RFD Box 28, West Baldwin ME 04091; or Bob W1GWU, Walton Road, Seabrook NH 03874.

CEDARBURG WI
MAY 9

The Ozaukee Radio Club will hold its annual indoor swapfest on Saturday, May 9, 1981, at the Cedarburg Community Center Gym, Washington Avenue, Cedarburg WI. Cedarburg is 22 miles north of Milwaukee. Doors will open at 8:00 am for the general public and 7:00 am for table setup. Admission is $2.00 in advance and $3.00 at the door. Tables are $3.00 per 6 feet (advance purchases are recommended). Features will include door prizes, food, refreshments, and free parking. Talk-in on 146.37/.97 and 146.52. For more information or advance tickets, send an SASE to Ozaukee Radio Club, PO Box 13, Port Washington WI 53074.

CADILLAC MI
MAY 16

The Wexaukee Amateur Radio Association will hold its 21st annual Swap Shop & Eyeball QSO on Saturday, May 16, 1981, at the Michigan National Guard Armory, Haynes Street, Cadillac MI from 9:00 am to 4:00 pm. Admission is $2.00, and 8-foot tables are $3.00. There will be a grand prize, a Yaesu FT-207R hand-held transceiver, plus many smaller prizes. A lunch counter and parking will be available, as well as camping in the immediate area, and free transportation for flying to and from the Wexford County Airport. Talk-in on 146.37/.97. For further information, contact the Wexaukee Amateur Radio Association, Box 163, Cadillac MI 49601.

SILOAM SPRINGS AR
MAY 16

The Northwest Arkansas Amateur Radio Club, Inc., will hold its 1st annual hamfest/swapmeet on Saturday, May 16, 1981, at the Siloam Springs Community Building, Siloam Springs AR, from 8:00 am to 5:00 pm. It will be all indoors and commercial exhibitors' tables are free. Flea market tables are $2.00 each. Doors open at 6:00 am for setting up tables. Great prizes will be available, including a TS-830. There will be refreshments and free parking. Talk-in on .16/.76 or .52 simplex. For more information, send an SASE to Bob Harmon W5SEP, Route 1, Box 13E, Elkins AR 72727.

KEY WEST FL
MAY 16-17

The annual Conchfest will be held on May 16-17, 1981, in Key West FL. Activities will include an all-you-can-eat conch dinner on Saturday night, a social hour, a free conch train tour, a free conch trolley ride, a conch shell blowing contest, and prizes. A discount book for many Key West attractions will be available. Conchfest tickets are $25.00 per person, tickets for harmonics (12 and under) are $15.00 each, and rooms at the Sportsmen's Inn are $34.00. Tickets include Saturday night dinner, three free drinks at the social hour, the Sunday morning continental breakfast at the Sportsmen's Inn, and the discount book. For more information and advance reservations, write Key West Amateur Radio Club, Inc., PO Box 2371, Key West FL 33040.

DURHAM NC
MAY 16-17

The Durham FM Association will hold its Durhamfest '81 on May 16-17, 1981, at South

Square Mall, Durham NC. There will be a large covered flea market, and rental tables will be available. General admission is $3.00 with no additional charges for tailgaters or dealers' spaces. On May 17 there will be ladies' bingo. Talk-in on 147.825/.225, 146.52, and 222.34/223.94. For further information and advance tickets, write Durham FM Association, PO Box 8651, Durham NC 27707.

EASTON MD
MAY 17

The seventh annual Easton Amateur Radio Society hamfest will be held on May 17, 1981, rain or shine, from 10:00 am to 4:00 pm at the Easton Senior High School cafetorium on Route 50, just south of Easton at mile marker 66. Donation is $2.00, with an additional $2.00 for tables or tailgaters. Talk-in on .52 simplex and 146.445/147.045 on the repeater in Easton. For more details, write R. C. Thompson KA3BKW, PO Box 1473, Easton MD 21601, or Easton Amateur Radio Society, Inc., Box 781, Easton MD 21601.

EVANSVILLE IN
MAY 17

The Tri-State Amateur Radio Society will hold its annual hamfest on May 17, 1981, at the Vanderburgh County 4-H Center, Evansville IN. There will be an air-conditioned indoor flea market, and over 70 indoor tables will be available. Adult admission is $1.00. An outdoor flea market will also be featured. Talk-in on 147.75/.15 or 146.19/.79. For further information, contact Tom WA9QDZ, 2851 Wayside Drive, Evansville IN 47711.

ATHENS OH
MAY 17

The Athens County Amateur Radio Association's annual hamfest will be held on Sunday, May 17, 1981, at the Athens City Recreation Center, East State Street, Athens OH, from 8:00 am to 4:00 pm. Tickets are $1.00 in advance, $1.50 at the gate. There will be a free flea market for electronics-related items in a large outdoor, paved area. Some indoor space will be available on a first-come, first-served basis. Setup will be at 7:00 am. Food and plenty of free parking will be available. Several restaurants and a recreation area are adjacent to the Athens Mall. Talk-in on .34/.94. For further information, send an SASE to ACARA, c/o Jeff White WD8OXK, PO Box 767, Athens OH 45701, or telephone Joe Foilrod WB8DOD at (614)-797-4874.

WEBSTER MA
MAY 17

The Eastern Connecticut Amateur Radio Association will hold its seventh annual hamfest and flea market on May 17, 1981, rain or shine, at Point Breeze Restaurant, Webster MA. For more information, contact Richard Spahl K1SYI, Lake Parkway, Webster MA 01570, or call (617)-943-4420 after 8:00 pm.

BOULDER CO
MAY 17

The Rocky Mountain VHF Society will hold the annual spring hamfest on Sunday, May 17, 1981, from 9:00 am to 4:00 pm, rain or shine, at the Boulder National Guard Armory, 4750 North Broadway, Boulder CO. The admission donation will be $2.00 per family, and there is no seller's charge. Setup starts at 8:30 am and we suggest you bring your own table. The door prizes will include a synthesized FM transceiver, and extra raffle tickets will be available. In addition to the big ham swap, there will be formal technical demonstrations and seminars, covering topics such as fast-scan ham TV, microwaves, satellite communications, etc. Food and drink will be available. Talk-in on 146.16/.76 and 146.52. For more information, contact Richard Ferguson KA0DXM, 1150 Albion Road, Boulder CO 80303, or phone (303)-499-2871.

WABASH IN
MAY 17

The Wabash County Amateur Radio Club will hold its 13th annual hamfest on Sunday, May 17, 1981, from 6:00 am until 3:00 pm at the Wabash County 4-H Fairgrounds, Wabash IN. Admission will be $3.00 at the gate or $2.50 in advance. There will be plenty of food and parking available, as well as camping space for Saturday night. Talk-in on 7.63/.03 or .52. For tickets or more info, send an SASE to Dave Spangler N9ADO, 45 Grant Street, Wabash IN 46992.

MARSHALL MO
MAY 17

The Indian Foothills Amateur Radio Club will hold its 6th annual hamfest on May 17, 1981, at the Saline County Fairgrounds building, Marshall MO. Tickets are $2.00 each or 3 for $5.00 at the door, or 4 for $5.00 in advance. There is no charge for tables but reservations are requested. Registration will be at 8:00 am and coffee and breakfast rolls will be served from 8:00 am to 10:00 am. Lunch (all you can eat) will be at 11:30 am and the drawing will be held at 2:30 pm (with a first prize of an Icom IC-2AT). Talk-in on .52, .28/.88, and 147.84/.24. For information and advanced tickets, contact Phyllis French W0WIE, Route 4, Box 168, Sedalia MO 65301, or phone (816)-826-8319 after 5:00 pm or K0BVB at (816)-886-2837.

ISLIP LI NY
MAY 17

The Long Island Mobile Amateur Radio Club, Inc., will hold the ARRL Hamfair '81 on May 17, 1981 (rain date June 7th), at the Islip Speedway, 2 blocks south on Islip Avenue (Rte. 111) or Exit 56. General admission is $2.00 for all hams, with family members admitted free. Each exhibitor space is $4.00 and admits one person. Features include the LIMRUN at 11:00 am, over 350 computer and ham exhibitors along with general merchandise and swap 'n shop, food and refreshments, and many awards presented throughout the day. Talk-in on 146.25/.85. For more information, call Sid Wolin K2LJH at (516)-379-2861, or Hank Wener WB2ALW at (516)-484-4322 in the evening.

PITTSBURGH PA
MAY 17

The 27th annual Breeze Shooters Hamfest will be held on May 17, 1981, from noon to 5:00 pm at the White Swan Park, Rte. 60 (Parkway West), near the Greater Pittsburgh International Airport, Pittsburgh PA. Registration is $2.00, or three for $5.00. Activities will include a large free flea market, prizes, contests, and a family amusement park. Sheltered tables for vendors are available by advance registration only. Talk-in on .28/.88 or 29.0. For further information, contact Don Myslewski K3CHD, 359 McMahon Road, North Huntingdon PA 15642.

NEWPORT RI
MAY 18

The Newport County Radio Club will hold an auction on Monday, May 18, 1981, at 7:00 pm at the club headquarters in the Seamen's Church Institute Building, 18 Market Square, Newport RI. Talk-in on 147.96/.36.

GASTONIA NC
MAY 23

The Gastonia Amateur Radio Society will hold its fifth annual hamfest on Saturday, May 23, 1981, beginning at 9:00 am, at Karyae Park near Gastonia NC. Pre-registration is $2.50 and tickets at the gate are $3.00. Flea market tables are $5.00 each, with a limit of 4. Flea market as well as rag-chew space will be provided. Tailgating is invited. Exhibitors may set up at 7:00 am. Features include refreshments, a grand prize of a Kenwood TS-520SE (plus other prizes), a bingo hour, plus plenty of parking facilities. Talk-in on 147.72/147.12 and 146.52 simplex. For more information, contact the hamfest chairman, Glenn Varner W4PBQ, 1322 Poston Circle, Gastonia NC 28052, or phone (704)-866-8339.

HAMBURG PA
MAY 24

The Reading Radio Club will hold its third annual hamfest on May 24, 1981, rain or shine, at the Hamburg Field House, Pine Street, Hamburg PA. Adult admission is a $2.00 donation. Outside space is $2.00 and an inside table is $3.00. Doors will open at 7:00 am for tailgaters and 8:00 am for the public. Door prizes will consist of cash and equipment. For more information and reservations, write Box 124, Reading PA 19603.

ST PAUL MN
MAY 30

The North Area Repeater Association will sponsor a swapfest and exposition for radio amateurs and computer hobbyists on May 30, 1981, at the Minnesota State Fairgrounds, St. Paul MN. There will be free overnight parking for self-contained campers on May 29th. Exhibits, booths, and prizes will be featured. Admission is $3.00. For information or reservations, write Amateur Fair, PO Box 30054, St. Paul MN 55175.

COLUMBIA SC
MAY 30

The Columbia Amateur Radio Club will sponsor the 4th annual Columbia Hamfest on Saturday, May 30, 1981, at Midlands Tec College, Beltline Campus, Co-

lumbia SC. Doors will open at 9:00 am. There will be plenty of room available for the outdoor flea market in the south parking lot. Dealer displays will be indoors, and the food stand will be on campus. Talk-in on .34/.94. For more information, please contact Mr. Bob Burks KC4LB, CARC, PO Box 5802, Columbia SC 29250, or phone (803)-776-9054.

GORHAM ME
MAY 30

The Portland Amateur Wireless Association and the University of Southern Maine/Gorham will hold an amateur radio flea market on May 30, 1981, from 8:00 am to 5:00 pm at the gym and the parking lot (inside if it rains) at the University of Southern Maine, Gorham ME campus. The cost is $1.00 per person. Food and drinks will be available. For more information, contact John A. Taylor N1SD, 44 Mitton Street, Portland ME 04102, or phone (207)-773-2651.

HARTWELL GA
MAY 30-31

The Anderson, Hartwell, and Toccoa Amateur Radio Clubs will hold the 3rd annual Lake Hartwell Hamfest on May 30-31, 1981, at the Lake Hartwell Group Camp, located on Highway 29, 4 miles north of Hartwell GA. Features include free admission, free camping, and free flea-market spaces. Activites include live musical entertainment, tours of Lake Hartwell dam and power house, a left-footed CW contest, a horseshoe tournament, and many other activities for the whole family. Fishing, swimming, and camping are available at the site. The campgrounds opens at 6:00 pm Friday and the main prize drawing will be held at 2:00 pm Sunday. Talk-in will be on 146.19/.79, 147.93/.33, and 146.895/.295. For further information, contact Carl Davis KY4T, 203 College Avenue, Hartwell GA 30643.

RANCHO CORDOVA CA
MAY 31

The North Hills Radio Club will hold its 9th annual Sacramento Valley Radio Ham Swap on Sunday, May 31, 1961, from 9:00 am to 3:00 pm at the Machinists' Hall, 3081 Sunrise Boulevard, Rancho Cordova CA. There will be table rentals, food, club auctions, and prizes. Admission is free. Talk-in on 144.59/145.19 and 223.18/224.78. For further information, contact NHRC, W6BWZ, PO Box 41635, Sacramento CA 95841.

WEST FRIENDSHIP MD
MAY 31

The Maryland FM Association will hold its annual hamfest/computer show on Sunday, May 31, 1981, at the Howard County Fairgrounds, West Friendship MD, from 8:00 am to 4:00 pm. Admission is a $3.00 donation, tailgating is $2.00, and tables are $6.00. Talk-in on 146.16/.76. For more information, write MFMA, c/o Heru Walmsley, Post Office, Harmans MD, or phone (301)-766-3545.

TRENTON TN
MAY 31

The Humboldt Amateur Radio Club will hold its annual hamfest on Sunday, May 31, 1981, at Shady Acres City Park, Trenton TN. Featured will be a flea market, prizes, ladies' activities, and light lunches. There are restaurants available nearby; also available will be overnight parking for a limited number of RVs. There is no admission charge. Talk-in on 146.37/.97. For further information, contact Ed Holmes W4IGW, 501 N. 18 Avenue, Humboldt TN 38343

GRAND RAPIDS MI
JUN 6

The Independent Repeater Association will hold the Grand Rapids Spring Swap & Shop on Saturday, June 6, 1981, at the National Guard Armory, 44th Street, just 1/4 mile west of US 131. There will be door prizes, dealers, food, and indoor swap area, forums, and trunk sales. Reserved dealer area is available. Doors open at 8:00 am. Tickets are $2.00 and indoor tables are $5.00. Talk-in on 147.765. For further information, contact David Jenista WD8NZZ, 437 Airview SE, Wyoming MI 49508.

MANASSAS VA
JUN 7

The Ole Virginia Hams Amateur Radio Club, Inc., will hold its annual Manassas Hamfest on Sunday, June 7, 1981, at the Prince William County Fairgrounds, Route 234, Manassas VA. Booths are available. Admission is $3.00, children under 12 will be admitted free, and tailgaters will be charged an additional $2.00. Features will include a ladies' program, indoor and outdoor exhibit areas, a full breakfast and lunch, children's entertainment, CW proficiency awards, and QSL bureaus. Talk-in on 146.37/146.97 repeater (W1CRO) and 146.52 simplex. For booth reservations, contact Joseph A. Schlatter K4FPT, Ole Virginia Hams ARC, Inc., PO Box 1255, Manassas VA 22110.

CHELSEA MI
JUN 7

The Chelsea Swap and Shop will be held on Sunday, June 7, 1981, at the Chelsea Fairgrounds, Chelsea MI. Gates will open for sellers at 5:00 am and for the public from 8:00 am until 2:00 pm. Admission is $1.50 in advance or $2.00 at the gate. Children under 12 and non-ham spouses are admitted free. Talk-in on 146.52 simplex and the 147.855 Chelsea repeater. For more info, write to William Altenberndt, 3132 Timberline, Jackson MI 49201.

SHARONVILLE OH
JUN 12

The Hamilton County Amateur Radio Public Service Corp. will sponsor the first annual Cincinnati ARRL '81 Convention at the Scarlet Oaks Vocational Campus, Sharonville OH, on Saturday, June 12, 1981. This event will *not* be replacing the Cincinnati Hamfest which will be held on Sunday, September 20, 1981, at the usual location at Stricker's Grove, Ross OH.

MIDLAND MI
JUN 13

The Central Michigan Amateur Repeater Association will hold its seventh annual hamfest on June 13, 1981, from 8:00 am to 2:00 pm at its new location in the "Great Hall" in the Valley Plaza complex, just off US Rte. 10 in Midland, Michigan. Tickets are $3.00; children under 12 will be admitted free. Tables are available for $6.00 ($3.00 for half a table). Trunk sales will be $2.00 in a designated area. There will be plenty of free parking. The Valley Plaza Complex offers motel accommodations, RV hookups, swimming, dining, a bowling alley, theaters, and a picnic area. The major prize drawing will be at 1:30 (for an HT); there will be hourly drawings for other prizes. Videotapes of the Saturn fly-by will be shown. Talk-in will be on 146.13/.73 and 146.52 simplex. For information, contact Carol Hall WD8DQG, 4651 Cardinal Drive, Mt. Pleasant MI 48858; (517)-772-0363.

GUELPH ONT CAN
JUN 13

The Guelph Amateur Radio Club will hold the 6th annual Central Ontario Amateur Radio Fleamarket and Computer Fest on Saturday, June 13, 1981, at the Centennial Arena, College Avenue West, Guelph, Ontario, Canada. Admission is $1.00, with children 12 years and under admitted free. Admission for vendors is an additional $2.00. Tables are $5.00 each on a first-come basis. The hours are 8:00 am to 4:00 pm; vendors may begin setting up at 6:00 am. There will be commercial displays, computer software and hardware, surplus dealers, indoor and outdoor displays, and door prizes. The refreshment concession will open at 12:00 noon. Talk-in on .52/.52, .37/.97 (VE3KSR), and .96/.36 (VE3ZMG). For further information, contact Dennis Gore VE3DGA at (519)-836-6226 or Andy Janosik VE3GDY at (519)-824-3227.

WILMINGTON OH
JUN 14

The Clinton and Highland County Radio Clubs will sponsor their annual hamfest and flea market on June 14, 1981, rain or shine, at the Clinton County Fairgrounds, State Route 22, Wilmington OH, from 1200 to 2100 UTC. Admission is $3.00 and flea market space is free with admission ticket. There will be a sheltered display area, a food concession, an auction, and door prizes. Camping is available at nearby Cowan Lake State Park, as well as at private campgrounds and motels. King's Island Park is also nearby. Talk-in on 147.72/.12, 147.81/.21, or 146.52. For further information, contact Bob Lewis KE8E, 192 Northview Road, Blanchester OH 45107, or phone (513)-783-2740 evenings.

SANTA MARIA CA
JUN 14

The Satellite Amateur Radio Club will hold the Santa Maria Amateur Radio Swapfest at the Newlove picnic grounds (Union Oil Company), Santa Maria CA. For information on prizes, swap tables, dinner tickets, etc., mail inquiries to Santa Maria Swapfest, 1600 E. Clark #49, Santa Maria CA 93455.

OSCAR ORBITS

Courtesy of AMSAT

The OSCAR satellites are subject to atmospheric drag, of course, and the present period of intense solar activity has accentuated the problem. During this period, our sun has been expelling huge numbers of charged particles, some of which find their way into the Earth's upper atmosphere, increasing the density (and thus the drag) there. It is through this region that the OSCARs must pass. OSCAR 8, in a lower orbit than OSCAR 7, is the more seriously affected of the two.

If the drag factor is not considered when OSCAR calculations are performed, long-range orbital projections will be in error. For example, by the end of 1979, OSCAR 8 was more than 20 minutes ahead of some published schedules. The nature of orbital mechanics is such that extra drag on a satellite causes it to move into a lower orbit, resulting in a shorter orbital period. Thus, the satellite arrives above a given Earthbound location earlier than predicted.

Using data supplied to us by Dr. Thomas A. Clark W3IWI of AMSAT, the equatorial crossing tables shown here were generated with the aid of a TRS-80™ microcomputer. The tables take into account the effects of atmospheric drag and should be in error by a few seconds at most.

The listed data tells you the time and place that OSCAR 7 and OSCAR 8 cross the equator in an ascending orbit for the first time each day. To calculate successive OSCAR 7 orbits, make a list of the first orbit number and the next twelve orbits for that day. List the time of the first orbit. Each successive orbit is 115 minutes later (two hours less five minutes). The chart gives the longitude of the day's first ascending (northbound) equatorial crossing. Add 29° for each succeeding orbit. When OSCAR is ascending on the other side of the world from you, it will descend over you. To find the equatorial descending longitude, subtract 166° from the ascending longitude. To find the time OSCAR 7 passes the North Pole, add 29 minutes to the time it passes the equator. You should be able to hear OSCAR 7 when it is within 45 degrees of you. The easiest way to determine if OSCAR is above the horizon (and thus within range) at your location is to take a globe and draw a circle with a radius of 2450 miles (4000 kilometers) from your QTH. If OSCAR passes above that circle, you should be able to hear it. If it passes right overhead, you should hear it for about 24 minutes total. OSCAR 7 will pass an imaginary line drawn from San Francisco to Norfolk about 12 minutes after passing the equator. Add about a minute for each 200 miles that you live north of this line. If OSCAR passes 15° east or west of you, add another minute; at 30°, three minutes; at 45°, ten minutes. Mode A: 145.85-.95 MHz uplink, 29.4-29.5 MHz downlink, beacon at 29.502 MHz. Mode B: 432.125-.175 MHz uplink, 145.975-.925 MHz downlink, beacon at 145.972 MHz.

At press time, OSCAR 7 was scheduled to be in Mode A on odd numbered days of the year and in Mode B on even numbered days. Monday is QRP day on OSCAR 7, while Wednesdays are set aside for experiments and are not available for use.

OSCAR 8 calculations are similar to those for OSCAR 7, with some important exceptions. Instead of making 13 orbits each day, OSCAR 8 makes 14 orbits during each 24-hour period. The orbital period of OSCAR 8 is therefore somewhat shorter: 103 minutes.

To calculate successive OSCAR 8 orbits, make a list of the first orbit number (from the OSCAR 8 chart) and the next thirteen orbits for that day. List the time of the first orbit. Each successive orbit is then 103 minutes later. The chart gives the longitude of the day's first ascending equatorial crossing. Add 26° for each succeeding orbit. To find the time OSCAR 8 passes the North Pole, add 26 minutes to the time it crosses the equator. OSCAR 8 will cross the imaginary San Francisco-to-Norfolk line about 11 minutes after crossing the equator. Mode A: 145.85-.95 MHz uplink, 29.4-29.50 MHz downlink, beacon at 29.40 MHz. Mode J: 145.90-146.00 MHz uplink, 435.20-435.10 MHz downlink, beacon on 435.090 MHz.

OSCAR 8 is in Mode A on Mondays and Thursdays, Mode J on Saturdays and Sundays, and both modes simultaneously on Tuesdays and Fridays. As with OSCAR 7, Wednesdays are reserved for experiments.

OSCAR 7 ORBITAL INFORMATION FOR MAY

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
29545	1	0050:33	90.6
29558	2	0144:47	104.2
29570	3	0044:06	89.1
29583	4	0138:20	102.7
29595	5	0037:39	87.5
29608	6	0131:53	101.1
29620	7	0031:12	85.9
29633	8	0125:26	99.5
29645	9	0024:45	84.4
29658	10	0118:59	98.0
29670	11	0018:18	82.8
29683	12	0112:32	96.4
29695	13	0011:51	81.2
29708	14	0106:05	94.8
29720	15	0005:24	79.7
29733	16	0059:38	93.3
29746	17	0153:53	106.8
29758	18	0053:11	91.7
29771	19	0147:26	105.3
29783	20	0046:44	90.1
29796	21	0140:59	103.7
29808	22	0040:17	88.6
29821	23	0134:32	102.1
29833	24	0033:50	87.0
29846	25	0128:05	100.6
29858	26	0027:23	85.4
29871	27	0121:37	99.0
29883	28	0020:56	83.9
29896	29	0115:10	97.4
29908	30	0014:28	82.3
29921	31	0108:43	95.9

OSCAR 8 ORBITAL INFORMATION FOR MAY

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
16076	1	0018:54	63.5
16090	2	0023:40	64.7
16104	3	0028:26	65.9
16118	4	0033:11	67.1
16132	5	0037:57	68.3
16146	6	0042:43	69.5
16160	7	0047:28	70.7
16174	8	0052:14	72.0
16188	9	0057:00	73.2
16202	10	0101:45	74.4
16216	11	0106:31	75.6
16230	12	0111:16	76.8
16244	13	0116:02	78.0
16258	14	0120:47	79.2
16272	15	0125:33	80.4
16286	16	0130:18	81.6
16300	17	0135:04	82.8
16314	18	0139:49	84.0
16327	19	0001:23	59.4
16341	20	0006:08	60.6
16355	21	0010:54	61.8
16369	22	0015:39	63.0
16383	23	0020:24	64.2
16397	24	0025:09	65.4
16411	25	0029:55	66.6
16425	26	0034:40	67.8
16439	27	0039:25	69.1
16453	28	0044:11	70.3
16467	29	0048:56	71.5
16481	30	0053:41	72.7
16495	31	0058:26	73.9

OSCAR 7 ORBITAL INFORMATION FOR JUNE

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
29933	1	0008:01	80.7
29946	2	0102:16	94.3
29958	3	0001:34	79.2
29971	4	0055:49	92.7
29984	5	0150:04	106.3
29996	6	0049:22	91.2
30009	7	0143:36	104.8
30021	8	0042:55	89.6
30034	9	0137:09	103.2
30046	10	0036:27	88.0
30059	11	0130:42	101.6
30071	12	0030:00	86.5
30084	13	0124:15	100.1
30096	14	0023:33	84.9
30109	15	0117:48	98.5
30121	16	0017:06	83.3
30134	17	0111:21	96.9
30146	18	0010:39	81.8
30159	19	0104:53	95.4
30171	20	0004:12	80.2
30184	21	0058:26	93.8
30197	22	0152:41	107.4
30209	23	0051:59	92.2
30222	24	0146:14	105.8
30234	25	0045:32	90.6
30247	26	0139:47	104.2
30259	27	0039:05	89.1
30272	28	0133:19	102.7
30284	29	0032:37	87.5
30297	30	0126:52	101.1

OSCAR 8 ORBITAL INFORMATION FOR JUNE

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
16509	1	0103:11	75.1
16523	2	0107:56	76.3
16537	3	0112:41	77.5
16551	4	0117:26	78.7
16565	5	0122:12	79.9
16579	6	0126:57	81.1
16593	7	0131:42	82.3
16607	8	0136:27	83.5
16621	9	0141:12	84.7
16634	10	0002:45	60.1
16648	11	0007:30	61.3
16662	12	0012:15	62.5
16676	13	0017:00	63.7
16690	14	0021:44	64.9
16704	15	0026:29	66.1
16718	16	0031:14	67.3
16732	17	0035:59	68.5
16746	18	0040:44	69.7
16760	19	0045:29	70.9
16774	20	0050:13	72.1
16788	21	0054:58	73.3
16802	22	0059:43	74.5
16816	23	0104:27	75.7
16830	24	0109:12	76.9
16844	25	0113:57	78.1
16858	26	0118:41	79.3
16872	27	0123:26	80.5
16886	28	0128:11	81.7
16900	29	0132:55	82.9
16914	30	0137:40	84.1

HAM HELP

I've been reading over my old copies of *73 Magazine* this evening and thought I should write to *73* and thank everyone for the fine magazine I have had the opportunity to be reading these past months.

Now for the good news: As of Feb. 13, 1981, I was granted a parole. The man told me I got it not because I earned it, but because of my medical problem. To clarify that: I had an operation in November, 1980, for a pancreatoduodenectomy, a malignant tumor in the distal common bile duct. The good doctors gave me an expected chance of survival at less than 30% at five years.

But even with the bad news I'm trying to keep my head and still plan ahead. A good, very good friend will be helping me soon after I get home with the CW portion and will try to do all he can to help me get my Novice license; at least it will be something I've been trying to do in the 16 months I've been in this place.

Also, I've met many amateurs through the mails from a letter in Ham Help of May, 1980. These new friends have helped me more than I can express in mere words, and hopefully I can still keep in touch when I get home and later on the bands with my very slow CW. I was told by one good doctor to live my life the best I can and have fun. Only one knows when I'll leave this Earth, and that one is God alone.

I should be leaving the institution in 7-10 days; my papers say I'd be unemployable. But, somehow, I have to find a job or I will go stir crazy doing nothing. I will sure try to get even a part-time job some place, and may also do some work on gas engines (lawn mowers and cycles) to keep myself busy on the farm. If I do pass the test on the Novice, I'll surely get my feet wet, so to say, and jump in and listen on the bands and later try my fist with my lousy CW. Hopefully, I may even get good enough to go ahead and try for the Technician license later this year. Strange, though I can remember schematics, rules, regs, formulas, and electronic knowledge, I have trouble with CW. All I've got down so far is: E, A, T, SOS, and M and N. More and more practice is surely needed—maybe my brain is dense or something. I've read all I can on amateur radio, and have got a lot of books here to take home. Also, I've gone through the Novice *73* book 4-5 times since being here.

I reread the magazines as much as I can and think hopefully soon I'll get that license for sure.

I would like to thank everyone who wrote to me here and all the doctors and nurses at Iowa City, Iowa's University Hospital for everything while I was a patient there. I sincerely do appreciate it very much. I especially thank *73 Magazine* for putting my letter in Ham Help last May and Wayne Green, without whom *73* wouldn't be such a great magazine as it is today. Again, thank you all.

Richard Hollingshead
RR #2
Ogden IA 50212
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Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14A	14	14	7	7	14	21	21A	21A	21A	21
AUSTRALIA	21	14	14	7B	7B	7B	7	14	14B	14	14	21A
CANAL ZONE	21	14	14	7	7	7	14	21	21	21A	21A	21
ENGLAND	14	7A	7	7	7	7A	14	14A	21	21	14	14
HAWAII	21	14	7A	7	7	7	7	14	14	14	14A	21
INDIA	14	7A	7B	7B	7B	7B	14	14	14	14	14	14
JAPAN	14	14	7B	7B	7B	7B	7	7	14	14	14	14
MEXICO	14A	14	14	7	7	7	7	14	14	14	21A	21
PHILIPPINES	14	14	7B	7B	7B	7B	7B	14	14	14	14	14
PUERTO RICO	14	14	7	7	7	7	7A	14	14	21A	21	21
SOUTH AFRICA	14	7	7B	14	14	14	14A	21	21A	21A	21	14A
U. S. S. R.	7	7	7	7	7	14	14	14	21	21	14	14
WEST COAST	21	14	14	7	7	7	7A	14	14	21	21	21

CENTRAL UNITED STATES TO:

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ARGENTINA	21	14A	14	14	7	7	14	14A	21A	21A	21A	21
AUSTRALIA	21	14	14	14	7B	7B	7	14	14B	14	14	21A
CANAL ZONE	21	14	14	7	7	7	14	14	21	21	21A	21A
ENGLAND	14	7	7	7	7	7	14	14	14	21	21	14
HAWAII	21	14	14	7A	7	7	7	14	14	14	21	21A
INDIA	14	14	7B	7B	7B	7B	7B	7B	14	14	14	14
JAPAN	14	14	14	7	7B	7B	7	7	14	14	14	14
MEXICO	14	14	7	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14	14	14	7B	7B	7B	7B	7A	14	14	14	14
PUERTO RICO	21	14	14	7	7	7	7A	14	21	21A	21A	21
SOUTH AFRICA	14	7	7B	7B	7B	7B	14	14	14	21	21	14
U. S. S. R.	7	7	7	7	7	7	7	14	14	14A	14A	14

WESTERN UNITED STATES TO:

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ARGENTINA	21A	21	14	14	7	7	14	14	21A	21A	21A	21A
AUSTRALIA	21A	21	14A	14	14	14	7	14	14B	14	14	21A
CANAL ZONE	21A	14	14	7	7	7	14	14	21	21	21A	21A
ENGLAND	14	7B	7	7	7	7	7	14	14	14	14A	14A
HAWAII	21A	21A	21	14	14	14	7	14	14	14	21	21A
INDIA	14	14	14	7B	7B	7B	7B	7B	14	14	14	14
JAPAN	14A	14	14	14	7	7	7	7	14	14	14	14A
MEXICO	21	14	14	7	7	7	7	14	14	14	21	21
PHILIPPINES	14A	14	14	14	14	7B	7B	14	14	14	14	14A
PUERTO RICO	21	14A	14	7	7	7	7	7A	21	21	21A	21A
SOUTH AFRICA	14	7	7B	7B	7B	7B	7B	14	14	14A	21	14
U. S. S. R.	7	7B	7	7	7	7	7B	14B	14	14	14	14
EAST COAST	21	14	14	7	7	7	7A	14	14	21	21	21

First letter = day waves   Second = night waves
A = Next higher frequency may also be useful
B = Difficult circuit this period   F = Fair
G = Good   P = Poor   * = Chance of solar flares

may

sun	mon	tue	wed	thu	fri	sat
					1 G/G	2 G/G
3 G/G	4 G/G	5 G/F	6 G/F	7 F/F	8 G/F	9 G/G
10 G/G	11 G/G	12 G/F	13 G/G	14 G/G	15 G/F	16 G/F
17 G/G	18 G/G	19 G/G	20 G/G	21 G/G	22 G/G	23 G/G
24 G/F, 31 G/G	25 G/F	26 G/F	27 F/F*	28 F/P*	29 F/P*	30 G/F

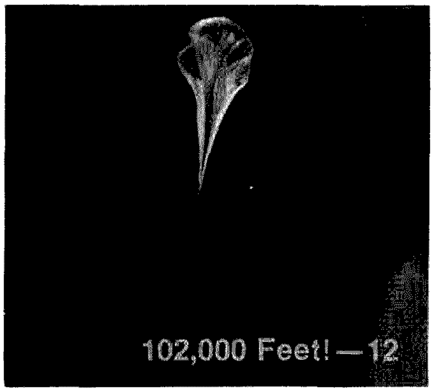
June 1981 $2.95

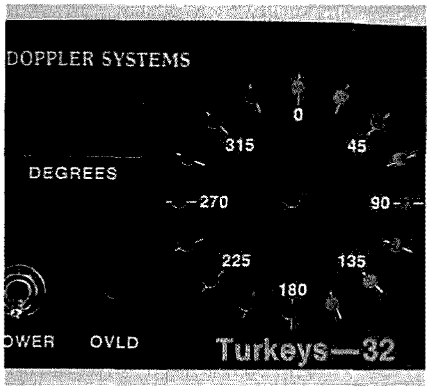
73 MAGAZINE
FOR RADIO AMATEURS

Plain Language Rules: Disaster Area?

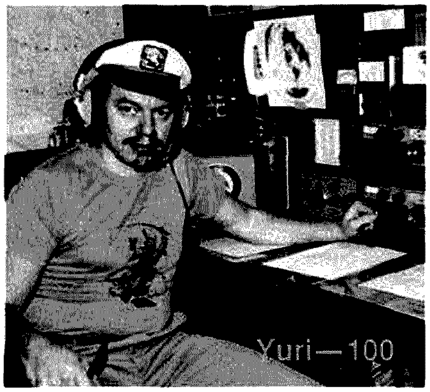
Direction-Finding: Open Season on Turkeys

june 81
73 MAGAZINE


102,000 Feet!—12

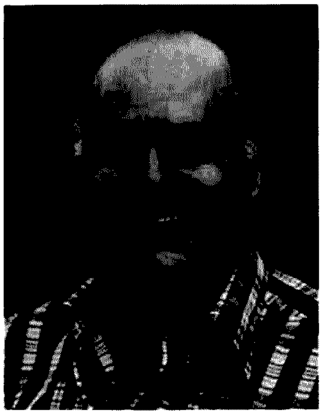


Turkeys—32


Yuri—100

Cover: Photo by James Boesch WB3DBV, East Greenville PA.

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green



CQ'S BOO-BOO

The cover article on the April *CQ* was about the OH2BH trip to Sudan. Inside was a three-page article on the "expedition." Marty OH2BH, who has made such trips to many interesting places, pulled a serious boner with this one. The QSL card for the operation, which was *not* shown in the article, but was mentioned, had a picture of a starving child. To say that this was in bad taste is an understatement.

A card managed to get to the Sudan government people very quickly and the result was a serious black eye for amateur radio. It wasn't that anyone wanted to hide starvation; it was that, as far as I am able to determine, it doesn't exist in that country at present.

I talked with a ham recently back from the Sudan who had operated in both Khartoum and in Southern Sudan; he said that he had not seen anything like that anywhere he had been. The government officials were astounded and furious, because they know of no such starvation in the Sudan.

Amateur radio really doesn't need that sort of foreign relations.

HARTFORD CANCELLED

Things are really hurting, apparently. The ARRL New England Convention was cancelled recently. I gather that the reason was a lack of interest on the part of the usual exhibitors. Unfortunately, the show was cancelled far too late for the chaps who run the Boxboro (Mass.) convention to pick up the ball. So, at a time when the infusion of spirit that a convention brings is so desperately needed, there will be no New England convention at all!

Everything was going well with New England until their place for the hamfest (in Swampscott) burned down a few weeks before the show several years ago. They tried holding it in Boston, but that was not popular. Parking was expensive and cars are often stolen or vandalized if not parked off the streets in Boston.

They tried Cape Cod, but that was too far away and attendance was low. The site at Boxboro turned out to be a good one, but by the time that had been found, another group in Hartford had started putting on shows there and there was a good deal of push and shove. They settled down to alternating years. Unfortunately, Hartford did not have the right kind of area for a good hamfest. The hotel where they have been showing is too small, with little area for exhibitors...and an almost impossible situation as far as setting up exhibits is concerned. Parking is very expensive, etc.

The Civic Center at Hartford has more space, but it is far too large and too expensive, so there has been a lot of frustration all around. Perhaps the collapse of the Hartford convention will enable the Boxboro group to get into a regular yearly show. Our hobby needs this.

ARRL SURVEY

The recent ARRL survey, reported in *QST*, showed a readership of *73 Magazine* of 141,000. Since that about covers the *active* amateur population, that's not bad. This is certainly consistent, within the limits of their sampling method, with the results *73* surveys have shown, which indicated that about 150,000 licensed amateurs were reading *73*.

ORLANDO

Since I'm as popular as a mongoose in a cage of snakes at an ARRL convention, others of the *73* staff ran our booth at this event. The reports are that there was a good crowd, though they apparently brought very little money. Estimates run from 2,000 to 5,000, depending on the bias of the reporter.

Dannals was reported to have given his speech on how great the ham satellite communications would be if we had not lost 99% of our satellite channels ten years ago at Geneva. I'm sorry I missed that, for I really did enjoy it at St. Paul some years ago...and at other conventions. It left me really enervated.

Baldwin announced his approaching retirement, leaving members to wonder who will be his replacement. Speculation is that the top job will probably go Lee Aurick, known around HQ as "Mr. Nice Guy." Several directors hinted that Dannals, too, will be retired soon, with Mary Lewis being mentioned as the possible new president.

ANOTHER WINNER

Congratulations to Larry Groppi of Elk Grove IL, winner of a life subscription to *73 Magazine* at the March 14-15 Orlando Hamcation.

Another topic of discussion was some of the recent lawsuits brought against the League. Apparently more and more outraged members are aware that the League can be sued in their local area and not just in Connecticut. They can be sued wherever they do business. These suits are being won... look for details in *QST*. Go on and look.

There is some speculation as to whether the picture of directors Metzger and Bergman, both sound asleep during the board meeting, will be published in *QST*. Metzger got in when Don Miller was suddenly forced to resign the day before the ballot count. The hams in Indiana are really upset over what they consider the screwing of Miller... and do not seem to appreciate Metzger getting elected in spite of their vote against him.

Just in case I am unable to come up with anything positive about the ARRL in June, as promised, I do have a firmly positive thing to say about the League. I hope this will shut up those pinheads who are saying that I am anti-League. ARRL observers, who are privy to the inside skinny, assure me that there are now *two* good guys on the board of directors. Two out of 16 is fantastic and I think a round of huzzahs is in order. If this sort of thing keeps up, who knows what marvelous things we may eventually see.

In case the above does not completely satisfy the League brainwashed, I'll keep reading my mail, asking everyone in the industry, and in general making a pest of myself trying to come up with something really positive for June...or at least July. Keep your fingers crossed.

ARE THINGS GOOD?

No, not really. The recent *QST* editorials bemoaning their poverty have shaken a lot of complacent League members. The disappearance of a growing number of previously visible ham dealers has not gone completely unnoticed. The sudden demise of *Ham Horizons* was another clear indication. The panic dumping of ham gear at discount rates which are barely above wholesale prices by some ham dealers is another clear clue.

Those discount prices have been raising hell throughout the industry, by the way. The

manufacturers swear that they are not shipping much gear to these discounters, so there is no way in the world for them to fill orders once their past stock is out. Calls to some of them have shown clearly that they do *not* have the equipment to ship, so all they are doing, really, is keeping anyone from selling equipment. We hams, being dedicated skinflints, would rather die than spend an extra buck for a rig, even if we have to wait until hell freezes over to get it.

It appears that the importers of ham gear have responded to this situation by diverting much of their normal supply to take care of the increased need in Japan, where amateur radio is growing far more rapidly than it is here. Indeed, Japan has over twice as many active hams as we have right now and they are stepping up their push for new hams. Their leading ham magazine had over 40 pages of pictures of ham club activities last month...while I have yet to get one single such picture for *73*, despite editorials asking for them. I guess our clubs are pretty much dead ... particularly in comparison with the Japanese.

73 has had to thin down to cope with the drop in equipment sales. To keep a magazine viable, you have to run about 40% advertising. *Ham Horizons* got down into the 20s...the kiss of death. *CQ* ran in the 30s last year, causing much concern in the field. *HR* was also in the 30s...low 30s...another disaster was possible. Publishers watch things like that with an eagle eye.

Rather than sit back passively, I have some ideas which could revitalize amateur radio. Those of you who were around ten years ago can testify as to the results of my push for FM and repeaters...with no help whatever from any of the other magazines...and vigorous opposition from the ARRL. Despite that, FM went from the private province of perhaps 2,000 hams to the single most active aspect of the hobby. It can be done again.

Though my initial approaches to Radio Shack were rebuffed, I have by no means given up with them. Never Say Die, remember? I am going to keep after them until they at least give my idea a test and prove it won't work. I'm going to see what I can do with Heath and their 50+ stores...all of the ham dealers in the country...and so on. Once we have our new *73* training series ready, I'll be pushing every club I can find as hard as I can to get hopping to get amateur radio back into a strong growth mode. In case you don't know it, we lost over 50% of the people we tried to get into amateur radio through inferior teaching materials.

Continued on page 99

Well...I Can Dream, Can't I? by Bandel Linn K4PP

"The meeting will be in Vegas—wives excluded—and the all-expense cost, including air fare, is just five dollars and seventeen cents..."

James N. Barrie VE4FK
51 Alexander Avenue
Pinawa, Manitoba
Canada R0E 1L0

Repeater at 102,000 Feet!

—Canadian hams go up, up, and away

Seventy miles north of Winnipeg, on the western shore of Lake Winnipeg in Central Canada, lies the small fishing village of Gimli. The town's main claim to fame is in being the oldest existing Icelandic community in Canada.

Gimli Air Force Station, now an industrial park, was for years a pilot training school, and for a short time was home for many World War II pilots and, later, for pilot trainees from NATO countries.

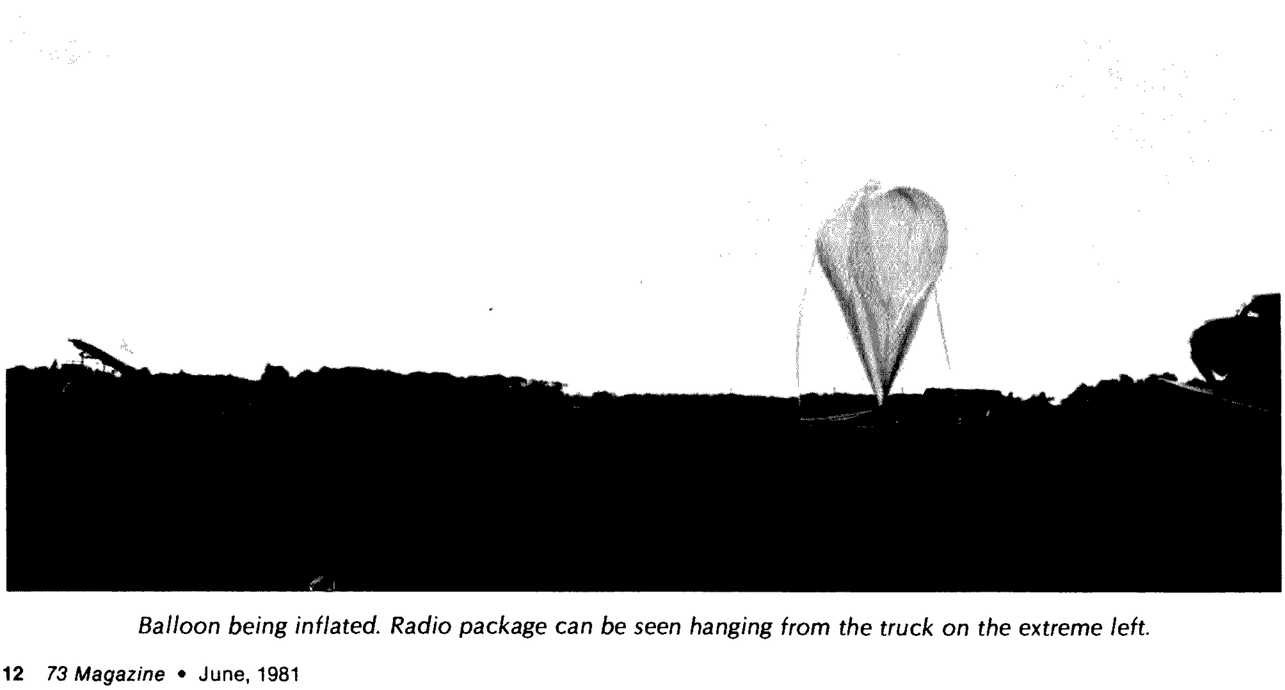
During the spring of 1979, the Space Research Facilities Branch of the National Research Council (the Canadian equivalent of NASA) reopened the deactivated airport as a launching base for high altitude scientific balloons, its two long runways making it an ideal site.

The initial launches were partly to train launch crews and partly to investigate any effects on launch procedures due to the proximity of a large body of water. Later, high-altitude balloons launched from this site would carry various scientific experiments into the lower stratosphere, these balloons being designed to cruise at 100,000 to 150,000 feet, or 20 to 30 miles.

At this time, Larry Toms VE4VX and his brother Max worked as instrumentation technologists with the contractor operating the launch facility for NRC. The possibility of an amateur radio experiment hitching a ride on one of the training flights occurred to Larry and Max, and enquiries were made through NRC official channels. Hopes were not high as no firm plans of what the experiment configuration might be had been formulated, and therefore no formal proposal could be made. Only a request was made that a 2-meter repeater, the design of which would evolve as construction proceeded, was to be flown.

On June 21st the cruncher came! Yes, permission was granted to fly an amateur radio experiment on balloon flight number 7907B scheduled for launch on or after July 18th! Only 26 days to go and only a vague concept of what the experiment would be—no hardware, no money, no work force. . .!

Much thought and head-



Balloon being inflated. Radio package can be seen hanging from the truck on the extreme left.

Flight Payload Specifications

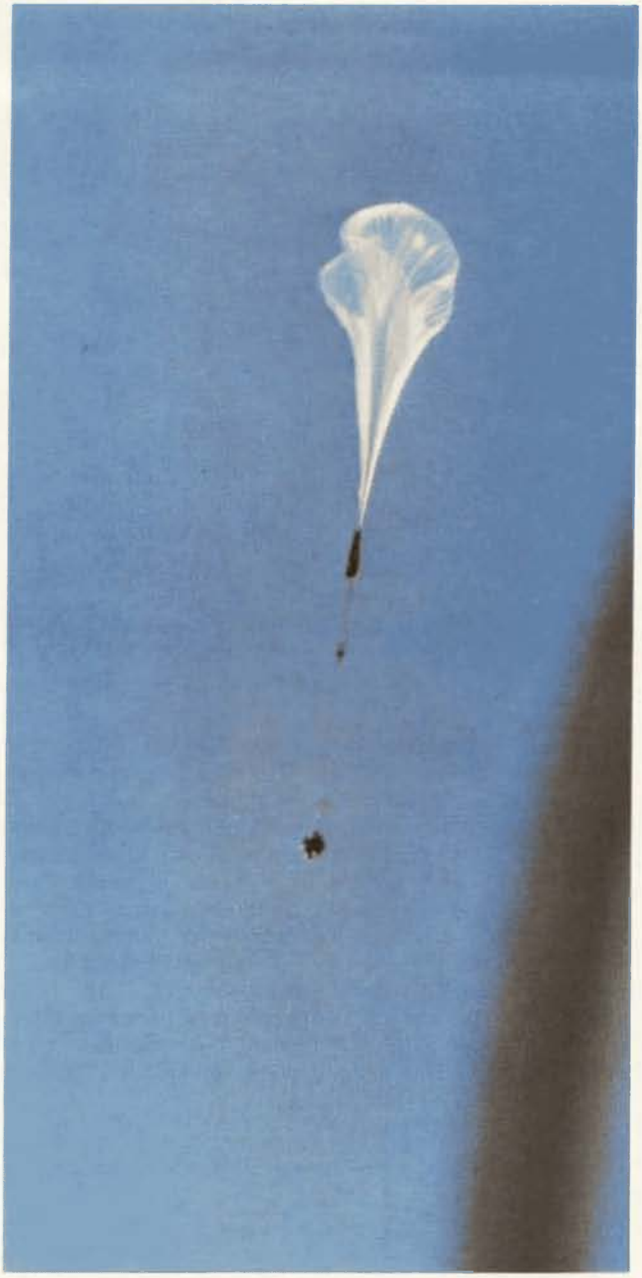
Weight:	250 lb.
Repeater	Transmitter Power: 1 Watt
	Frequency: 147.33 MHz
	Modulation: FM, 3.5-kHz deviation
	Antenna: Modified ground plane
	Mode: Simplex/duplex, commandable
Link:	Transmitter Power: 1 Watt
	Frequency: 144.33 MHz
	Modulation: FM, 3.5-kHz deviation
	Antenna: Modified ground plane
Beacon:	Transmitter Power: 80 milliwatts
	Frequency: 432 MHz
	Mode: CW
	Antenna: Turnstile
Power Supplies:	+ 16 V dc, 35 Ampere/hour
	+ 15 V dc, 1 Ampere/hour
Total Current Drain:	1 Ampere/hour
Command Signals:	+ 24-volt pulse, 80-ms duration

scratching followed, during which time the matter was chatted up on the air with anyone who would listen. Ron Nurnberg VE4KA became interested and, after some discussion, it was decided that a "simplex" repeater would be flown. Although the title "simplex repeater" seemed incredible to some amateurs who heard last-minute publicity announcements some time later, the concept was fairly straightforward. Two repeaters would be constructed back-to-back. One would accept input on 144.33 MHz from the ground control station and retransmit on 147.33 MHz. The other would accept input from amateur stations on 147.33 MHz and retransmit on 144.33 MHz. This would be our "simplex" mode using a common simplex channel. A solid-state relay system would ensure that when either transmitter was operating, the receiver of the opposite pair would be muted. Normal duplex repeater operations on 144.33/147.33 or 147.33/144.33 were also possible upon command. The 3-MHz spacing was selected to give protection against desensing of the unmuted receiver. This was necessary as it would not be possible, due to restricted space, to include a duplexer for a normal 2-meter repeater split.

The word started to get around about the crazy things being planned out at Gimli! Barry Malowanchuk VE4MA came forward with a plan to include a low-power 432-MHz beacon in the package. As an L-band radar reflector was mounted on the balloon, it was suggested by members of the group that "balloon-bounce" communications might be attempted. The ideas were coming forward, but still the problems of components and hardware remained. The slowly growing team of helpers began to chip in equipment and bucks where they could. A massive scrounging spree for expensive or hard-to-get items was directed towards local electronics stores and other businesses. Larry and Max reworked two Marconi DT-85 transceivers for use as the repeaters, and Ron VE4KA set to work on the control circuitry.

Because of the anticipated current drain, power was a problem! Numerous suggestions were made ranging from dry cells to gel batteries, but due to the high costs, these ideas were discarded in favor of a bank of silver cells which had been formerly used for rocket experiments. Hugh McKay VE4HC was given the somewhat tedious task of charging and discharging the battery pack to a very strict program to ensure that the maximum battery life would be available "come the day."

Because the design operating altitude was to be about 100,000 feet, the package would have to be insulated against the extremely low temperatures and sealed against the rarified atmosphere as none of the equipment had been originally designed to operate in a partial vacuum. One local amateur worked for a company which used explosion-proof electrical junction boxes. These were made of 3/4"-thick aluminum alloy, with inside di-



"Skyhook" balloon at about 1000 feet, just after lift-off.

Ron VE4KA working on the repeater package.

mensions approximately 19" × 12" × 12" and weighing an incredible 95 pounds each! Two such boxes were diverted to the project and became the air-tight equipment enclosures we needed.

Thus, most of the equipment was acquired and assembly of the flight package began during the first week of July. The radio equipment was installed in a compartmented aluminum box 12" × 17" × 3" with two receivers in one compartment and the transmitters in separate compartments. Connections between the compartments was via feedthrough capacitors. Control of the package was of paramount concern. No control equipment, either digital or tone, was readily available. However, on each high-altitude experimental balloon, several command functions are required, such as to open a helium valve to cause the balloon to descend or to dump ballast to cause it to ascend. Command functions for on-board experiments also are provided. A Command Instrument Package (CIP) is flown for this purpose. A system had to be devised which would convert the CIP output, consisting of a +24-volt pulse of 80-ms duration to a logic level which would actuate the specific functions of our experiment. Ron VE4KA, being responsible for the control circuitry, with assistance from Keith Jonas VE4YA, constructed a system of optical isolators and digital latches which effected the required command sequences. In addition, op amps and digitally-actuated relays were used in the repeater when operating in the duplex mode. Failing to manufacture a suitable bipolar supply to operate from the battery pack, we were forced to rely on Radio Shack D-cells hastily wired together to provide the ±15 volts required for these op amps. This proved to be the Achilles heel of the whole operation! Fig. 1 shows a block diagram of the repeaters and command system.

During the later part of the assembly period, Bill Bowman VE4AFO had been busy assisting with assembly of the equipment, helping to prepare the deactivated airport control tower for use as the ground station, building antennas for HF communications, and running errands for the constructors. He also managed to spend some time on the local 2-meter repeaters advertising the Gimli activity, arranging for the loan of equipment, and recruiting help where he could find it.

I was recruited at this time and did some publicity work on 20 meters and on the various 75-meter nets in the adjoining states and provinces. This I found a little frustrating. After accepting the information I had to offer, sometimes a little skeptically, most people would ask for a launch date and time. This I was not able to give! The problem

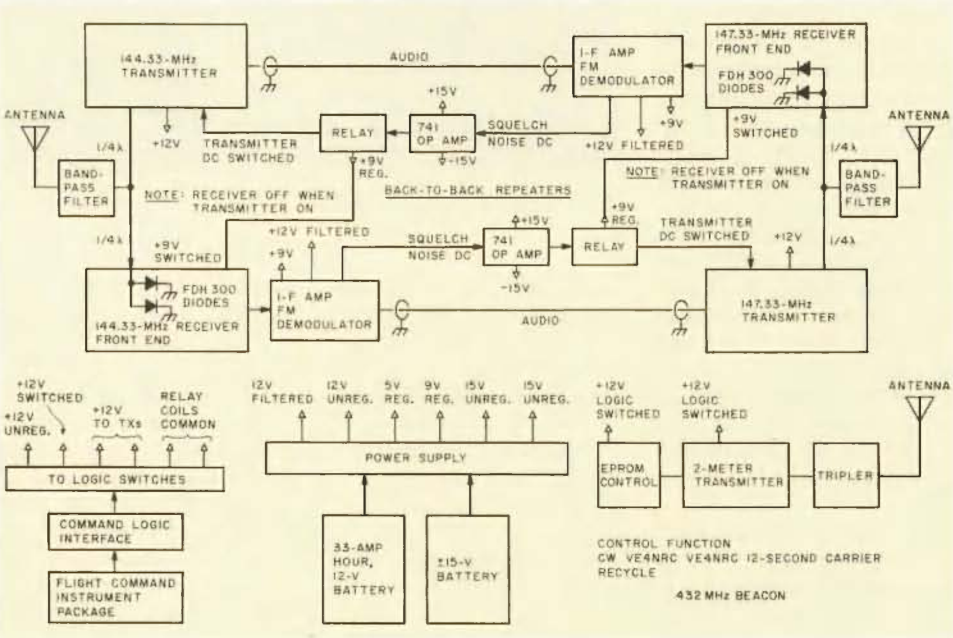


Fig. 1. Flight package.

The repeater package with two receivers in the left-hand compartment and the transmitters in two separate compartments on the right.

was that this balloon would be a real monster! It would have an inflated volume of 1.5 million cubic feet, and the combined length of the balloon, payload, and flight train, consisting of the ladder structure and collapsed parachute, would be 600 feet. It was therefore necessary that, at launch time, there be no more than a 5-mph wind velocity difference between ground level and 400 feet, or else the balloon could be damaged. Thus the launch date and time were highly dependent on local weather conditions. Regarding the size of the balloon/package combination, one of the group described it as "like flying a large condominium to a height of 22 miles."

During the later stages of the airborne package construction, the ground station was being prepared. Most of this equipment was obtained on loan from various amateur and business sources, while some specialized equipment was obtained from NRC. Dick McGuire VE4HK ran a courier service between Winnipeg and Gimli! He delivered purchased and scrounged equipment to the construction team. The ground 2-meter transceiver was an Icom 280 driving a KLM 70-Watt linear amplifier. The main tracking antenna, a 4- × 6-element yagi array, was jointly constructed by Vic Grant VE4VG and Joe DeLaronde. It was mounted on an Andrew pedestal for manual control of azimuth and elevation. Also mounted on the pedestal was a remote receiver agc meter to assist the antenna operator in tracking the balloon. Fig. 2 is a block diagram of the ground station equipment used.

The Federal Department of Communications had been kept informed of our plans at all times and had approved the call VE4NRC for use during the flight, the sponsor being Kathy Toms VE4YI. Sponsorship was later transferred to VE4KA in order that Advanced class privileges would be available.

At last the day came, after many days of payload checks, weather briefings, false alarms, and final preparation of the ground station. At 0012Z on July 27, 1979, the balloon was launched, not looking like a conventional hot-air balloon, round and graceful, as I for one expected, but more like a sad sausage skin which someone had forgotten to fill! At first, as I watched from the balcony of the control tower along with dozens of local amateurs who had heard that the launch was imminent, the balloon went straight up, then it drifted off to the southeast over Lake Winnipeg. It appeared to hang motionless over the southern end of the lake for several hours. Later, under the influence of upper winds and the Earth's rotation, it would travel westward across Manitoba and into Saskatchewan.

Amateur operations commenced at 0025Z, thirteen minutes after lift-off when the balloon was at about 15,000 feet, the first contact

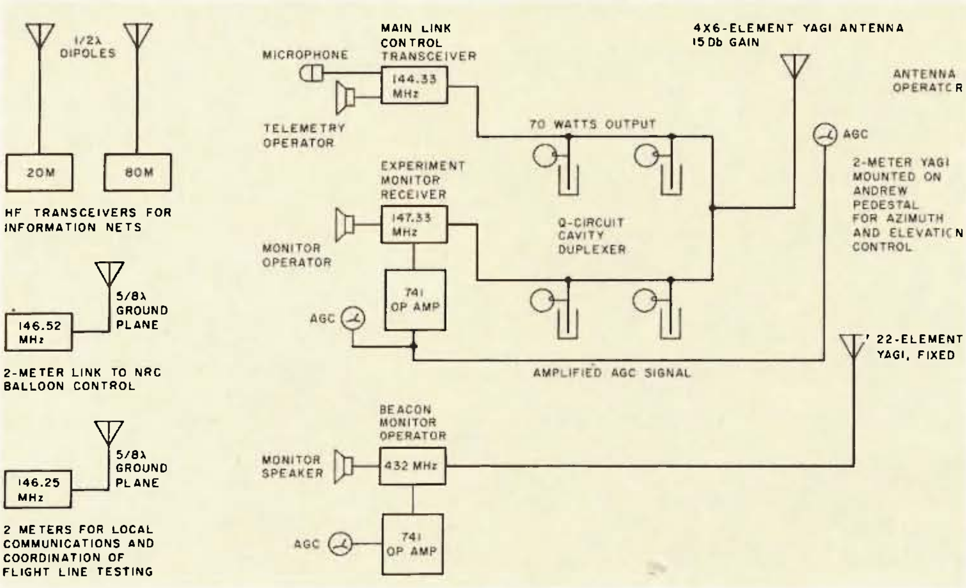


Fig. 2. Ground station.

Balloon package prepared for flight.

being VE4BE at 0027Z. Bill VE4AFO was in his element, feeling like a DX operator in a pileup! Alas, it did not take long for the amateur community to find the ground control input frequency, but this was being monitored and no station attempting contact on the control frequency was acknowledged. We had little to fear! With 2000 Watts ERP from the base station through its antenna system, we could certainly "capture" the flight uplink receiver! Although some interference continued, a great many contacts were made until the experiment was temporarily shut down at 0830Z.

There were a few amusing contacts. While I was putting out the word on 75 meters, I ran into two amateurs in Minnesota and I broke into their QSO to tell them what was taking place. A few minutes later I heard them make contact with the control station, and a short time later, again on 75 meters, I heard the following:

Hugh VE4HC and the 432-MHz monitors.

"How high did that guy say the balloon was?"

"102,000 feet, but no one in his right mind would put a repeater on a free balloon. It must be tethered."

Short pause.

"Where the devil would they get a rope 20 miles long?"

Long pause!

My favorite story is the one about the amateur in northern Nebraska who was called by nature in the early hours of the morning. Noticing that the scanner on his handie-talkie by his bedside was stuck on one frequency, he took it with him. Perhaps to this day he doesn't believe that he spoke to an operator 500 miles away on 147.33 simplex, with a 1-Watt handie-talkie with a rubber ducky antenna while sitting on his own john!

Many similar tales made our 30-hour day more bearable!

The experiment was turned on again at 1010Z, but insufficient power remained in the ±15-volt power supply to operate the repeater in the simplex mode. The 147.33-MHz transmitter was commanded on continuously and successful operation continued in the 144.33/147.33 duplex mode until termination at 1529Z. During the 15-hour, 17-minute flight, over 500 contacts were made in 5 states and 3 provinces. From calculations and a Fresnel plot, the theoretical radio range from 102,000 feet was 451.6 miles. Information provided by the NRC weather service indicated that there were no significant inversions during the period of the flight. Analysis of the actual contacts made indicates that the actual radio range was indeed very close to the theoretical.

It was also noted that differences in polarization at ground stations, e.g., verti-

cal, horizontal, or circular, had no apparent effect on the received signal strength.

A drop in signal strength of about 30 dB occurred approximately every 74 minutes. The regularity of this phenomenon leads us to suspect that balloon rotation resulted in eclipsing of the flight antenna system. Rotation was confirmed by telescopic sightings.

The 432-MHz beacon experiment was not successful as the unit was inadvertently turned off by the balloon command officer and it was only just before termination that, when supposedly switching it off, it was in fact switched on, and we could hear the signal clearly from almost 400 miles away. No reception reports were received.

The flight was terminated near Broadview, Saskatchewan, and a search team quickly located and recovered the amateur package which was safely returned, undamaged, to Gimli the next day.

As a result of this flight and the professional attitude of the amateur fraternity, amateurs in general, and the recently formed Canadian Amateur Radio Research Club (CARRC) in particular, have gained a measure of credibility and recognition from the scientific and industrial communities.

At present, members from the Greater Winnipeg area, together with an Ottawa chapter, are working on a flight experiment expected to be included as a passenger on a balloon flight during the summer of 1981. The design of the package calls for:

1. A microprocessor which will act as the control center for other experiments on board. This will demonstrate that programming and execution can be controlled from the ground. Commands will be transmitted from the ground to activate various functions of the experiment, e.g., to turn equipment on or off, etc. Command verification and analog data from the experiment (temperatures, supply voltages, etc.) will be transmitted back to the ground via Pulse Code Modulation (PCM).

The data transmissions will be decommutated at the ground station and the data will be analyzed in real time. Magnetic tape recordings will preserve data for further analysis at a later time.

PCM format: 1.5 kilobits per second, bi-phase level; mainframe length—20 words; word length—9 bits (8 data bits + 1 bit); sync word length—18 bits. The PCM will be transmitted on an FM subcarrier, frequency modulated on the main telemetry down-link.

2. The radio experiments will consist of:

(a) a 2-meter duplex repeater with input on 144.33 MHz and output on 147.33 MHz.
(b) a 10-meter-to-2-meter transponder. This will consist of a 10-meter SSB input with a 2-meter FM output.
(c) a UHF beacon, tone modulated.

We have been informed that, as we would be passengers on the flight, we must keep the package weight down to 50 pounds and the size down to 1 cubic foot. Ah, well, the impossible just takes a little longer!

It is hoped that we will be able to publicize the next flight rather better than the last. Our publicity man will probably send information to local net managers in Canadian provinces and the northern United States, so perhaps you should monitor your local net frequencies for up-to-date news on the progress of our next venture. The results of the proposed experiment may be published in a future article. Meanwhile, any further information is available from CARRC, Box 473, Pinawa, Manitoba, Canada R0E 1L0. ■

The Gimli control tower. The 4- × 6-element yagi for 2 meters is seen to the right and the 432-MHz beam can be seen to the left.

Fig. 3. Dotted envelope shows the theoretical maximum coverage throughout the flight.

Digital Control for the Ham III Rotor

—good-bye manual switching!

Don Inbody WA0PBQ
8413 Riggs
Overland Park KS 66212

Shortly after I installed my new CDE Ham III™ rotator, I decided that there just had to be a more convenient method of operation. Being basically lazy, I am fundamentally opposed to the manual manipulation of switches required. (Press brake lever and hold, press rotation switch and hold until antenna is at desired heading, release rotation switch, and release brake switch a few seconds later.) With the state-of-the-art of electronics, I knew that there should be a better way.

I contemplated the matter for several weeks and even sketched out a few designs on paper. Nothing really jelled until I read a *73* article by Randy Kaeding K8TMK (September, 1979). The article described how he developed a digital readout for the CDE AR-44™ rotator. With his modification, manual manipulation of switches is still required, but he showed me how to produce digital information which can be used to control rotator operation.

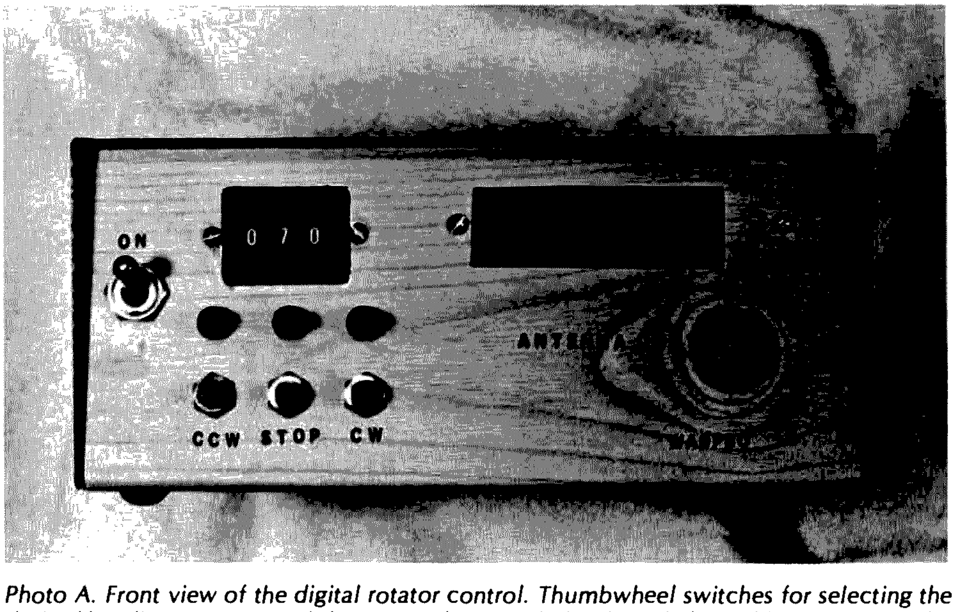


Photo A. Front view of the digital rotator control. Thumbwheel switches for selecting the desired heading are at upper left. LED readouts are behind a red plastic filter at upper right. At lower left are three push-buttons for ccw and cw rotation manually. Discrete LEDs above each push-button indicate the status of the control.

I can operate my rotator by selecting the desired heading with thumbwheel switches and momentarily pressing one of two push-buttons, depending on whether clockwise or counterclockwise rotation is desired. I can go back to operating while the antenna rotates to the new heading and stops. A few seconds later the brake solenoid engages. The heading is shown by a three-digit LED readout.

The block diagram (Fig. 1) shows the general operation of the control. A voltage which varies according to the antenna heading is produced across the potentiometer in the rotator assembly. That voltage is

translated into digital information by an analog-to-digital converter. The A/D converter output is fed to decoder/drivers and LED displays. The A/D output is also compared with the settings of thumbwheel switches. When the values agree, rotation stops. A delay timer keeps the brake released for a few seconds to allow the antenna to coast to a full stop.

Fig. 2 shows the logic circuit. U9 is a 3½-digit analog-to-digital converter designed for voltmeter applications and provides a full-scale reading of 2.0 volts. A voltage divider (R34 and R35) furnishes 0.36 volts across the 500-Ohm pot in the rotator assembly; thus, at complete rotation, a readout of 360 is provided. Pins 20-23 provide binary-coded-decimal (BCD) outputs for all digits. Pins 16-19 are digit-enable lines. To obtain information needed by the 7485 comparators (U3 and U4), the output must be de-multiplexed. I used a 74175 (U7) and a 7474 (U6). As explained later, only two digits are used, so the outputs of pins 16 and 19 are disregarded.

The largest number to be shown in the hundreds position is 3, so the binary 4 and 8 outputs are ignored for that digit. The BCD outputs go to the memory chips (U6 and U7) which are clocked by the digit-enable lines. U6 and U7 require positive-going pulses for clocking, so the outputs of pins 17 and 18 must be inverted. I tried various types of inverters, but I could get dependable clocking only by using a 7414, a hex Schmitt trigger. The Schmitt trigger has a very quick snap action, responds with less variation between high and low values, and is fairly tolerant of noisy signals.

U6 and U7 remember the BCD information for each digit until a new clock pulse is provided by the digit-enable lines. This allows the 7485s to compare the values being shown on the readout with those set on the thumbwheel switches. When the values agree, pin 6 of U3 goes high, resets the control flip-flops, and starts the brake-delay timer.

Antenna rotation is accomplished by three set-reset flip-flops and three relays. There is one each for clockwise and counterclockwise rotation and one for operating the brake solenoid. For example, when counterclockwise rotation is desired, momentarily pressing S5 drives pin 1 of U11 high, which closes K1, an SPST relay, and provides 25.2 V ac to the brake solenoid.

At the same time, pin 10 of U10 goes high, which closes K2 and provides 25.2 V to the ccw winding in the rotator motor.

When the desired heading is reached, pin 6 of U3 goes high and resets the ccw flip-flop, which releases K2 and stops rotation. Also, the delay timer is triggered. About three seconds later, the stop flip-flop is reset and K1 is released, allowing the brake to engage. Operation for clockwise rotation is the same, using S4.

S3 provides a manual method of stopping rotation before the desired setting is reached. (This is also useful if you press ccw when you mean to press cw!) LEDs (D4 and D5) light when the antenna is turning. Another LED (D6) lights when the brake solenoid is energized (brake released). These are not really necessary, but they give a visual indication of action and impress the tourists.

To get more dependable triggering, I routed the output of U3 through two inverters of U8. This may not be necessary, but the inverters were available and they do provide a very clean, fast trigger pulse. D7 blocks the +5-V dc supply from the output of the inverter when the stop button is pressed.

Brake delay is accom-

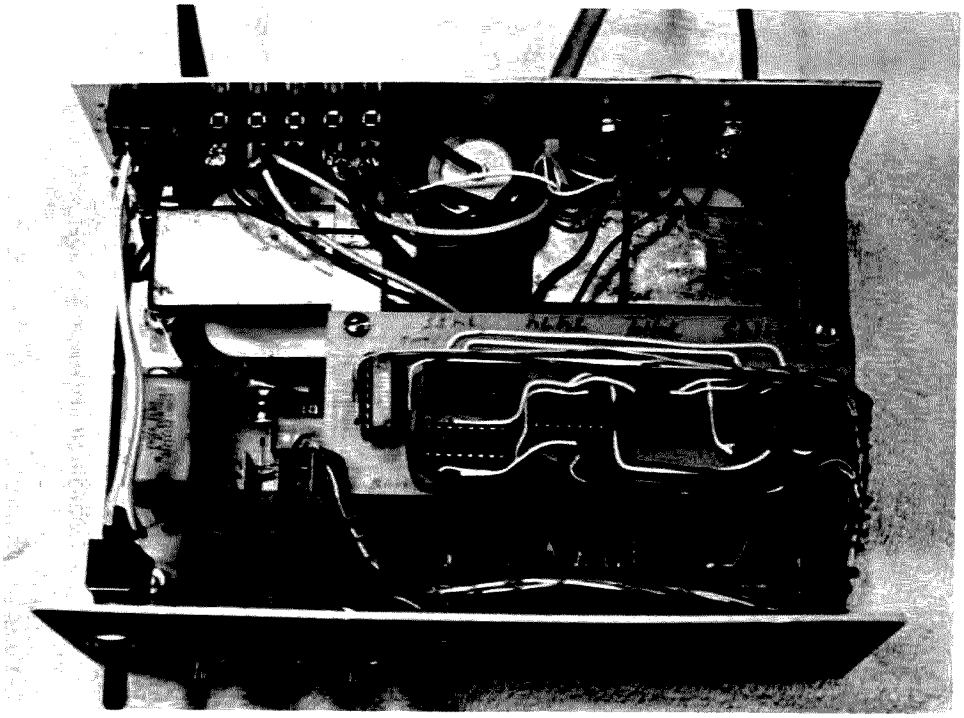


Photo B. Interior view. A 25.2-V transformer at upper left provides ac for rotator operation. At upper right is a 12.6-V transformer for control operation. Connections to the rotator assembly are made on the terminal strip at upper left. After the photo was taken, I installed a molex connector and eliminated the terminal strip. The ac power switch and thumbwheel switches are at lower left. The six ICs mounted on a separate circuit board which is double-decked over the main board are the de-multiplexers, comparators, and inverters.

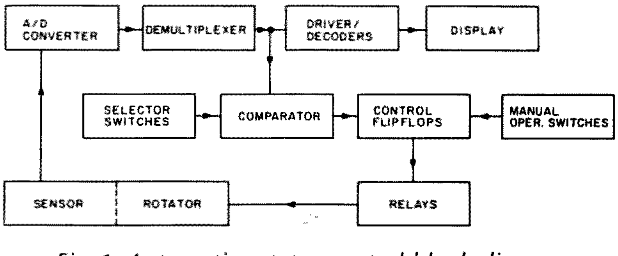


Fig. 1. Automatic rotator control block diagram.

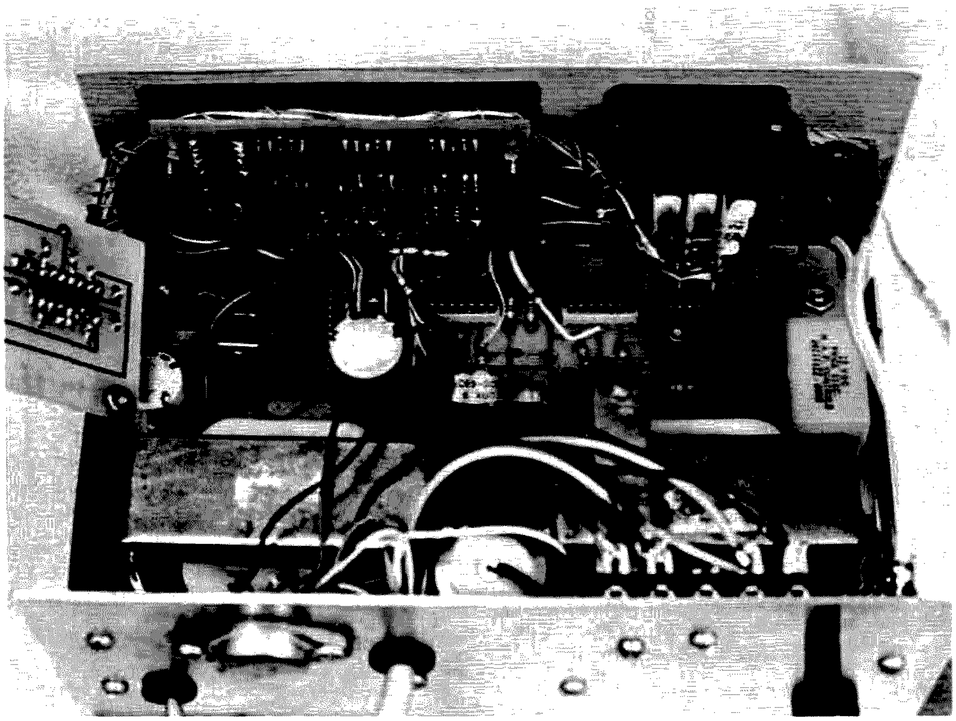


Photo C. The double-decked board has been rotated away to show layout of the main board. The displays and drivers are mounted on the board at upper left. Thumbwheel switches are at upper right. The A/D converter is the large chip at left center. Motor control and brake relays are at right center. The tops of the transformers can be seen near the bottom. At the left is a separate two-conductor shielded cable for the sensor circuit. At left center is the main rotator cable. These have been replaced by a nine-conductor molex connector.

plished by U12, a 555 timer. The values of C5 and R32 shown in Fig. 3 hold the brake released for about three seconds after the motor is turned off. The time can be altered by changing the values of C5 and/or R32 to provide the amount of delay needed for any particular installation. The delay can be any amount from a small fraction of a second to several minutes.

The trigger input of a 555 must be a negative pulse and must be held high between triggerings. The high output from U3 is inverted by a gate on U11. (One of the inverters on U8 could have been used.) The timer is held high by R30 and R31 and is isolated from U11 by C4. When pin 13 of U11 goes low, a pulse crosses C4 and starts the delay timer. C6 in the U12 output line (pin 3) also improves triggering.

The external components around the A/D converter (U9) were chosen according to the manufacturer's application sheet. R16 and R17 are used to set the reference voltage at +2.0 V dc. Other components establish internal operation of the chip.

As shown on the schematic, the rotator control reads out only the hundreds and tens digits. I tried several ways to get more precise readings, but I finally gave up. Because of the method of picking up the sensing voltage, a long rotator cable, and the clocking times of U6 and U7, reliable action in the units digit just wasn't possible. I finally hard-wired the units LED to show 0. Unless your antenna is much sharper than mine, I doubt that 10 degrees difference between actual and indicated heading will be noticeable. If you know of a way to get a more precise readout, please let me hear from you.

I got the control working well on the breadboard using a 500-Ohm trimpot to simulate the pot in the rotator assembly. When I connected it to the rotator, the readout was totally erratic. After a great deal of checking, consultation, head scratching (and maybe just a little cussing), I found the problem. Instead of 0.36 V dc across terminals 3 and 7 of the rotator, I had about 12 V ac. Apparently, an ac voltage was being induced within the approximately 100 feet of rotator cable. I tried several types of filters and chokes, but nothing worked. A separate two-conductor shielded cable from the shack to the rotator assembly solved that problem.

Another source of difficulty was the nature of the wiring of the rotator assembly. The wiper of the indicator pot in the rotator is connected to earth ground. As that is the source of voltage for U9, all control circuitry must be insulated from earth ground. Also, as I learned the hard way, grounded test instruments cause erratic and meaningless readouts.

I used PC board construction. Perfboard or wire-wrap should work just as well. There are three boards. On one are the power supply, the flip-flops, the relays, and the A/D converter with its associated components. A second board holds the readouts and drivers. The de-multiplexers, Schmitt trigger, and comparators are on a third board, which is double-decked over the main board.

The whole works is mounted in a Radio Shack (#270-269) cabinet, including the transformers. The fit is pretty tight, but it does work, and it looks nice. Wood-grained self-adhesive paper was used to cover the bare aluminum.

The thumbwheel switches provide BCD output. The 7485 comparators require BCD complement, so the switch outputs must be inverted. As only the 1 and 2 outputs are used by the hundreds digit, one 7405 (U5) provides the needed 6 inverters.

The power supply as shown in Fig. 4 is conventional. U13, an LM309K regulator, is mounted on the rear of the cabinet to dissipate the heat. No heat sink is needed for U14, a 7905 regulator, which provides −5 V dc for U9. C10 and C11 are needed to prevent oscillation. They should be installed very near the output terminals of the regulators.

I used 6-volt relays for motor operation and a 12-volt relay for brake oper-

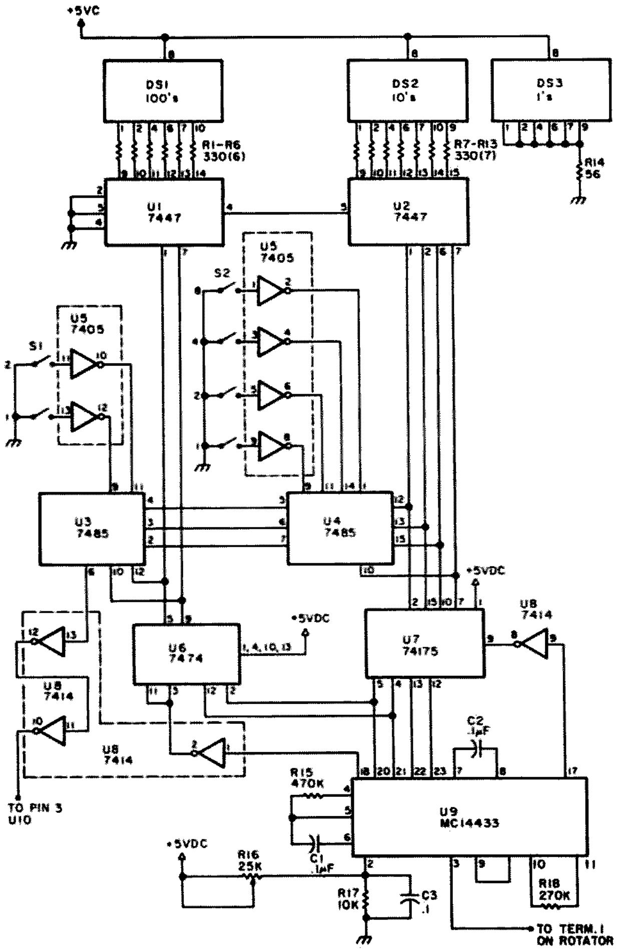


Fig. 2. Readout and logic schematic. All circuitry must be insulated from earth ground.

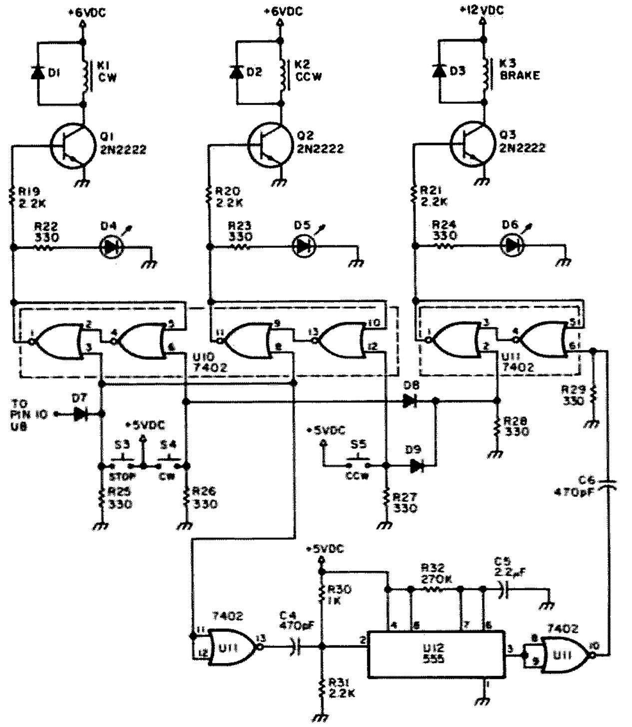


Fig. 3. Control schematic. All circuitry must be insulated from earth ground.

ation because they were on hand. The motor relays are not especially critical as the current is relatively small. The brake relay must handle about 2 Amps plus the amount required by the motor. Note that the motor relay contacts are in series with the brake relay contacts. This ensures that the motor will not run unless the brake is released.

My 6-volt relays would not operate from the 5-volt power supply, so I included D12, a 6-volt zener, ahead of the positive regulator with R35 in series. The power supply voltage ahead of the positive regulator was near enough to 12 volts to operate the brake relay. Different relays will, of course, have different power requirements.

Almost any general-purpose NPN switching transistors should work for Q1-Q3. D1-D3 across the relay coils help prevent voltage spikes which occur when the coils are switched out.

If you build this project, don't forget C7, a 120-140-uF unpolarized electrolytic capacitor. It is necessary for rotator operation. I got mine from CDE.

There are only two adjustments to make. R16 must be set to provide 2.0 V dc at pin 2 of U9. R34 is adjusted to provide a 360 reading at full rotation of the antenna and will need to be readjusted if the control cable length is changed.

All parts used in the control are readily available. Except for the motor capacitor, I got all my parts from

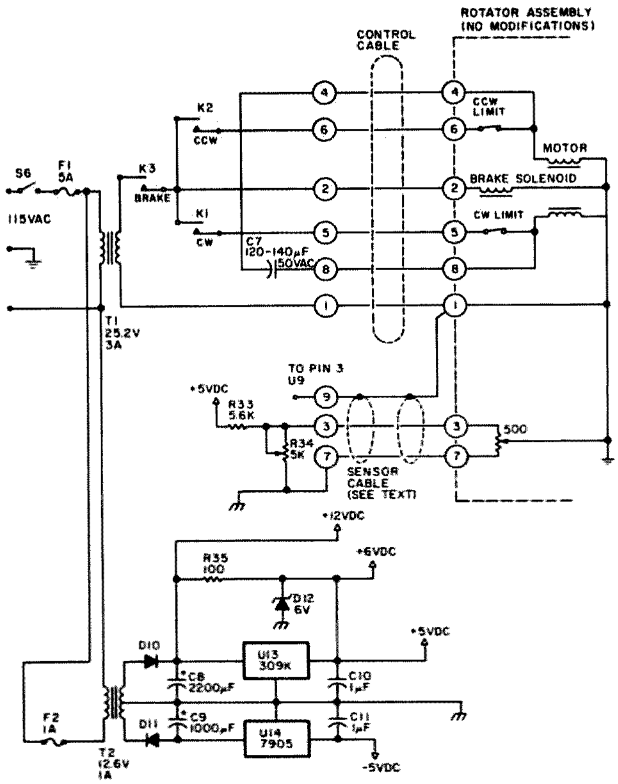


Fig. 4. Power supply and connections to rotator assembly. All circuitry must be insulated from earth ground except potentiometer wiper and motor in the rotator assembly and the cabinet ground on the 115-V ac line.

Parts List

C1	0.1-uF mylar®
C2,3	0.1-uF ceramic disc
C4,6	470-pF ceramic disc
C5	2.2-uF tantalum
C7	120-140-uF ac electrolytic
C8	2200-uF electrolytic
C9	1000-uF electrolytic
C10,11	1-uF tantalum
D1-3,7-9	1N914/1N4148, etc.
D4-6	LED
D10,11	1N4001
D12	6-volt zener
DS1-3	FND-510
K1,2	SPST 1-A relay
K3	SPST 3-A relay
Q1-3	2N2222 or equivalent
R1-13,22-29	330 Ohms (all fixed resistors are 1/4 Watt)
R14	56 Ohms
R15	470k
R16	25k trimpot
R17	10k
R18,32	270k
R19-21,31	2.2k
R30	1k
R33	5.6k
R34	5k,10-turn trimpot
R35	100 Ohms
S1,2	BCD thumbwheel switch*
S3-5	NO push-button
S6	SPST toggle
T1	25.2 V, 3 A
T2	12.6 V, 1 A
U1,2	7447
U3,4	7485
U5	7405
U6	7474
U7	74175
U8	7414
U9	MC14433
U10,11	7402
U12	555
U13	LM309K
U14	7905

Other:

Cabinet
Power cord
5-A fuse and holder
1-A fuse and holder
IC sockets
2-conductor shielded cable
9-pin molex connectors
(2 male, 1 female)
Despiking capacitors
(0.01-0.1-uF ceramic)

*Thumbwheel switches are available from Jameco Electronics, 1355 Shoreway Road, Belmont CA 94002. This project uses 2 SR21 BCD switches and 1 pair SREP end plates.

Radio Shack, *73* advertisers, and my junk box. Prices vary, so it pays to do some comparison shopping. Except for the timing of the brake release delay and the external components around the A/D converter, nothing in the circuit is especially critical. The 330-Ohm resistors are typical for TTL circuits, but any value from 100 Ohms to 560 Ohms will work, although lower values will increase the power supply demand. Diodes D1-D3 and D7-D9 can be just about any general-purpose diodes you have available.

Good TTL design requires liberal use of despiking capacitors. They are not shown on the schematics, but several 0.01-uF ceramic discs were installed at various locations where +5-V dc lines were near ground buses. There should be one for every three ICs and one at each place a supply line enters a circuit board. Any value from 0.01 uF to 0.1 uF will work in a circuit such as this one. Supply connections for most ICs have been omitted from the schematics. See Fig. 5 for connections required.

The readouts are FND-510s. They are large (0.5″) and can be bought for $1.00 or less. Almost any 7-segment LEDs could be used. The 510 is a common-anode device. If common-cathode displays are used, substitute 7448 drivers for the 7447s and connect the common pins to ground instead of to +5 V dc.

As mentioned before, this project was developed to adapt my Ham III. Other CDE rotators have basically the same circuit, so adaptation to other models should be possible. Fig. 6 shows the sensing circuit of the Ham III. If you have a different model, you can check the circuit shown in your owner's manual to learn if any changes are needed.

With this control, the antenna will have to be shifted 180 degrees. The standard dial on CDE rotators has 0 and 360 degrees at the center of the meter scale. With the digital control described here, mid-rotation provides a 180-degree reading. As I wanted to be able to continue using my CDE control box as a backup, I changed the marking on the meter plate. A south-centered meter plate is available from CDE.

I also provided both control boxes and the rotator cable with molex™ connectors. This allows me to switch controls easily. Incidentally, this quick-disconnect feature provides a safety factor. When lightning threatens and I disconnect my antennas, I also can disconnect the rotator cable and remove one more possible source of lightning in the shack.

The digital rotator control has been in operation in my shack for several months without any problems. It certainly is more convenient to use than the standard control. During net or contest operation, I can change the antenna heading quickly by dialing the new heading and pressing a button. I can immediately go on operating without waiting for the antenna to complete its rotation.

There are probably better and simpler ways to accomplish the same results. I will be interested in hearing about your efforts. If you have questions, write to me and include an SASE. I will try to answer. ■

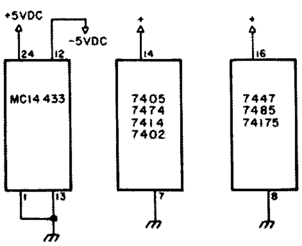


Fig. 5. Supply connections for integrated circuits.

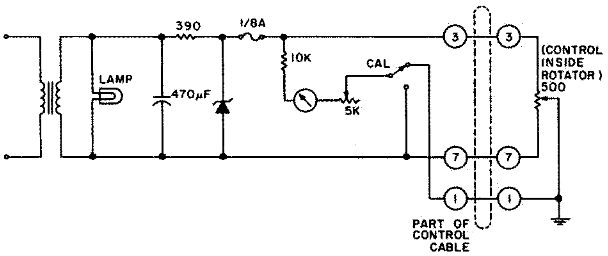


Fig. 6. Unmodified sensing circuit of the Ham III rotator. Wiper of control in rotator is connected to earth ground.

The Doppler Systems DDF-3003

—a review of the latest in direction-finding equipment from Doppler Systems

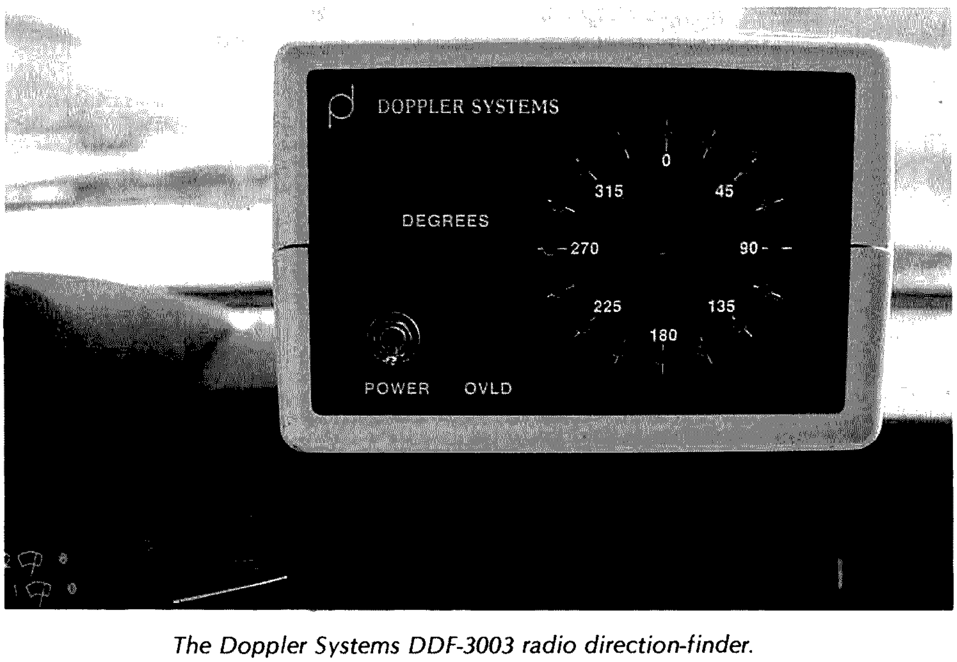
Paul Grupp KA1LR
73 Magazine Staff

One rather unfortunate by-product of the boom in repeater activity is the large flock of wild turkeys that has accompanied it. For the uninitiated, a wild turkey is an uncivilized lout who manifests various and sundry antisocial behaviors while firmly clutching the PTT switch on the microphone of an FM transceiver. As an avid FM operator, I have developed a fairly well-tested hypothesis which I call the wild-turkeys-per-square-mile factor.

In any given population center, there will be a certain number of wild turkeys per square mile. The greater the population density of a specific geographical area, the greater the number of wild turkeys in that area. By the same token, the wider the coverage of a particular repeater, the larger the number of wild turkeys that will be operating within its coverage area.

Now, whatever the coverage of a particular repeater, it can only carry so much traffic. A repeater with a very small coverage area in a location with a low population density will probably be able to laugh off the feeble efforts of the .325 wild turkeys within its coverage area. The matter gets a bit more serious as the coverage of the repeater increases. A wide-area-coverage repeater in a metropolitan area will have no more hours in its operating day than the rural repeater, yet the flock of wild turkeys using its time will be much larger, causing a level of interference that often cannot be tolerated.

It is on this fertile ground that sophisticated direction-finding equipment has begun to get a foothold in the amateur market. At some point, the operators of a repeater grow tired of the activities of the wild-turkey contingent, and they



The Doppler Systems DDF-3003 radio direction-finder.

begin to cast about for methods of silencing the cretins. The FCC does what it can, but a problem has to get awfully serious before the Commission can get its ponderous machine into motion. Enter the direction-finding committee.

For the DF committee to do its job, it needs good direction-finding equipment, and really good DFing equipment has been neither plentiful nor cheap. Some of the best DFing units are those that operate on the Doppler principle, but the complexity and expense of these devices has kept them out of the reach of most repeater groups.

Doppler Systems of Phoenix, Arizona, is trying to change this situation. The Doppler Systems DDF-3003 is a radio direction-finder that works on the Doppler principle using a relatively compact antenna array. It is designed to work with almost any VHF FM receiver and is suitable for either mobile of fixed operation. Doppler Systems has been kind enough to present complete engineering data and construction information for their direction-finder in another article in this issue. That article gives you enough information to build a DFer on your own, or Doppler Systems will sell you a complete unit, in kit form or assembled. This review will not repeat the material presented in the article, but instead will attempt to give you an idea of what the completed unit is capable of and how well it works.

Description

Doppler Systems offers their DFing unit in three different configurations. The DDF-3001 is the basic unit and reads out the bearing of a transmitter with an array of sixteen LEDs spaced 22½ degrees apart. Model DDF-3002 adds a digital display that gives a numeric readout with one degree resolution. The DDF-3003 includes all the features of the other two models and adds a serial AFSK interface which can be used for remote readout, telemetry, tape recording, etc. As this is written, the price of the 3001 is $235 in kit form, $335 assembled. The 3002 is $295 kit, $470 assembled, and the 3003 is $325 kit, $470 assembled. For the truly cautious ham who doesn't rush into anything, the assembly and operation manual is available for $12.50.

For this review I obtained a DDF-3003 and an antenna built to the specifications detailed in the manual. The antenna can either be mast-mounted or mounted atop a car—I opted for the mobile installation. New Hampshire's mountains are beautiful for everything but direction-finding. Reflections being so plentiful and unpredictable, I thought I would have better luck with mobile DFing than with operation from a fixed location.

The Manual

The DDF-3003 I tested was supplied assembled, so I really can't comment on the assembly instructions other than to say that they appear to be well thought out and complete. The theory of operation, installation, and troubleshooting sections are some of the best I've seen anywhere, but the operation and use section isn't too hot—in fact, it is almost nonexistent! According to the manufacturer, the DDF-3003 has seen a lot of action in competitive transmitter hunts. It would be nice if the experience gained in this activity could be passed along to the customer. I'd like to see Doppler Systems add a section on how to interpret readings or at least suggest another publication that offers general information on DFing.

Installation and Use

Installation was fairly simple, involving audio and antenna connections to a VHF receiver and a source of 12 V dc. Four RG-174 cables from the antenna atop the car also plug into the back of the DDF-3003. Audio and power connect through an Amphenol "D" connector; antennas use phone jacks and plugs.

Once everything is installed and connected, the real fun begins. You flatlanders have it easy! The object of the game is to aim the front of the DFer-equipped car directly at a transmitter and have the DFer read 0 degrees at the same time. A multi-turn pot inside the case gives a 90-degree range of adjustment. If proper calibration is out of this range of adjustment, you simply plug the antennas into the DFer in a different order. Calibration isn't complicated, but it can be annoying. It took me several hours to get the thing aligned correctly, because of reflections from surrounding mountains. I would zero the display, move the car backwards or forwards a few feet, and the display would go totally berserk. This unit can teach you some good lessons about multipath!

I finally found a location that was relatively free of reflections, and thereafter things went smoothly. After careful calibration, I drove the car in a circle and the display tracked perfectly, always showing the location of the transmitter in relation to the nose of my car. Things were looking up! I took a nice long drive around the transmitter and was soon reassured that the DFer was indeed calibrated correctly. Over the next few days I spent a lot of time taking bearings on several different transmitters, and it was quite an education. The DDF-3003 is at best only a smart machine, and it will occasionally display the bearing of a reflection of a signal rather than the signal itself. However, once you get to know the little beast, it will rarely fool you. I found that when it was tracking reflections, the display would "box the compass," with the LEDs flicking around erratically. When it was on to the real thing, it would lock onto a single heading, occasionally flicking back and forth between two 22½-degree increments. Only when I attempted to track a very distant transmitter while I was deep in a valley did I get incorrect readings that appeared to be correct.

Conclusions

The DDF-3003 will tell you where a transmitter is, but you sometimes have to use a little common sense when interpreting readings. I didn't have another type of unit to compare it with, but it didn't seem to have any serious shortcomings. The accuracy was such that a single unit installed in a vehicle could be used to track down a reasonably long-winded wild turkey. More units, handled properly, will pinpoint the gobbler far more quickly. A repeater group could install a set of DDF-3003s to monitor their repeater's coverage area and use the serial AFSK outputs to feed the information into a microcomputer. Such a network could accurately locate a wild turkey in a very short period of time. What you do with him after you find him is another story, but this DFer will find him for you!

For further information, contact *Doppler Systems, 111 E. Moon Valley Drive, Phoenix AZ 85022.* Reader Service number 479. ■

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DF Breakthrough!

—the "turkey" tracker we've all been waiting for

A U.S. Patent is pending on the direction-finding system described in this article. For further information, contact the author.

Radio direction-finding (RDF) systems tend to fall into two general categories depending on whether or not they use the Doppler shift principle. Most non-Doppler RDFs employ directional antennas which produce peaks or nulls in the received signal amplitude as they are rotated. Doppler-type systems, on the other hand, detect the phase modulation imparted to the received signal by translational motion of the receiving antenna. As a consequence of the "capture effect" of the FM receiver which detects the phase modulation, Doppler-type systems generally are less sensitive to site errors than amplitude measurement systems. The first known RDF based on detecting the Doppler shift was patented by H.T. Budenbom and used a motor driven antenna. Doppler RDFs today do not mechanically rotate an antenna, but instead rely on sequential switching between a series of antennas placed in a circular array to approximate the continuously rotating single element.

In 1969, W7KWB and I built one of the earliest adaptations of this system for amateur use. That system employed 16 switched antennas housed in a 4-foot-diameter wooden "hat box" and was used successfully in local transmitter hunts during 1970-1972. The antenna itself was heavy (115 pounds) and the system required an external oscilloscope for display. DTL logic was used. Other systems were subsequently built in the Phoenix area which operated on essentially the same basis but incorporated improved mechanical construction and utilized the more sophisticated TTL and CMOS integrated circuits then becoming available.

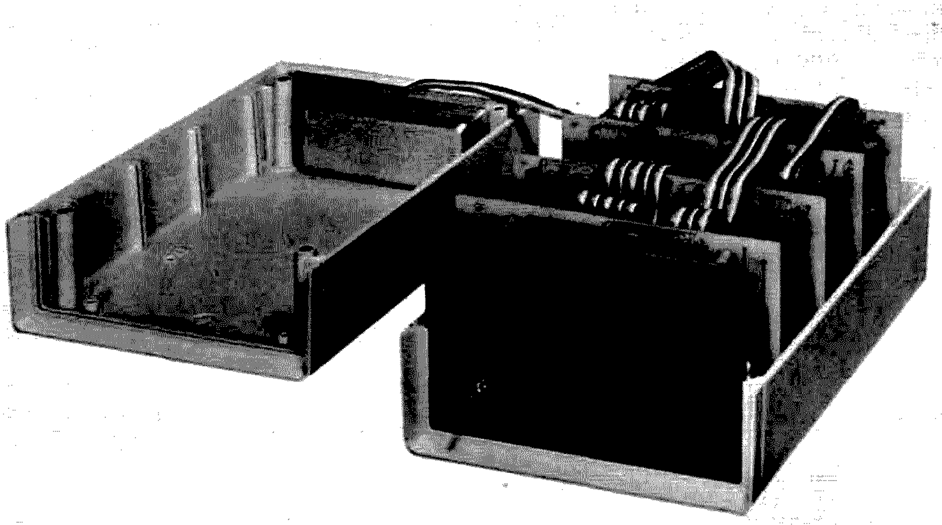


Photo A. Fully expanded version of the electronics available in kit form from Doppler Systems.

A serious drawback to these systems was the drastic loss in sensitivity which occurred during operation. A second problem which was equally vexing was the appearance of mysterious false bearing vectors apparently due to off-channel frequencies being shifted onto the received frequency by something in the commutation (electrical rotation) process. Both of the above problems would disappear whenever the antenna commutation was halted, i.e., on-channel stations would immediately regain their signal strength into the receiver and off-channel carriers would disappear.

Several techniques were tried unsuccessfully to eliminate these problems. Theorizing that the switching transients related to turning on and off the various antennas were causing receiver desensitization and, in addition, were modulating off-channel signals into the receiver passband, several methods were investigated to smooth out the switching transients. These included:

(1) overlapping the antenna selection so that at least

one antenna was always connected to the receiver;

(2) rounding the antenna switching waveforms and using PIN diodes to create a more gradual on/off transition; and

(3) generating a complex analog control waveform matched to the gain characteristics of the PIN diodes to further reduce switching transients.

None of these solutions produced especially noteworthy results. In addition, it was felt that an antenna array of the size being used was impractical, especially for mobile use. Reducing the number of elements would help this problem, but with discrete commutation, the linearity of the system deteriorates as the number of antennas decreases.

Photo B. Antenna mounted to a 1974 Blazer. The ground plane formed by the radials is particularly useful with non-metallic roofs.

The solution which ultimately was discovered uses only four antennas which are located in a square pattern, the sides of which are typically 1/4 wavelength long. The received signal induced into all four antennas is continuously mixed in a precision summing circuit in such a manner that the resultant rf voltage produced is very nearly identical to that which would be induced in a single antenna rotating at a uniform rate around the circle which inscribes the square formed by the four actual antennas. Tests have demonstrated that this system does not possess the loss of gain or off-channel susceptibility problems of previous designs. Antenna size for VHF applications is very compact. Electronic processing is relatively involved, but considering the performance which is obtained, it is justified for serious direction-finding applications. The system to be described works with any FM receiver to detect the Doppler-induced phase modulation and does not require any modification of the receiver. It is relatively broadband and has been tested over the frequency range of 135 to 165 MHz.

Depending on the application, three different outputs are available. For mobile application, a circular array of 16 light-emitting diodes (LEDs) provides an immediate analog bearing relative to the vehicle's direction. For more demanding mobile or fixed station applications, a 3-digit panel display provides the bearing directly in degrees. Finally, a serial interface is available in a format suitable for remote-display (utilizing the same or similar electronics for readout), recording the bearing data on an ordinary audio tape recorder, or connection to a microprocessor. The linking of several remotely-located direction finders into a common microprocessor for automatic station triangulation and logging should be straightforward.

A simplified functional block diagram of the complete system is shown in Fig. 1. The rf summer combines the output of the four antennas in a manner which phase-modulates the rf signal to the receiver. As explained on the next section, the phase modulation contains the bearing information. A conventional FM receiver provides the audio input to the Doppler signal processor via connection to the external speaker output. Synchronous filtering removes the normal voice content leaving a sine wave having the same frequency as was used to modulate the antenna signals and a phase angle equal to the bearing angle. This sine wave acts as a trigger to latch the outputs of counters for display of the bearing in either a circular LED array and/or a 3-digit decimal display. An optional serial interface transmits the bearing data displayed by the unit or receives external bearing data as input for the display.

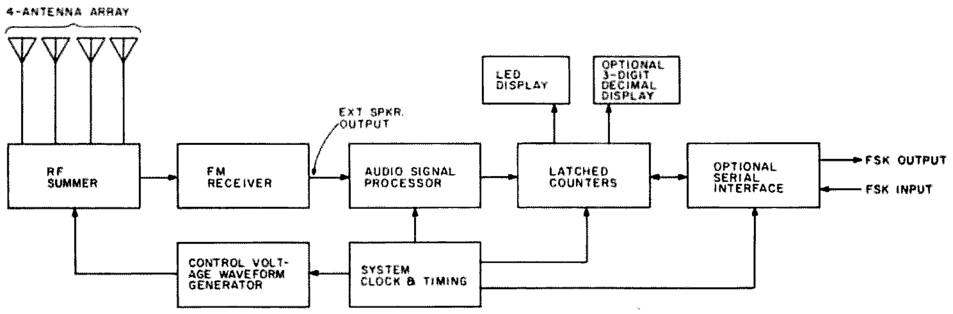


Fig. 1. Block diagram of the complete direction-finding system.

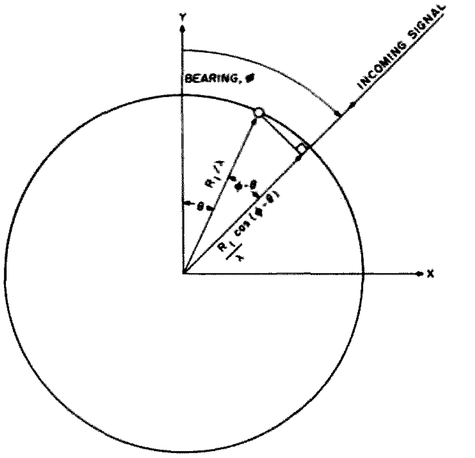


Fig. 2. Geometry used to derive the signal received by a rotating antenna.

Theory

Fig. 2 illustrates a simple antenna located at distance R_1/λ and angle θ from the reference position. Assume the incoming signal is located far (relative to the wavelength, λ) from the receiving antenna at the bearing ϕ shown. Then the voltage induced in the antenna can be written as shown in Equation (1), where A is the received amplitude in volts, ω_c is the carrier frequency in radians per second, t is the time in seconds and is selected to start with a zero crossing of E_R at the origin, and ψ is the phase shift in radians due to the antenna being closer to or further from the transmitter. If the antenna is closer to the source, ψ would be positive, indicating a phase lead, etc. For the geometry shown, see Equation (2).

Now suppose the receiving antenna is permitted to rotate with velocity ω_d in a circular path of radius R_1/λ. Then $\theta = \omega_d t$ and the phase of the received signal is as shown in Equation (3).

Equation (3) indicates that the rotating antenna has caused the incoming carrier to become phase (and frequency) modulated. The modulation frequency is the same as the rotation frequency, ω_d, so the frequency deviation which is equal to the rate of change of the phase is as shown in Equation (4) or Equation (5).

A standard FM receiver with de-emphasis will produce an audio output equal to the phase which is modulating the received signal (assuming the deviation is small compared to the discriminator full-scale range). See Equation (6).

Thus the receiver's audio output is a sinusoid having a frequency equal to the antenna commutation frequency, ω_d, and a phase angle equal to the bearing angle, ϕ. The commutation frequency should be selected to be at the low end of the receiver's audio passband to facilitate filtering out the normal voice modulation of the received signal.

Another way of looking at the problem is to consider the situation when the rotating antenna is at the angle where it is directly approaching the incoming signal. The maximum relative velocity causes an apparent increase in the carrier frequency at this point. Similarly, when the antenna has moved 180 degrees to the point where it is traveling away from the transmitter, the relative velocity is a minimum and the carrier frequency appears to be lower. This is the familiar Doppler shift phenomenon, but here the rotation of the antenna produces a periodic up/down shift, the phase of which is set by the bearing angle between receiver and transmitter.

Fig. 3(a) shows Equation (3) plotted against time for an assumed bearing angle of 45 degrees. Instead of physically rotating a single antenna, present-day Doppler systems discretely switch between adjacent antennas located in a circular array. To indicate graphically what sort of waveforms are generated by discretely commutated antenna arrays, the theoretical audio output for a system of 16 and 8 antennas is plotted in Figs. 3(b) and 3(c), respectively. The antenna, of course, receives many different signals in addition to the channel of interest. The phase modulation of all of these signals by a complex waveform such as shown in Fig. 3(b) or 3(c) may generate a variety of frequency components within the receiver passband. It is believed that these spurious frequencies are responsible for the false bearing problems noted earlier.

The technique for electronically producing the phase modulation of Fig. 3(a) with four antennas will now be described. Consider the system of antennas A, B, C, and D shown in Fig. 4 and assume for the moment

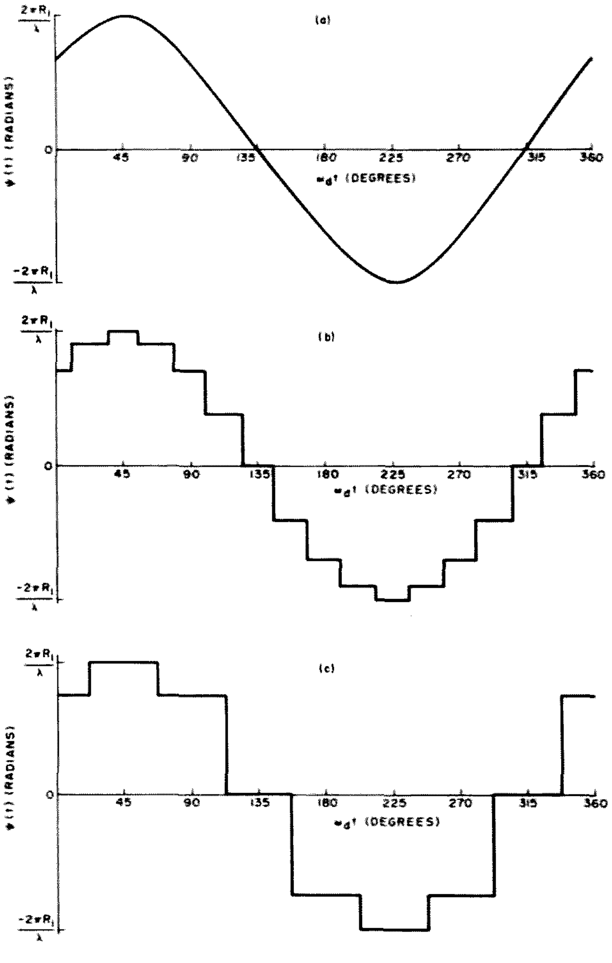


Fig. 3. Waveforms illustrating the phase modulation imparted to the received signal when the bearing angle is 45 degrees.

that the antennas are not coupled, i.e., there is no mutual impedance between them. The signals received by the four antennas can be summed electronically as shown in Equation (7), where K_A, K_B, K_C, K_D are gains and E_A, E_B, E_C, E_D are the rf voltages induced in the four antennas. We wish to find the value of the four gains which will create a voltage E_S equal to that induced in an antenna S located on the inscribed circle of radius R_1/λ at the angle θ shown in Fig. 4.

If an incoming signal were arriving from the left or right in Fig. 4, the phase at A and B would be equal, and the phase at C and D would also be equal. As long as the array is less than 1/2 wavelength on a side, the phase at point S may be computed by interpolating linearly between the phases to the left and right as indicated in the plot directly below the sketch of the antenna array in Fig. 4. See Equation (8).

For example, if S is midway between A and D, $\theta = 0°$, $K_X = 1/2$, $(1-K_X) = 1/2$, and the phase is the simple average of the phases measured at A and D. If we now consider a signal originating from the top in Fig. 4, the phase at S can be computed from that at A or D and that at B or C by interpolating along the Y direction. Referring to the graph to the left of the antenna in Fig. 4 see Equation (9).

Equations (8) and (9) may be combined to give a two dimensional interpolation of phase. From similarity, Equation (7) can then be written as in Equation (10).

The mixing is not perfect since rf voltages rather than phase angles are being mixed; the errors, however, are small, as discussed below. The gain for antenna A is given in Equation (11), which is shown plotted in Fig. 5 over one cycle of rotation in θ. Note that the gain peaks, as would be expected, at 45 degrees where the imaginary antenna is closest to antenna A. A second small gain increase also occurs 180 degrees from this location. The other antenna gains, K_B, K_C, and K_D, have identical shapes to K_A, but are displaced 90 degrees in phase (K_B lags K_A by 90°, etc.).

To evaluate the accuracy of the mixing given by (10), the instantaneous amplitude and phase of E_S was computed for antennas of different size with various bearing angles, ϕ. A typical result is shown in Fig. 6 for an antenna of dimension $2R_1/\lambda = 1/4$ on each side. In

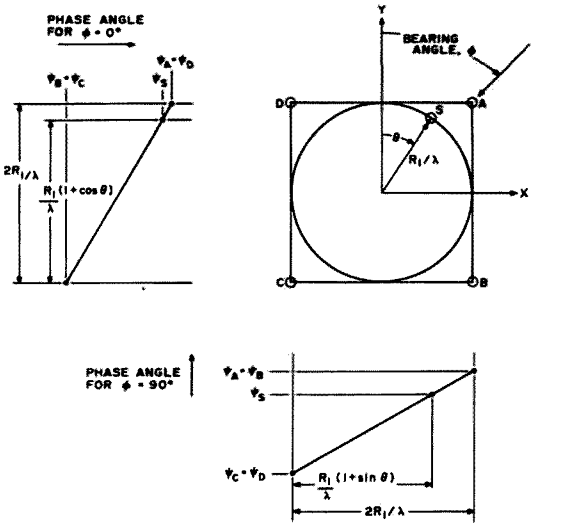


Fig. 4. Top view of a four-antenna array showing the interpolation of phase angle between opposite sides of the array.

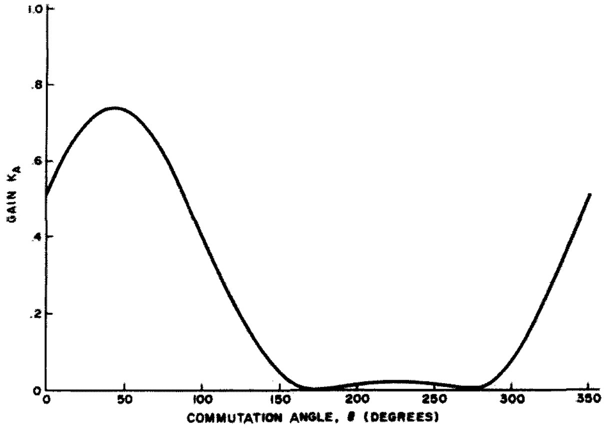


Fig. 5. Theoretical gain variation for antenna "A" required to produce an equivalent continuously rotating antenna signal.

EQUATIONS

Equation (1): $E_R = A \sin(\omega_c t + \Psi)$

Equation (2): $\Psi = \frac{2\pi R_1}{\lambda} \cos(\phi - \theta)$

Equation (3): $\Psi(t) = \frac{2\pi R_1}{\lambda} \cos(\phi - \omega_d t)$

Equation (4): $\omega_{deviation} = \frac{2\pi R_1 \omega_d}{\lambda}$ radians/second

Equation (5): $f_{deviation} = \frac{R_1 \omega_d}{\lambda}$ Hz

Equation (6): $E_{audio} = K_A \frac{2\pi R_1}{\lambda} \cos(\phi - \omega_d t)$

Equation (7): $E_S = K_A E_A + K_B E_B + K_C E_C + K_D E_D$

Equation (8): Phase at S $= \Psi_S = \Psi_{C \text{ or } D} + \left[\frac{(1 + \sin\theta) R_1/\lambda}{2 R_1/\lambda}\right] (\Psi_{A \text{ or } B} - \Psi_{C \text{ or } D})$

$= K_X \Psi_{A \text{ or } B} + (1 - K_X)\Psi_{C \text{ or } D}$

where $K_X = (1 + \sin\theta)/2$

Equation (9): $\Psi_S = \Psi_{B \text{ or } C} + \left[\frac{(1 + \cos\theta) R_1/\lambda}{2R_1/\lambda}\right] (\Psi_{A \text{ or } D} - \Psi_{B \text{ or } C})$

$= K_Y \Psi_{A \text{ or } D} + (1 - K_Y)\Psi_{B \text{ or } C}$

where $K_Y = (1 + \cos\theta)/2$

Equation (10): $E_S = K_X K_Y E_A + K_X(1 - K_Y) E_B + (1 - K_X)(1 - K_Y) E_C + (1 - K_X) K_Y E_D$

Equation (11): $K_A = K_X K_Y = 1/4 (1 + \sin\theta)(1 + \cos\theta)$

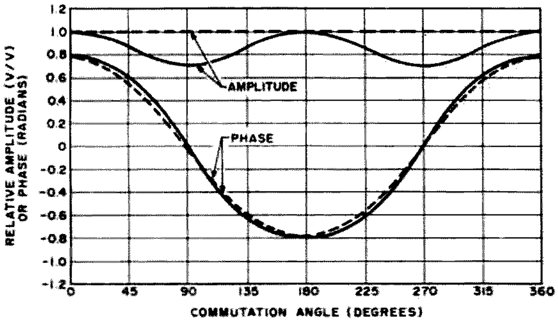


Fig. 6. Amplitude and phase modulation for an uncoupled antenna array of size 1/4 wavelength and a bearing angle of 0 degrees. The dashed lines represent the ideal (continuously rotating antenna) case.

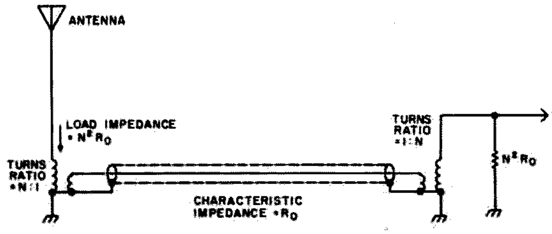


Fig. 7. Use of impedance transformers to minimize the effect of mutual impedance coupling between array antennas.

Fig. 6, the bearing angle ϕ is 0 (signal coming from top in Fig. 4). The composite rf signal contains some amplitude modulation (about 18% at twice the commutation frequency) in addition to the desired phase modulation. Note that the phase modulation error relative to an ideal (physically rotating) antenna is very small (less than 8%).

At bearing angles of 22.5 and 45.0 degrees, the amplitude modulation is lower and the phase modulation error is about the same—better than 8%. Antenna symmetry causes the amplitude and phase error characteristic to repeat every 45 degrees of bearing. Decreasing the antenna size improves the error characteristic over that shown in Fig. 6, but antenna tolerances become more critical and the magnitude of the phase modulation (deviation) which must be detected decreases as given by Equation (5).

The above results were based on an antenna array in which the elements do not interact with each other—that is, a current flowing in one antenna element does not induce a voltage in one of the other elements. This is generally not the case for antennas spaced at these distances.

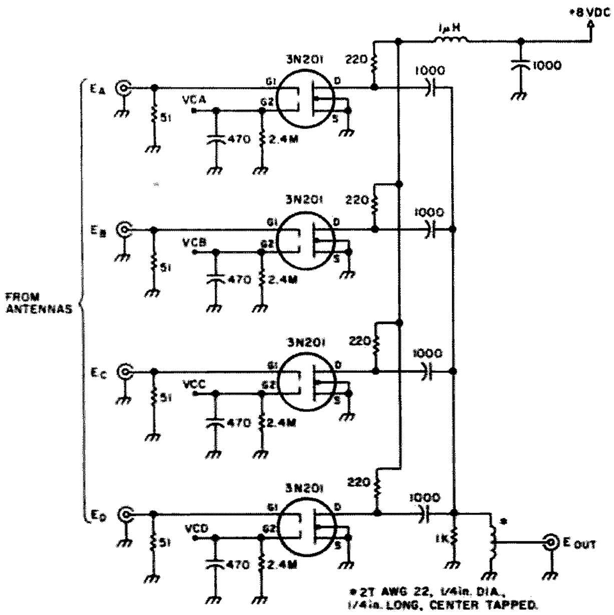


Fig. 8. Rf summer circuit schematic.

A detailed analysis has been made which takes into account the actual coupling between elements (mutual impedance). If each antenna element is terminated into a 50-Ohm load, the antenna currents and hence the coupling between elements are significant and the rf output voltage to the receiver is affected. For the 1/4-wavelength array, amplitude modulation increases to about 65% and the phase modulation waveform becomes noticeably distorted. The situation is considerably better with smaller antennas. For example, if the array size is 1/8 wavelength on a side, the amplitude modulation is only 19% and the phase modulation is very nearly sinusoidal.

An alternate to reducing the array size is to increase the effective load impedance across each antenna element. This may be accomplished using an impedance step-down transformer at the antenna and an impedance step-up transformer at the receiving end of the transmission line. See Fig. 7. It should be kept in mind that in a receiving application, the antenna is acting as the source and the receiver (or rf summer here) is the load. We wish to minimize standing waves on the transmission line to prevent rf pickup other than from the antenna. Therefore, the line must be matched to the rf summer. At the antenna, we are interested in having the maximum voltage developed across the antenna terminals. This is obviously obtained by presenting a high impedance load to the antenna. An impedance match between line and antenna is generally regarded as essential to proper system operation, but that is the case only for transmitting where the antenna acting as the load determines the line swr and maximum power transfer occurs when line and load are matched.

At this point, it might be asked just how significant amplitude modulation and phase modulation distortion are in this system. The receiver provides limiting which will remove most of the AM, and the phase detector provides synchronous filtering which will remove most of the harmonic distortion in the phase modulation. Initially, it was feared that any amplitude modulation would cause modulation products from adjacent channel signals to be formed which might appear on the selected channel and cause interference. Also, distortion of the phase modulation could lead to bearing errors at specific bearing angles. Neither of these problems has been observed in either the testing or the field use of this system. Therefore, while a solution is at hand, the need to employ it has not been evidenced and the design to be discussed in the remainder of this article does not include impedance transformers. The subject

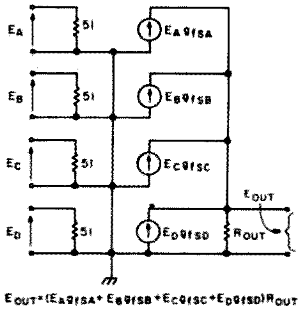


Fig. 9. Equivalent circuit of the rf summer.

of antenna array optimization and coupling for this system is an area for much additional experimentation and development.

Rf Summer

The circuit to be used for antenna summing should provide a low insertion loss, provide a stable and electronically-controlled gain characteristic, have negligible phase-shift variation with the control voltage, be compatible with a 50-Ohm unbalanced input, and lend itself to operating into a 50-Ohm unbalanced output.

PIN diodes and voltage-controlled FET resistor devices were tried and eventually rejected for one or more incompatibilities with the above requirements. The dual-gate MOSFET operating in a common-source configuration was found to provide an excellent choice. Fig. 8 shows the circuit configuration.

The rf equivalent circuit is given in Fig. 9. Each MOSFET acts as a current source into a common output impedance. The single, tapped inductor is used to cancel the combined output susceptance of the four MOSFETs. Device input impedance is extremely high, and the circuit is broadbanded by the use of relatively low value resistors for line impedance termination at all inputs and the output. Some gain is lost, but it is quite acceptable (less than 6 dB) and could easily be made up with a preamplifier stage at the output if desired. The output voltage is the weighted sum of the four antenna voltages with the weighting determined by the transconductance of the FETs. Since the transconductance can be varied by the second gate control voltage, this provides the means for electronically combining the rf voltages.

Fig. 10 plots the measured circuit gain (E_{out}/E_{in}) of four randomly selected devices together with a 7th order polynomial fit to the data. By combining the MOSFET rf gain characteristic of Fig. 10 with the desired antenna gain variation given in Fig. 5, the control voltage waveform for antenna A can be found. This is plotted in Fig. 11. The control waveforms for channels B, C, and D are identical in shape, but delayed by 90, 180, and 270 degrees respectively.

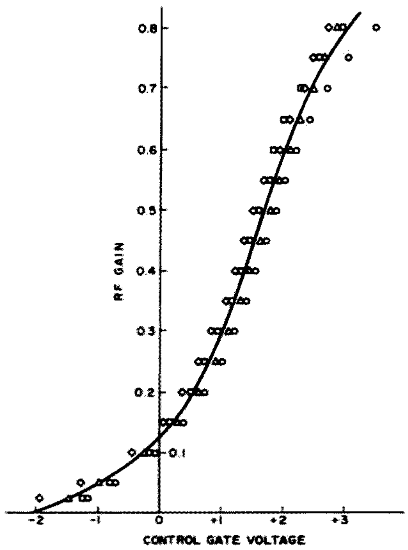


Fig. 10. Rf gain variation with control gate voltage for four typical field-effect transistors. The curve is a seventh-order polynomial fit to the measured data.

Control Voltage Waveform Generator

Two inexpensive PROMs are used to store the waveform plotted in Fig. 11. The PROM address is multiplexed in multiples of 90 degrees commutation angle, and the PROM output, after conversion to an analog voltage, is demultiplexed at the same time so that the entire PROM memory is utilized to generate each of the four control voltages. Fig. 12 shows the schematic of the control voltage waveform generator.

The CD4040 is a 12-stage ripple-carry binary counter that produces an 8-bit incrementing address to the PROMs. When driven at a frequency of 1,228,800 Hz, the PROM address will cycle at a rate of 300 Hz, which is the commutation frequency of the system. To multiplex the PROM, the two most significant bits are modified by adding a 0, 1, 2, and 3 sequentially to each of the PROM addresses using a CD4008 full adder. The resulting address is held temporarily in the 8-bit 74LS273 latch which synchronizes the otherwise skewed output of the ripple counter.

Together, the two 74S287 PROMs provide an 8-bit address by 8-bit output memory for the control waveform. Each address corresponds to 360/256 or 1.40625 degress of commutation, while the output is scaled to cover the range −2.5 to +3.5 volts dc which provides a resolution of 6.0/256 = 0.0234 volts/step. The MC1408 digital-to-analog converter is used with a CA3240 BIMOS operational amplifier to minimize offset and noise. The CD4051 is an 8-channel analog demultiplexer which directs the converter output into one of the four dual-gate MOSFETs. A small RC filter formed by the 10-kilohm resistors and 470-pF capacitors in the rf summer is sufficient to hold the demultiplexed control voltage between updates. NAND gates A and B are used to inhibit the demultiplexer except during that portion of the cycle when the D/A output is stable. They also provide the synchronizing pulse to the 74LS273 octal latch.

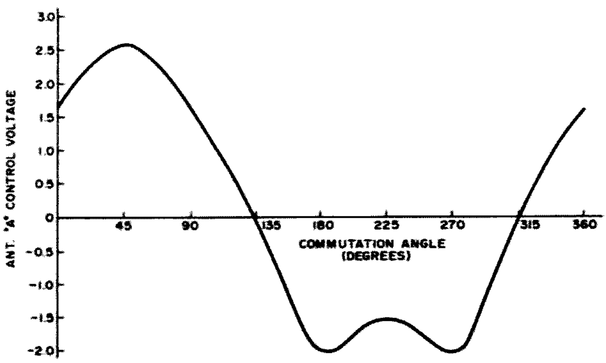


Fig. 11. FET control voltage required to produce the amplitude variation shown in Fig. 5.

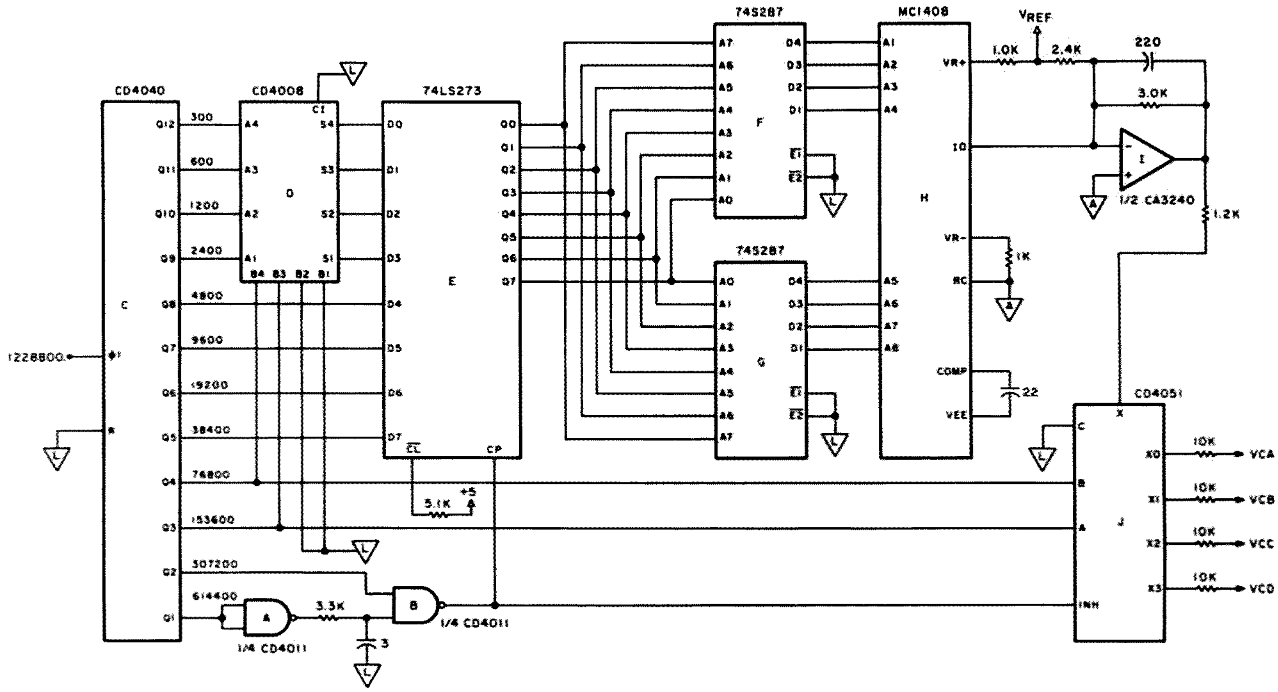


Fig. 12. Circuit schematic of the control voltage waveform generator. Notes: Logic power is Vcc = Vdd = +5, Vee = −6, Vss = GND = [L] Op amp power is +5 and −6 V dc.

Audio Signal Processor

Fig. 13 shows the circuitry used to extract the 300-Hz Doppler modulation frequency from the receiver's audio output and generate a logic signal synchronized to the phase of this signal for the display generator. Threshold detectors are also provided to give an overload indication to assist in setting up the audio gain of the circuit and to blank the display when no signal is present.

Preamplifier A is ac coupled to the receiver and contains a gain adjustment variable over the range 0.2 to 10. Frequencies below 142 Hz are attenuated by the input filter and frequencies above 664 Hz are reduced by the feedback compensation. Amplifier B provides an additional gain

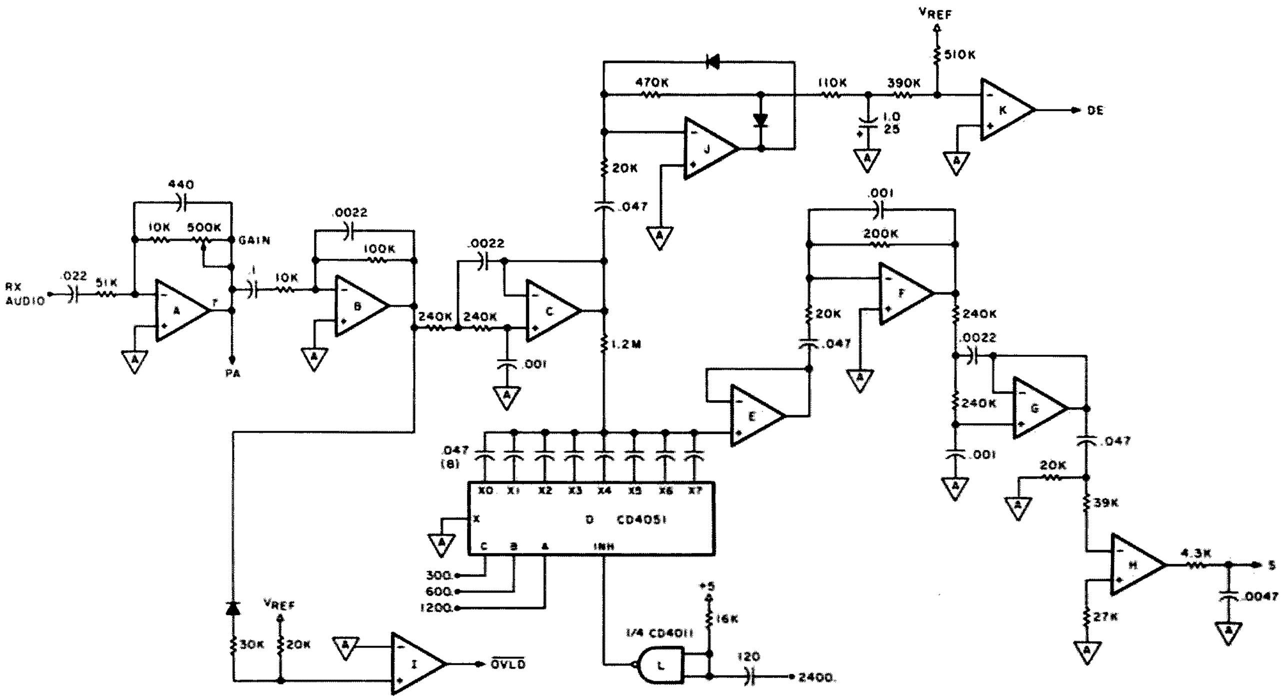


Fig. 13. Audio signal processor circuit schematic. Notes: All op amps are 1/2 LM1458 except H, which is 1/2 CA3240. All diodes are 1N4148. Logic power is Vdd = +5, Vee = −6, Vss = [A] Op amp power is +5 and −6 V dc.

of 10 and further filtering above 724 Hz.

Amplifiers C and G are identical second-order low-pass filters tuned to a frequency of 469 Hz with critical damping. These filters and the commutative filter described below were designed using the methods given in "Get Notch Qs in the Hundreds," by Mike Kaufman, *Electronic Design* 16, August 2, 1974, pp. 96-101.

The 8-section commutative filter, composed of multiplexer D and follower amplifier E, provides a 300-Hz bandpass synchronized to the antenna waveform frequency with a Q of 7540 RC where R is the series input resistor and C is the value of each of the switched capacitors. In Fig. 13, R = 1.2 megohms and C = .047 uF, providing a Q of 425. Since the Q of this circuit determines the speed of response of the system as well as the selectivity, a trade-off can be made in the selection of resistor R. The value shown provides a good compromise, but individual users may prefer a somewhat faster or slower responding display. The one-shot formed with NAND gate L is used to inhibit switching of the multiplexer during transition of its logic-select inputs.

Amplifier F provides an additional gain of 10 and helps to attenuate harmonics produced in the commutative filter above 796 Hz. Ac coupling is used to attenuate frequencies below 169 Hz because the commutative filter does pass dc. Amplifier H is used as a comparator to produce a square wave sync signal for the display generator. A CA3240 operational amplifier is used here instead of the LM1458s used elsewhere for its very high slew rate. Ac coupling is employed to remove any dc offsets from the previous two stages, and a small RC filter at the output prevents extremely short sync pulses from being generated with zero input.

Amplifier I generates an overload signal which is helpful in setting the audio gain of the system. Blanking of the display in the absence of audio input (when the receiver is squelched) is accomplished by the half-wave rectification of amplifier J and the comparator operation of amplifier K. A blanking delay of approximately 100 milliseconds is provided by the electrolytic capacitor.

Display

The circuitry required for a simple LED display is shown in Fig. 14. Two one-shot circuits are used to convert square wave sync signal S to a short positive clock pulse which is used to latch the binary clock count into the 74LS75 quad latch. The first one-shot has an adjustable delay time to permit calibration of the display over a 90-degree bearing angle. (Rotation of the four antenna inputs is used for greater correction.) The second one-shot generates the 10-microsecond latching pulse.

A 74154 decoder drives the 16-LED circular display directly. Two additional LEDs are used to indicate audio overload in the signal processing circuit and the power-on status.

When both LED and three-digit decimal bearing readouts are required, the circuit of Fig. 15 is used in place of Fig. 14. This circuit is designed for compatibility with the optional serial interface to be described below and uses a 4-bit data bus to transfer data between temporary holding registers and the display latches. If the serial interface is omitted, the two signals $\overline{\text{SEND}}$ and MS must be tied to logic ground.

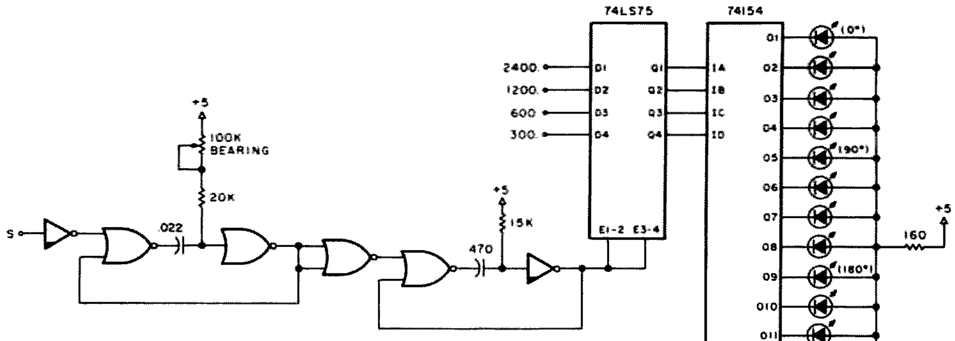
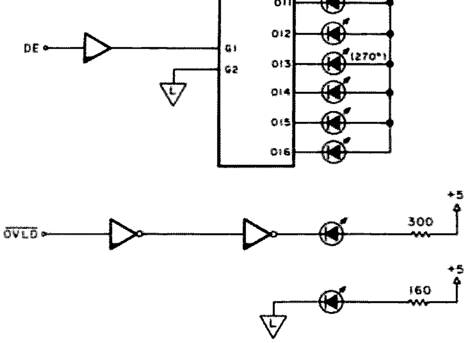



Fig. 14. Simple LED display circuit schematic. Notes: All LEDs are MIL32 R. Logic power is Vcc = Vdd = +5, Vss = GND = ⏚ NOR gates are 1/4 CD4001. Inverters are 1/6 74C903.

BCD counter latches H, I, and J are driven by a 108,026-Hz clock signal and their contents are latched into tri-state latches O, P, and Q by the delayed sync pulse. The binary clock count is simultaneously strobed into latch R by the same sync pulse. Since the maximum count is (decimal) 359, the maximum BCD count required for the hundreds digit is 3 (binary 0011). Since the two most significant bits of this digit are always zero, these bits are used to transfer the overload (MSB) and the display enable (MSB-1) information. A one-shot is used to stabilize the overload flag for sampling.

Selection of the system clock frequency and dividers was made so as to produce compatible binary and BCD counter frequencies. Over a complete commutation interval of 1/300 second, the 4-bit binary input to register R will increment through 2400/300 × 2 = 16 counts. Each of these counts then corresponds to 1/16th of a revolution on the LED circular display. Over the same time interval, the clock input to the BCD counters generates 108026.3736/300 = 360. 0879 counts, or approximately one count per degree. Although the error is very small (less than 0.1 degree), it will accumulate rapidly unless the BCD counter is periodically synchronized back to the binary counter. The circuit consisting of flip-flop A and the surrounding gates is used to reset the three BCD counters every complete cycle (as defined by the binary counter) so that the BCD and binary counts remain synchronized.

At a rate of 2.34375 times per second (each 426.66 . . . millisecond), data is transferred from tri-state registers O-R to latching registers S-V. Timing for the data transfer is obtained from the 12-bit counter, F, and the sequence is as follows for the case where a serial interface is not used. At the beginning of each transfer cycle (output of F all zeros), the input to registers O-R is disabled using the DID2 control inputs. These inputs remain disabled during the first quarter of the transfer cycle (106.66 . . . milliseconds). During this same quarter cycle, the 1-of-4 decoder, Y, places the tri-state output of registers O-R sequentially onto the bus using their DOD2 control inputs. The order of selection is Q (overload/blanking/hundreds), P (tens), O (units), and R (binary). Each register is connected to the bus for 26.66 . . . milliseconds. While a tri-state register is connected to the bus, a corresponding display register (S-V) is strobed by a short pulse generated by one-shot K-L and steered to the correct display register via a second 1-of-4 selector (Z). The data transferred to the display registers is held until the next update (426.66 . . . milliseconds later). Consequently, the display appears stable, but is still reasonably responsive to changes in the bearing data. Also, the data displayed is consistent (i.e., the binary and BCD data displayed are sampled simultaneously even though they

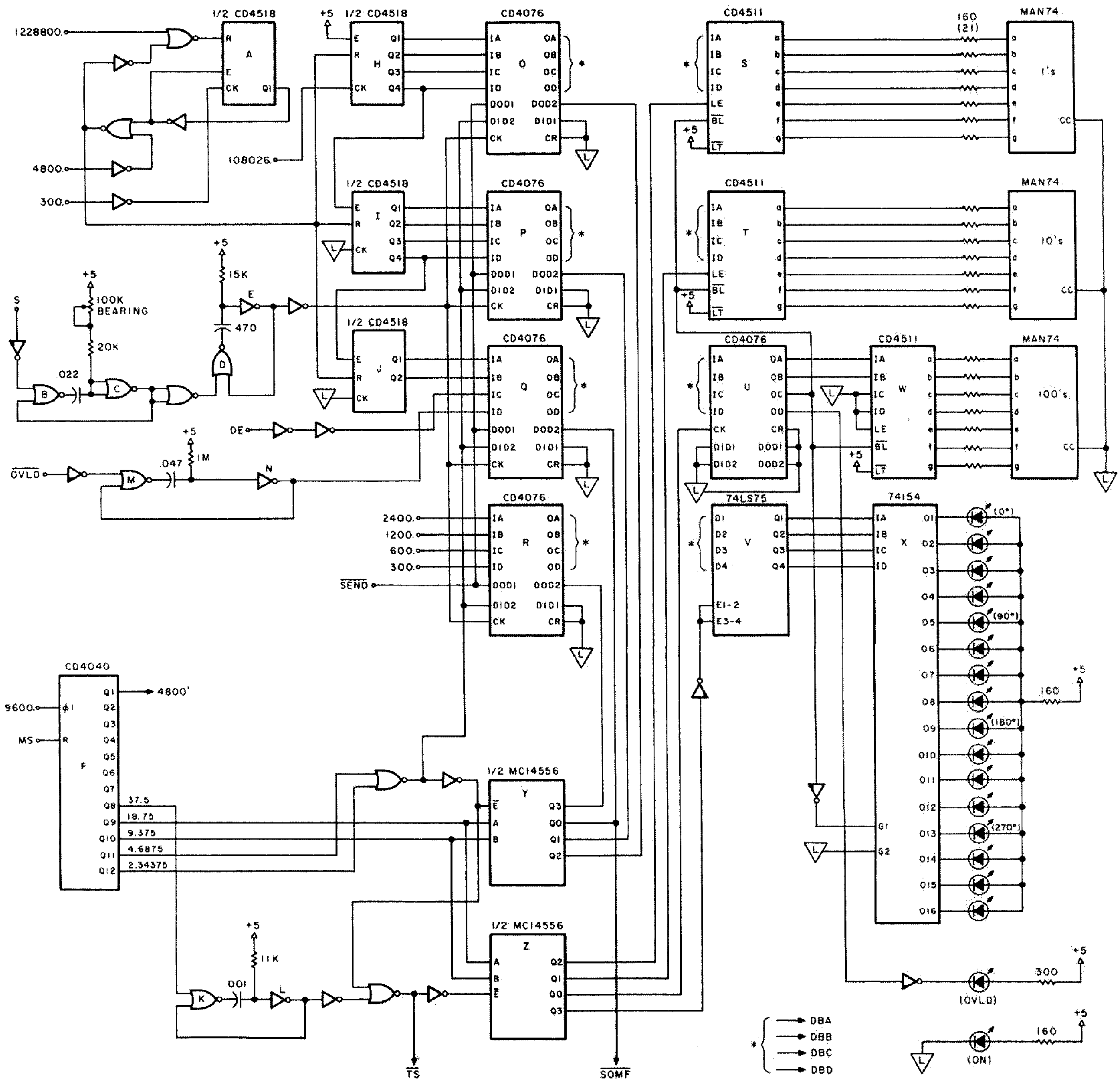


*Fig. 15. Schematic of the circuit used to provide circular LED display and a three-digit decimal display. A data bus technique is employed which is compatible with the optional serial interface. Notes: Connect 4-bit data bus *. All LEDs are MIL32 R. Digital logic power is Vdd = Vcc = +5, Vss = GND = L. All NOR gates are 1/4 CD4001. All inverters are 1/6 CD4069 except are 1/6 74C903. Schematic is drawn for operation with serial interface. For no serial interface, add jumpers $\overline{\text{SEND}}$ to L, MS to L.*

are transferred sequentially).

Registers S and T are CD4511 BCD-to-7-segment latching drivers which drive the units and tens displays directly. Latch U is a holding register which provides the 2 bits of hundreds data to the third CD4511 driver (W). The blanking information and overload data are also available from outputs C and D of latch U. Quad latch V provides the binary LED data to the 1-of-16 selector X.

Serial Interface

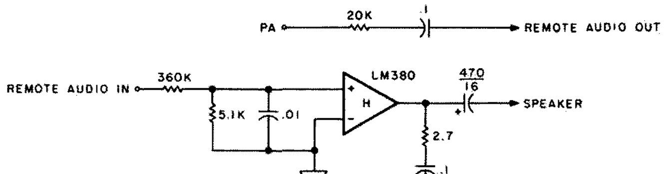
An optional serial interface is shown in Fig. 16 which permits remote transmission or reception of the displayed data using standard 300 baud audio frequency shift tones. This data rate and the FSK tones used are compatible with data recording and playback using an inexpensive tape recorder so that this interface may also be used whenever unattended operation is desired.

The universal asynchronous receiver transmitter (UART), A, is shown programmed for five data bits, no parity, and 1-1/2 stop bits per character. The first four data bits of each character are simply the four data bus bits transferred to the display registers S-V in Fig. 15. The fifth bit is used to signal the first character of the four-character message; a zero represents the first character (overload/blanking/hundreds).

When locally received data is to be displayed, the UART operates in its transmit mode. The data transfer across the data bus operates exactly as explained above, and the data bus is strobed into the UART transmit buffer whenever any of the display registers is clocked. Thus, a four-character word of data is sent every 426.66... milliseconds. At 300 baud, it requires (5 + 1-1/2)/300 seconds or 21.66... milliseconds to send each character. Since data is taken from the bus each 26.66... milliseconds, this creates a gap of 5 milliseconds between consecutive characters.

When display of remote data is selected, the timing changes somewhat. All of the tri-state registers are removed from the data bus using their DOD1 control inputs, and the UART tri-state received data output is connected to the bus ($\overline{RDE}$ = 0). When a first character has been received (bit 5 = 0 and UART data available), a pulse is generated at MS which resets 12-bit counter F in Fig. 15. Data transfer into the display registers then proceeds as usual except that the UART supplies the data. The first data character is clocked into display register U at 13.333... milliseconds following data reception. Therefore, a large skew can be tolerated between local and remote clocks without affecting system operation.

In the local data display mode, digital data at 300 baud from the UART serial output is used to select which of two clock frequencies, 9600 or 19200, is applied to the 4-bit Johnson counter, E. The counter outputs are applied through summing resistors to inverter F configured to work as an operational amplifier. The weighting of the three summing resistors is chosen such that the filtered output of F approximates a sine wave of frequency



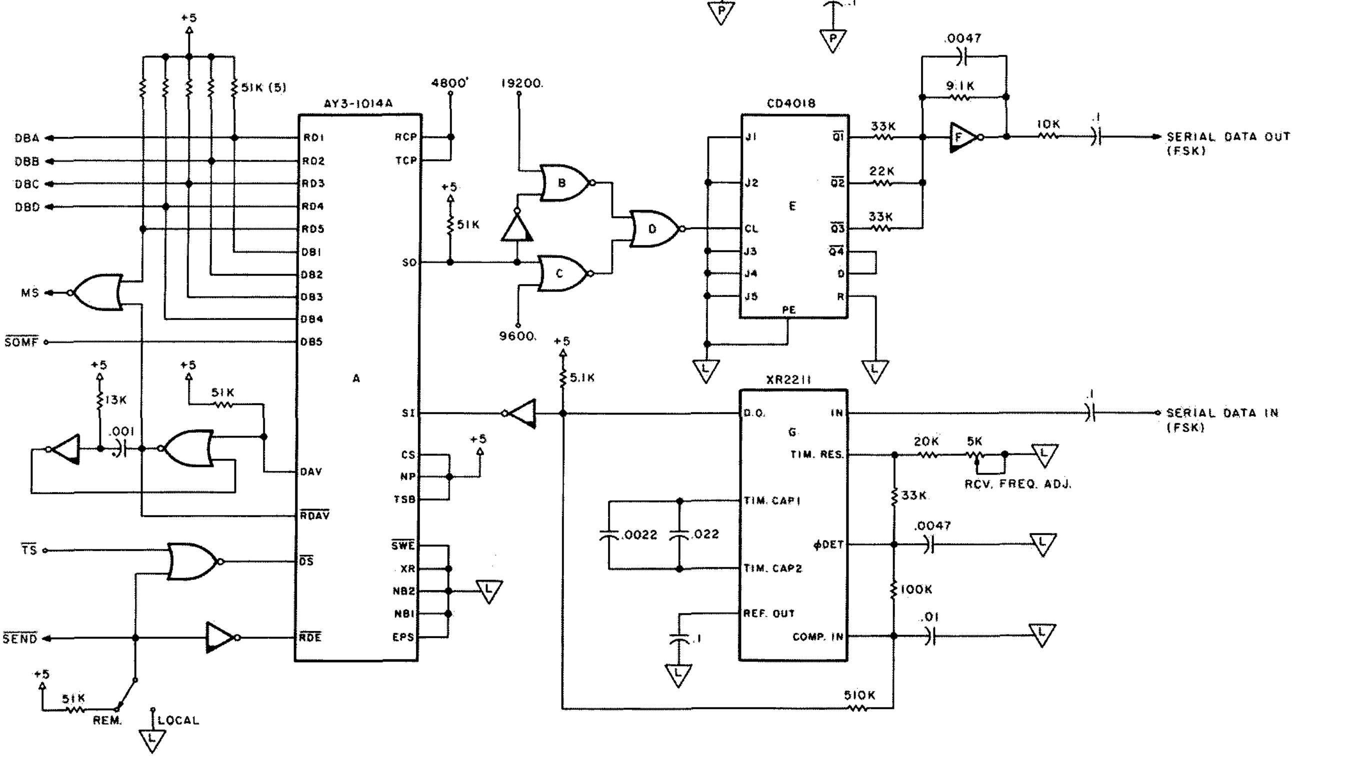


Fig. 16. Optional serial interface circuit schematic. Notes: NOR gates are 1/4 CD4001. Inverters are 1/6 74C903. Digital logic power is Vcc = Vdd = +5, Vss = GND = (L). Amplifier H power is +13 switched (sw); ground is (P).

1200 Hz when the UART output is "0" or 2400 Hz when the UART output is a "1". Sine-wave distortion is below 5% with this arrangement, and the FSK frequencies are as accurate as the system clock (which is crystal controlled).

When the system is in the remote data display mode, FSK input is demodulated in the XR2211 decoder, G. The component values shown are optimized for 300-baud, 1200/2400-Hz operation using the procedure given in EXAR's specification sheet for the XR2211.

The audio circuitry shown at the top of Fig. 16 is included as a convenience when using the system with a two-channel tape recorder. FSK data can be placed on one channel, and the received audio out of preamplifier A in Fig. 13 can be coupled through the RC circuit shown to the second channel for simultaneous recording. On playback, this audio is amplified by the LM380 (amplifier H) to drive a loudspeaker so that bearing data can be easily correlated with the received signal.

Power Supply and Clock

The entire system is designed to operate from a single unregulated supply voltage between 11.5 and 14.5 V dc negative ground for mobile operation. Total input current is approximately one Ampere with the display enabled. Fig. 17 shows the power supply and clock circuits.

Gates A and B are connected for linear operation and form a crystal-controlled oscillator. The 74LS197 is used to divide the 9.8304-MHz clock frequency by 8 to generate 1.2288 MHz for the antenna control waveform generator and binary display. Two 74LS193 counters are connected to divide the clock frequency by 91 to generate 108026 Hz for the BCD display. Gates F and G and the 74LS74 flip-flop are used to load a count of 256 − 91 = 165 into the two 4-bit counters. If the BCD display is not used, ICs D, E, and H may be omitted.

A 7805K regulator provides +5 V dc for the digital logic, operational amplifiers, and the displays. The 7808 regulator provides +8 V dc for the MOSFETs used in the rf summer.

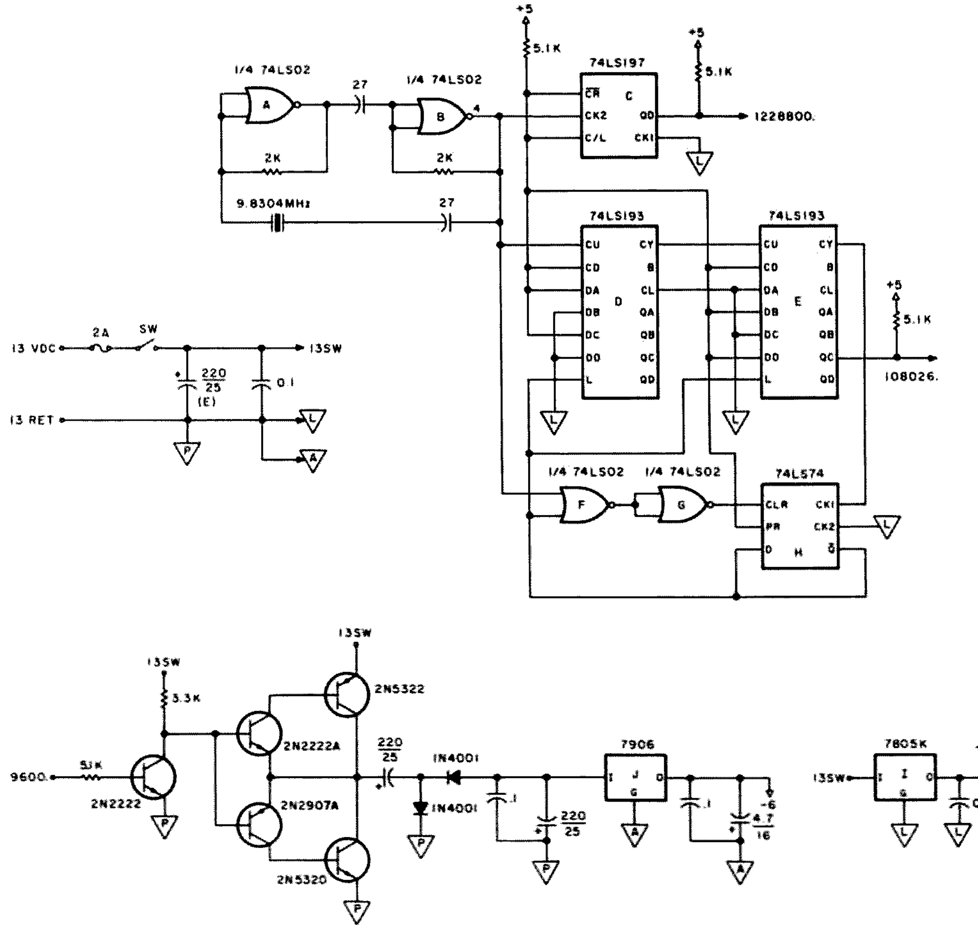
Negative voltage is generated by a switching inverter/voltage doubler circuit that produces approximately −8 V dc at the input to a 7906 regulator. The −6 V dc is used as the negative analog supply voltage.

Operational amplifier K generates the +2.0 V dc reference used for D/A conversion and threshold comparison.

Electronics Construction

If you wish to build the electronics from scratch, your best bet is to use wire-wrap sockets for all of the DIP integrated circuits and the discrete components (resistors, diodes, and small capacitors). Individual wire-wrap pins may be used for the larger components such as the electrolytic capacitors. All circuitry except the rf summer may be constructed on open perforated board with 0.1" spacing to accept the wire-wrap sockets. Be sure to bypass the +5 V dc using .047- or .1-uF disc ceramic capacitors near each of the TTL ICs and the CD4511s. Mount the 7805K regulator on a good heat sink. Be sure to use 5% resistors and either mylar or dipped mica capacitors for all of the audio filtering and digital one-shot circuits.

The rf summer circuit must be mounted in a shielded enclosure using construction practices consistent with the frequencies involved. Phono jacks work well for the antenna and



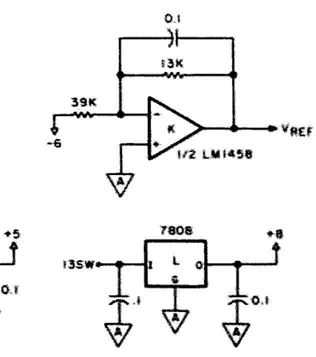


Fig. 17. Schematic of the power supply and clock circuitry. Notes: Power to LM1458 is +5 and −6 V dc. Logic power is Vcc = +5, GND = (L)

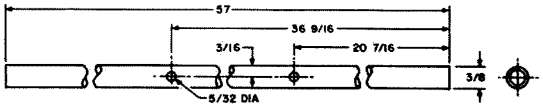


Fig. 18. Construction detail of the long radial. Two are required.

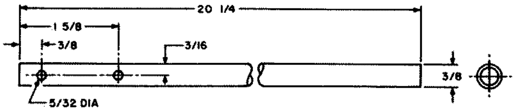


Fig. 19. Construction detail of the short radial. Four are required.

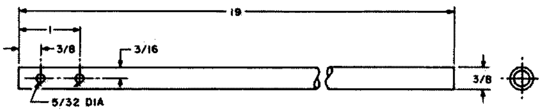


Fig. 20. Vertical element dimensions. Four are required.

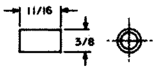


Fig. 21. Suction cup spacer. Four of these are required for mounting the antenna on a car roof.

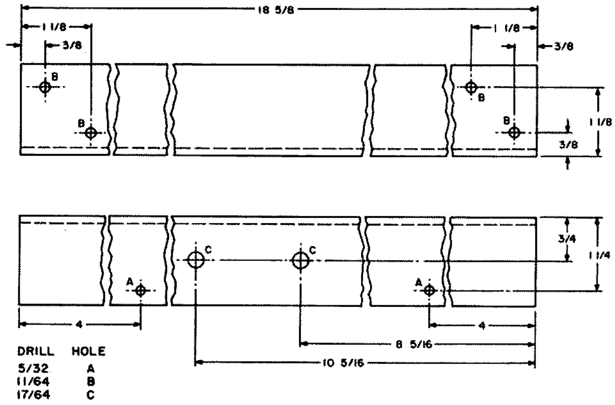


Fig. 22. Center support detail. Only one is required.

receiver connectors. Keep all leads short and arrange the parts symmetrically.

A professionally designed unit utilizing double-sided printed wiring boards with plated-through holes and an attractive enclosure is available from Doppler Systems in either kit form or fully assembled and tested. Photo A shows the interior construction of the fully expanded version of the system (digital readout and serial interface).

Antenna Construction

The antenna array must contain four identical elements located in the corners of a square array having sides less than one-half wavelength. Analysis shows, however, that the best performance can be expected with an array size between 1/16 and 5/16 wavelength. Each element must be vertically polarized and nondirectional in the horizontal plane. Antenna impedance and matching to the transmission lines is not especially important; however, each of the four lines must be of the same electrical length. For this reason, and to prevent excessive signal loss, the antenna should not be located too far from the electronics.

Element length may be increased to provide greater capture area and may be either balanced or unbalanced using a ground plane composed of radials. Mechanical stability is important, however, especially in a mobile application.

A good basic design suitable for either fixed or mobile use is given below. Elements are approximately 1/4 wavelength long and are spaced 1/4 wavelength apart at 2 meters. Radials extend an additional 1/4 wavelength beyond the elements, giving the antenna compact and sturdy characteristics. All material should be available from local suppliers. Alternatively, specific items may be ordered from Doppler Systems.

Aluminum Stock

(1)—6' × 1-1/2" × 1-1/2" × 1/8" angle
(2)—12' × 3/8" o.d. × .035"-wall tubing

Teflon

(1)—1' × 1-1/2" × 1/8" rectangular bar

Hardware

(16)—6-32 × 1/2" round head machine screws
(16)—6-32 × 3/4" round head machine screws
(4)—6-32 × 1" round head machine screws
(24)—No. 6 flat washers
(32)—No. 6 split-type lockwashers
(40)—6-32 hex nuts
(8)—No. 6 locking-type solder lugs
(4)—8-32 × 1/2" round head machine screws
(4)—No. 8 split-type lockwashers
(4)—8-32 hex nuts
*(4)—1/4-20 × 2" eye bolts
*(8)—1/4-20 hex nuts
*(8) – 1/4" split-type lockwashers
*(4)—1/4-20 × 1-1/2" bolts
*(4)—1/4" flat washers
*(4)—1/4-20 insert suction cups
*(4)—adjustable straps with gutter clips
**(1)—5/16 × 2" center-to-center × 3" long U-bolt
**(2)—5/16 split-type lockwashers
**(2)—5/16 hex nuts

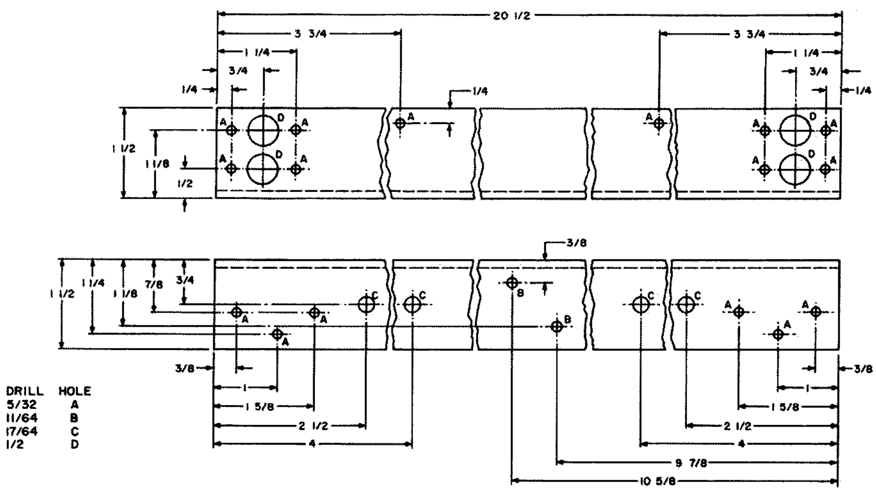


Fig. 23. Side arm construction detail. Two are required.

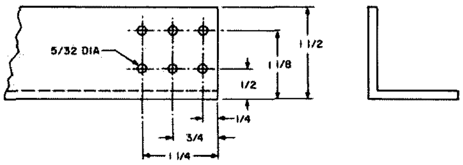


Fig. 24. Drill guide dimensions. Make this tool from stock left over from the center support and side arms.

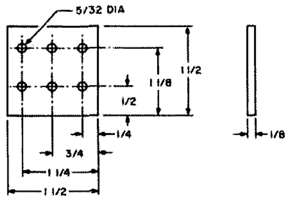


Fig. 25. Teflon insulator construction. Use the drill guide and a block of wood when drilling this material.

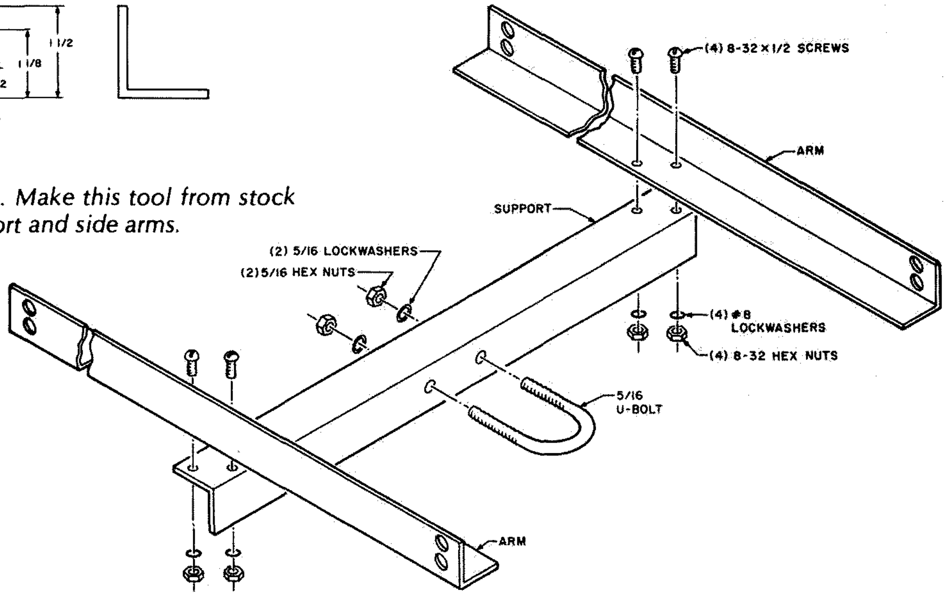


Fig. 26. Assembly of center support and side arms. The U-bolt is required only for mast mounting.

Electrical

RG-174/U coax cable (length depends on installation)

(4)—phono plugs (shielded type)

*Required for mobile mounting.

**Required for mast mounting.

Cut two pieces 20-1/2″ long and one piece 18-5/8″ long from the aluminum angle. Save the remaining short length for use as a drill template with the teflon. Be sure to file all ends smooth after cutting.

From each of the 12-foot pieces of tubing, cut one piece 57″ long, two pieces 20-1/4″ long, and two pieces 19″ long. If you are making the antenna for mobile mounting, cut four additional pieces 11/16″ long from the remaining short length of tubing. File all ends smooth after cutting.

Mark and drill all of the holes shown in Figs. 18 through 24. Use a countersink to deburr all of the holes after drilling.

Cut the teflon into four pieces 1-1/2″ long as shown in Fig. 25. Clamp the four teflon pieces together between a piece of wood and the end of the drill guide. Drill the six 5/32″-diameter holes through all four pieces.

Prepare four lengths of coax cable by soldering No. 6 solder lugs to both the inner conductor and the shield at one end, and a phono plug at the other. Be sure that the four pieces are cut to the same length.

Assemble the two arms to the support bracket using the 8-32 hardware as shown in Fig. 26. Use a square to align the arms perpendicular to the support before tightening the screws.

At each end of the two arms, assemble a vertical element using the 6-32 hardware and teflon insulator as shown in Fig. 27. Check that the element is perpendicular to the arm and that the element mounting hardware does not touch the aluminum arm. Tighten the screws sufficiently to compress the lockwashers, but do not overtighten so as to crush the tubing or the teflon insulator. Connect the coax cable and tie it as shown as a strain relief.

Attach the short and long radials to the ends of each arm using the 6-32 hardware shown in Fig.28. If the antenna will be used on a car, also mount the suction cups and eye bolts as shown. Align the "eyes" so that they face outward from the suction cups. Photo B shows a typical installation.

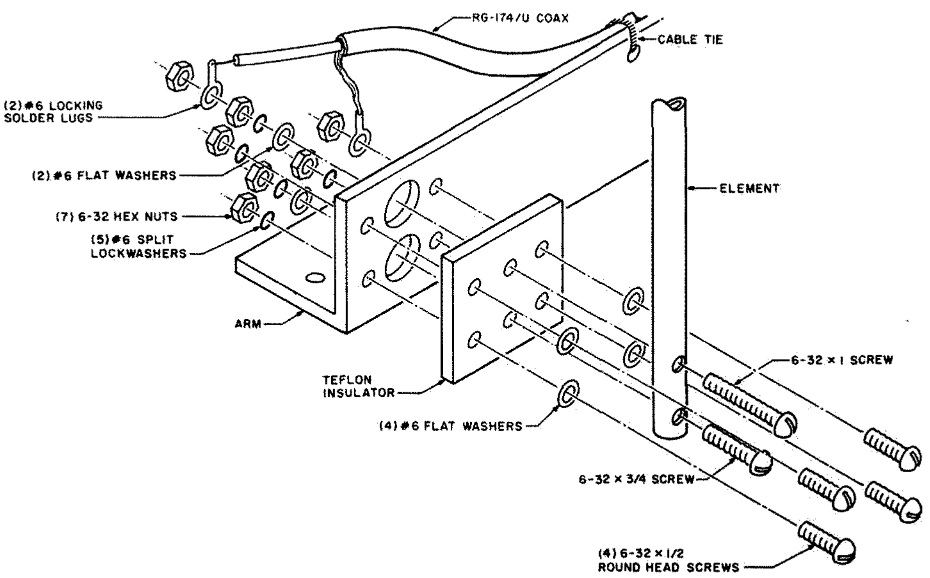


Fig. 27. Vertical element installation on the antenna side arms.

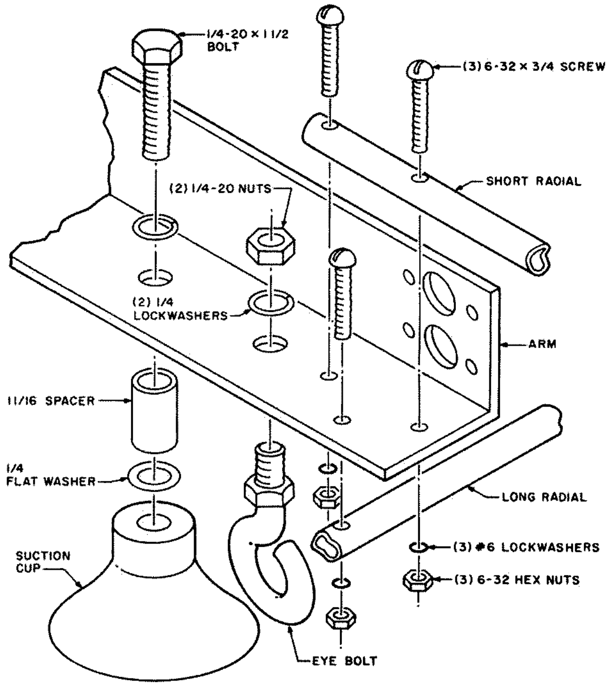


Fig. 28. Radial element assembly. The eye bolt and suction cups are required only for car mounting.

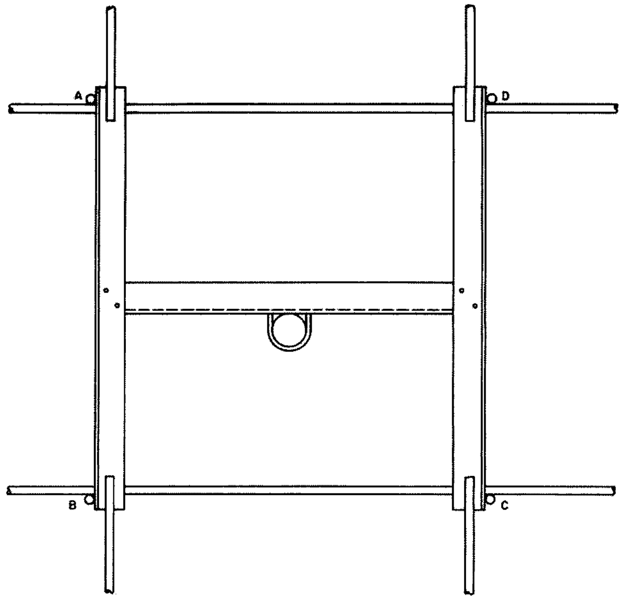


Fig. 29. Antenna top view showing marking of phono plugs required for proper calibration.

Mark the phono jack ends of the coax cable "A", "B", "C", and "D" according to Fig. 29. Mark antenna "A" also for ease in aligning the system later.

Installation and Adjustment

Primary power requirements for the electronics is 11.5 to 13.5 V dc negative ground at 1 Ampere maximum. Ordinary 12-V dc automobile battery power may be used, or, for fixed operation, an inexpensive 12.6-V dc power supply may be used, such as Radio Shack Model 22-127.

System interconnection without the serial interface is particularly simple as indicated in Fig. 30. While the external speaker connection can be used, you will probably find a more convenient connection to be the high and low ends of the receiver's volume control. This will enable the listening level of the receiver to be adjusted without affecting the audio input level to the direction finder.

The serial interface can be used in several ways as indicated in Figs. 31 and 32. Bearing data and receiver audio may be recorded simultaneously as shown in Fig. 31. Virtually any audio tape recorder is adequate for this application because of the low baud rate and wide FSK shift used for serial data transmission. A stereo system is recommended so that the normal receiver audio (voice) information may be recorded with the bearing data.

Two systems may be connected as shown in Fig. 32 for remote data display. A switch could be installed at the central site to enable a single monitor point to display the bearing data received at two or more remote sites for triangulation. The possibilities for more complex system interconnects using digital processing for automatic triangulation and logging are exciting.

Calibration adjustments are very simple and should not be required after initial setup unless the antenna orientation is changed or a different receiver is used. Allow the receiver and direction finder to warm up before making final calibration adjustments, however.

After setting the receiver's volume control, the direction-finder gain adjustment is made. Increase the gain until the overload LED flashes on voice peaks. (If this adjustment is very low, the display will remain blanked.) Setting is not critical, but the overload LED should blink with a duty cycle between about 10 and 50 percent during normal speech.

The direction-finder bearing control should then be adjusted so that the correct bearing is displayed for a known transmitted signal. Do not use a nearby handie-talkie for this calibration as local reflections are sure to result in an error. A repeater station which is within the line of sight of the antenna makes the best calibration source. Changing channels will have very little effect on system calibration, so any convenient station within the band may be used. The display should be

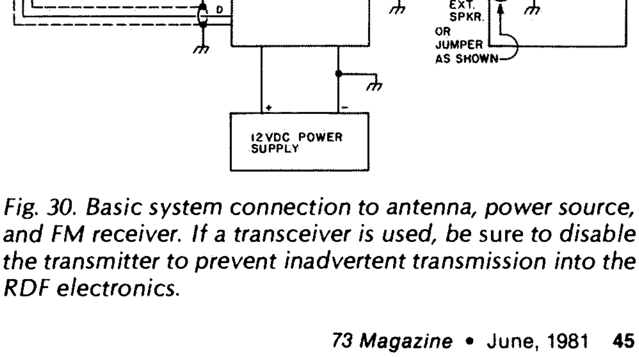


Fig. 30. Basic system connection to antenna, power source, and FM receiver. If a transceiver is used, be sure to disable the transmitter to prevent inadvertent transmission into the RDF electronics.

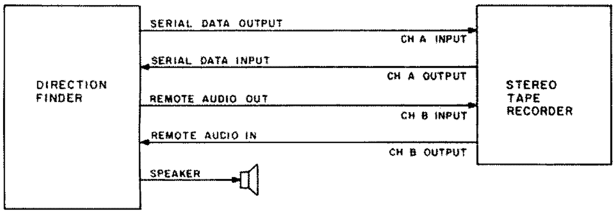


Fig. 31. Serial interface connection for tape recording and playback.

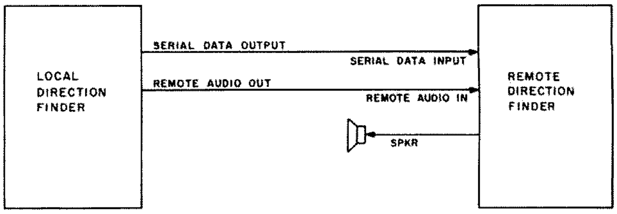


Fig. 32. Use of serial interface for remote display of bearing data.

calibrated to display bearing relative to magnetic North in a fixed station setup and should correspond to straight ahead in a mobile application. The calibration range of the bearing control is approximately 90 degrees. If the system needs further correction, either rotate the antenna physically or switch the antenna inputs to the electronics. Be sure not to reverse the order of antenna rotation, however. The acceptable combinations for inputs A, B, C, and D are: Ant. A, Ant. B, Ant. C, Ant. D; or Ant. D, Ant. A, Ant. B, Ant. C; or Ant. C, Ant. D, Ant. A, Ant. B; or Ant. B, Ant. C, Ant. D, Ant. A. See Fig. 8 for definition of antenna inputs to rf summer and Fig. 29 for the definition of antenna elements.

If the serial interface option is to be used, the receive frequency adjustment can be made by recording a few minutes of data, then playing it back in the Remote Display Mode while making this adjustment. Note the control settings where invalid data occur, then set the control midway between these settings. If valid data is received up to one of the ends of the control adjustment, use the end point as the invalid data point. The setting of this control is not very critical.

Accuracy tests have been performed using fixed-signal sources and a fixed-receiving site to eliminate changing reflection paths. The antenna was rotated on a calibrated turnstile and errors measured between the true bearing and the displayed bearing. These were generally well within 5 degrees except when the transmitted audio was unusually loud or deep-voiced. Even in those cases, better bearing data could be obtained by mentally averaging the displayed data.

Field testing has occured over the past year using the system competitively in local transmitter hunting. The success record achieved to date has been very impressive considering the high expertise in transmitter hunting which exists in the Phoenix area. ■

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527 Spring Creek Road
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The History of Ham Radio
—part XV

Reprinted from QCC *News*, a publication of the Chicago Area Chapter of the QCWA.

There had been no changes in radio legislation in fourteen years, and by 1926 there were over 700 applications on file with the Department of Commerce for radio broadcast station licenses and about 16,000 licensed radio amateurs operating in the United States. Of special interest to all was the allocation of frequencies above 2000 kc decided upon by the Fourth National Radio Conference. (See Table 1.)

Broadcasters had 95 available frequencies with ten-kc separation, with six reserved exclusively for Canada.

Mounting Listener Resentment

The listening audiences generally agreed that there were too many high-powered broadcast stations operating in the lower wavebands with too little information and entertainment of high-class value. In addition, the problem of regenerative whistles from neighboring radio sets was a bugaboo. The receivers on the market in 1926 lacked good design and circuitry development, so they oscillated and produced spurious signals. By 8 pm every night, when the squealers and howlers started, the time for receiver shutoffs had arrived. Enjoyment of radio listening began to wane.

Kilocycles	Meters	Service
500-550	545-600	CW, ICW, phone, aircraft
550-1,500	200-545	Broadcast
1,500-2,000	150-200	Amateur phone, CW, ICW
2,000-3,500	85.7-105	Aircraft, point-to-point, mobile relay
3,500-4,000	75-85.7	Amateur, army mobile, navy vessels with aircraft
4,000-7,000	42.8-75	Public toll, mobile, point-to-point, relay
7,000-8,000	37.5-42.8	Amateur, army mobile
8,000-14,000	21.4-37.5	Point-to-point, relay
14,000-16,000	18.7-21.4	Amateur
16,000-56,000	5.35-18.7	Public toll, mobile, government, point-to-point, experimental
56,000-64,000	4.69-5.35	Amateur
64,000-400,000	.7496-4.69	Experimental
400,000-401,000	.7477-.7496	Amateur

Table 1. 1926 frequency allocations.

Licenses and frequency assignments for radio broadcasting, as well as all other associated regulation, still rested with the Department of Commerce, with Secretary Hoover in charge. As more conflicts arose, the Department's authority was seriously questioned. Several broadcasters, notably WJAZ in Chicago, challenged the legality of the regulations pertaining to "time on the air" assignments. They asserted that The Freedom of the Air gave everyone the right to choose. . . where and when he operated. . . that the people of the country were the ones who had The Freedom of the Air. In consequence, the division of time among

the powerful stations, known as Class B stations, was challenged and legal action resulted.

The New Radio Bills

The radio legislative situation in Congress brought about important stipulations through the enactment of two long-overdue bills. The House's White Bill, H.R. 9971, one of many previously considered by committee, was finally voted on favorably March 15, 1926, placing the control of radio in the Department of Commerce. In the Senate, the Dill Bill, S.4027 (Fig. 1), introduced April 19, 1926, provided for an independent regulatory commission. These two bills went to a joint compromise conference committee, but were not acted upon until the 70th Session. The new law emerged in final form February 23, 1927, after being signed by President Calvin Coolidge and designated *The Radio Act of 1927*.

Henceforth, available licenses were granted to license-seekers on request on the basis of priority of demand. The new Radio Act provided for dividing the United States into five radio zones to facilitate parceling out available radio channels as applications for licenses and renewals were received. It was implied that the Secretary of Commerce should make an equitable distribution of frequencies and power among the zones and issue licenses accordingly. Also provided for in the Act was the appointment of a five-member commission, one member for each zone, to constitute an advisory body to aid the Secretary in the designation of channels, etc. President Coolidge made the committee appointments on March 1, 1927.

With radio and other associated regulations still in the hands of the Department of Commerce, Senator Dill had the following remarks to contribute:

The question has arisen during consideration of the bill as to whether the regulation of radio should be entrusted to the Secretary of Commerce, or to any other one man. It is my belief that at the present stage of development the details of administration should remain with the Department of Commerce, but that a nonpartisan commission should be established with authority to pass finally upon questions which may be referred to it by the Secretary of Commerce or anyone else. The decision of this commission should, of course, be subject to review by the courts.

In all the fourteen years of radio control under Secretary Hoover, no serious criticism was aimed at his method of administration . . . referred to in a passing remark by Dill. During the debate in Congress, there emerged criticism concerning one-man control with the observation that "such arrangement would give the President the final say while political opposition would be deprived the use of the ether! Control must be non-partisan!!"

The several committees, in their long debates before reaching compromises, recognized the need for extension of broadcast into the higher frequencies, but did not want to encroach upon the major bands used by the amateurs. The extensive progress continuously made by amateur and experimental "wireless" was clearly exemplified in the assignments made to the frequency bands for amateur use. ■

69TH CONGRESS
1ST SESSION

S. 4057

FROM THE LIBRARY OF
E[illegible]IC G. SHALKHAUSER

IN THE SENATE OF THE UNITED STATES

APRIL 19 (calendar day, APRIL 22), 1926

Mr. DILL introduced the following bill; which was read twice and referred to the Committee on Interstate Commerce

A BILL

For the regulation of radio communications, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, (A) That it is hereby declared and reaffirmed that the ether within the limits of the United States, its Territories and possessions, is the inalienable possession of the people thereof, and that the authority to regulate its use in interstate and foreign commerce is conferred upon the Congress of the United States by the Federal Constitution.

No person, firm, company, or corporation shall use or operate any apparatus for the transmission of energy or communications or signals by radio (a) from one place in

Fig. 1.

The VoCom Two-Meter Monkey

—30 Watts out from a mighty small package

Alyson Grupp N1BEJ
73 Magazine Staff

VoCom's 2CO25-2 2m amp.

Through the wonder of integrated circuits, you can now buy a hand-held two-meter transceiver that will do almost everything a larger rig will do. Today, many hams are using the new synthesized handhelds in their cars. The only drawback to this arrangement is the limited power output of the hand-held—sometimes you *need* those extra Watts! VoCom has come up with an ideal solution. The 2CO25-2 two-meter power amplifier will provide you with thirty Watts out for a mere two Watts in and is small enough to fit almost anywhere.

The amp is housed in a classy gold-colored metal case, measuring 3.37" × 3" × 1.56" high (2" high including the bracket). The bracket is a typical U-shaped strip of metal which can be positioned either over or under the amplifier. Finding a place for this little gem is not too difficult, even in a small car. Excellent installation instructions are given in the manual. Any questions that arise concerning what to use to hook the amp up are easily answered by consulting the complete charts provided which list properties of various sizes of stranded hookup wire and coax. Also covered in the well-written manual are the selection of a proper location and the vital importance of adequate heat dissipation.

The front panel has an on/off toggle switch for power and a power-status LED. The switch is on the horizontal axis rather than the usual vertical axis, which takes some getting used to. The back panel sports two SO-239 coax connectors, one for the antenna and the other to hook the amplifier up to the transceiver. Exiting the back panel via a grommeted hole is a short, heavy power cable, a reminder of the relatively high current requirements of such an amplifier.

Being insatiably curious, I had to know what was inside the box, and getting inside proved a bit difficult. The screws are apparently secured with some sort of shellac and require a lot of torque to remove. Operation of the amplifier does not require opening the

case, but two of the six screws that hold the case together also hold the bracket on. These, naturally, must be removed for installation.

Once you do get a peek inside, it is obvious that the amplifier is carefully planned and well laid out. Its kick is supplied by an MPSA13 which is bolted to the thick aluminum plate that serves both as a heat sink and as the bottom of the cabinet.

I tested the amplifier on a 12.25-volt power supply, which is some 1.55 volts less than the recommended 13.8 volts. Even at this low voltage, the amplifier performs above the manufacturer's rating. Specifically, with an input power of ½ a Watt, the output is 7 Watts; at 1 Watt, output jumps to 25 Watts. Either 1½ or 2 Watts will give you about 27 Watts out, while at 5 Watts in (the maximum recommended by the manufacturer), the output was 31 Watts.

Gripes? Only one. The cabinet is not rf-tight, which may or may not be a problem in your installation. Otherwise, I found the amplifier to be a superb performer. T/R switching is fast and silent, and use of the amplifier had no effect on the audio quality of my transceiver. The model I tested was designed for a rated drive of two Watts; there is also a model available that achieves full output with a battery-saving 200 mW. If you'd like to give your hand-held a little more punch, at home or in your car, take a good look at the VoCom amps!

For more information, contact *VoCom Products Corporation, 65 East Palatine Road, Suite 111, Prospect Heights IL 60070; (312)-459-3680.* Reader Service number 480. ■

✓Reader Service—see page 114

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The Solid-Copy RTTY TU

—state-of-the-art performance you can afford

RTTY can be one of the most enjoyable aspects of amateur radio. Though outwardly it may seem complex to the uninitiated, the concepts involved are easily mastered by anyone acquainted with CW. The September, 1977, issue of *73* is probably the best introduction, and it was after reading it that I became interested. RTTY had always seemed rather mysterious and untouchable, but a clear explanation was all that was needed to remedy that situation.

I will describe here the top-quality terminal unit

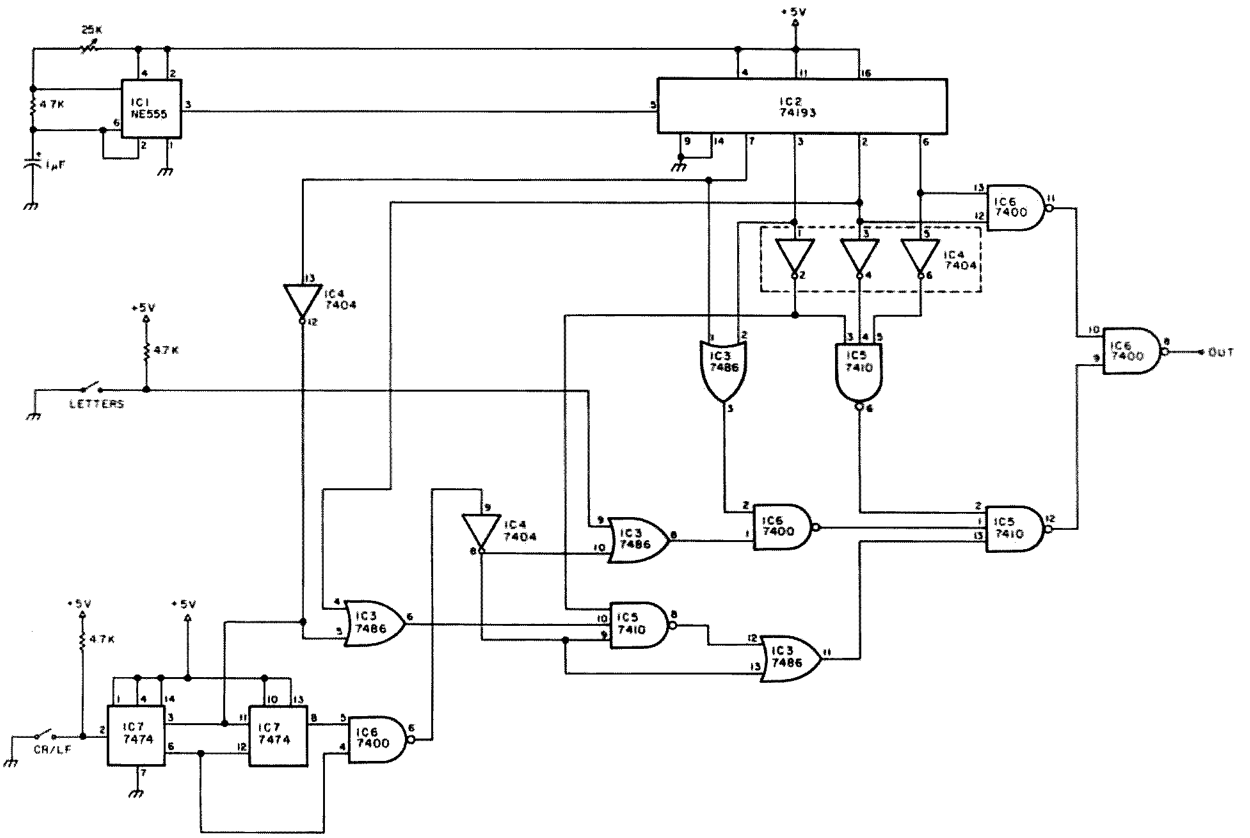


Fig. 1. The W2FJT RY generator.

that I have been using with excellent results for over a year now. It is simple to assemble and provides real state-of-the-art performance.

The heart of my TU is the Flesher DM-170. The price of $39.95 and excellent reviews[1] made this the logical choice for the best low-cost demodulator. The DM-170 has easily-tuned active filters (for 170-Hz shift), autostart, a tuning meter, and an oscilloscope output.

After using it for a while, I decided to try the Flesher PS-170 bandpass filter. The whole filter is contained on a 2" × 2-3/8" PC board and consists of four stagger-tuned active filters. I was skeptical about any increase in performance, but in situations of heavy QRM, the filter really helps. Watching the signals on a scope with and without the PS-170 switched in is convincing evidence that the unit really performs. The output of the filter can be taken before or after a stage of hard limiting, providing even more flexibility.

Having the Flesher demodulator and filter up and running, I added an autostart relay board to the setup. Actually, since I do little VHF RTTY work here, I haven't used this feature, but since the Flesher has an autostart output, it seemed easy enough to include it. The relay will turn on the ac power to the TTY in the presence of a RTTY signal and turn it off in its absence. The delay time for turning on the power is about 3 seconds and the delay for turning it off is adjustable by an external pot. Flesher also sells a relay board kit, incidentally, but it is simple enough to homebrew one.

In use, it is sometimes nice to be able to test the demodulator and teleprinter without the necessity of using signals from the receiver. For this purpose, I included in my terminal unit an RY generator. The characters RYRY . . . are sent continuously until the Return/Line Feed switch is depressed. This allows any adjustments to be made off the air. The RY generator I used is extremely simple; it was described in *73 Magazine*.[2] I have included a schematic in Fig. 1.

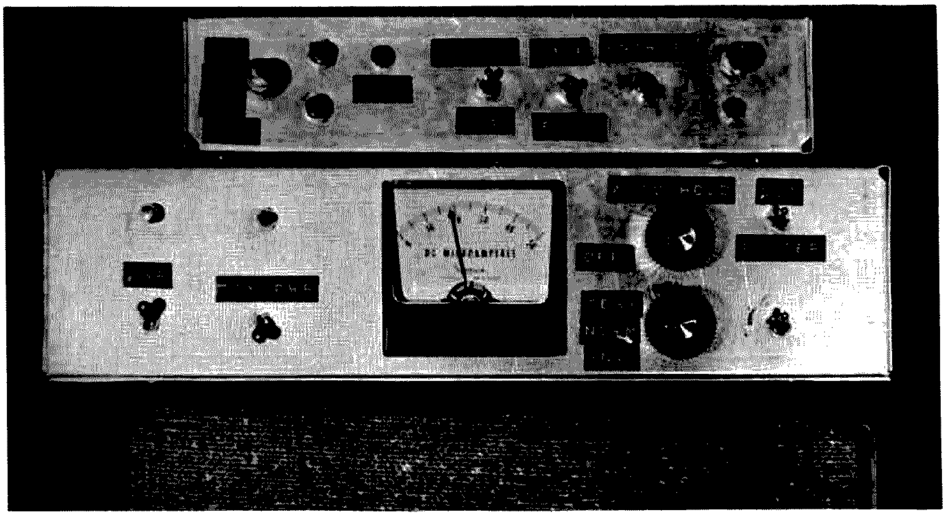


Photo A. TU with Baudot/ASCII converter on top.

My teleprinter is a Model 33 ASR and uses the ASCII code. A code converter is used with the 33 to convert to Baudot code. The code converter also was described in *73*.[3] One very nice feature of this setup is that the code converter utilizes two UARTs to convert the serial code to parallel code which can be processed by the converter. The UARTs provide signal regeneration and possible speed conversion as a side benefit. The TTY is much more reliable when operating on a regenerated signal. In addition, the converter includes the unshift-on-space feature which inserts a letters character after a space if you are in the figures mode. This helps the copy very much when conditions are bad.

A block diagram of the TU is shown in Fig. 2. A bottom view is shown in Photo B. On the right are the DM-170 and PS-170. In the center near the front panel is the RY generator, and behind it is the relay board. The left-hand side is filled with the ±12-volt supplies for the demodulator and filter and the +5-volt supply for the RY generator and code converter. The tuning meter on the front is useful, but not nearly so much as an external scope. Originally, I had planned on including a small scope in the same chassis, but things got a little too cramped. The scope outputs can be seen in the rear view, Photo C. They are the BNC connectors. Also shown in that photo are the plugs for the code converter and the TTY outlet.

The receiver here is an NC-303 which I use in the 500-Hz bandwidth position. The bfo is offset so that the passband is centered about

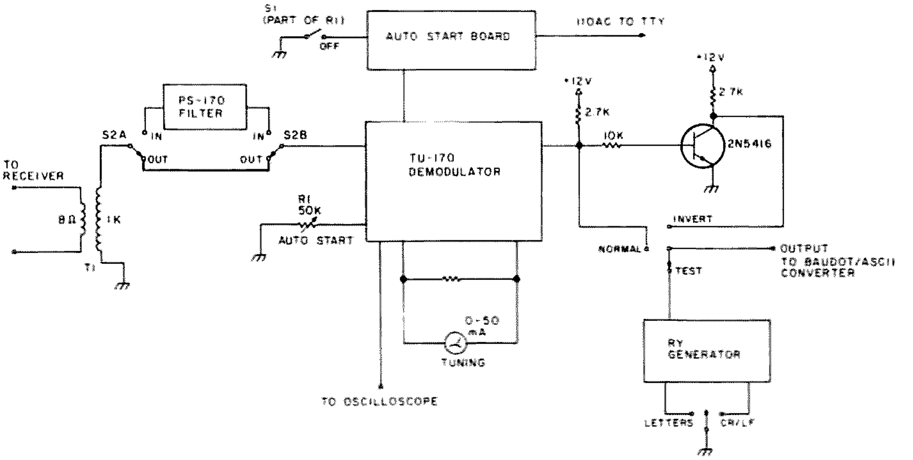


Fig. 2. Block diagram of the TU.

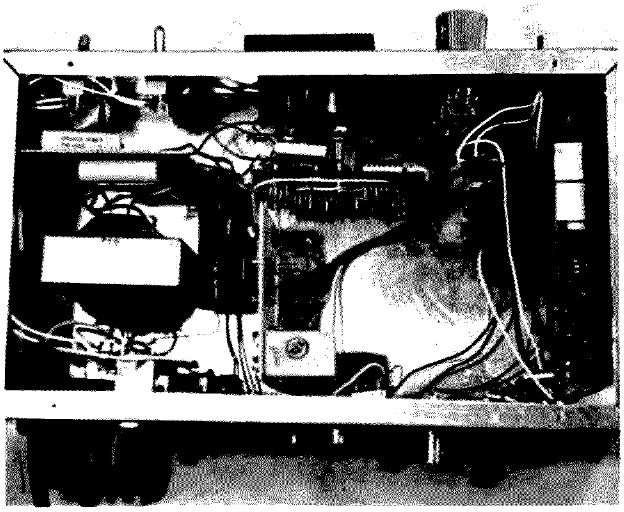


Photo B. Bottom view of the TU. DM-170 is on the far right, with PS-170 on its left. The RY generator is behind the meter.

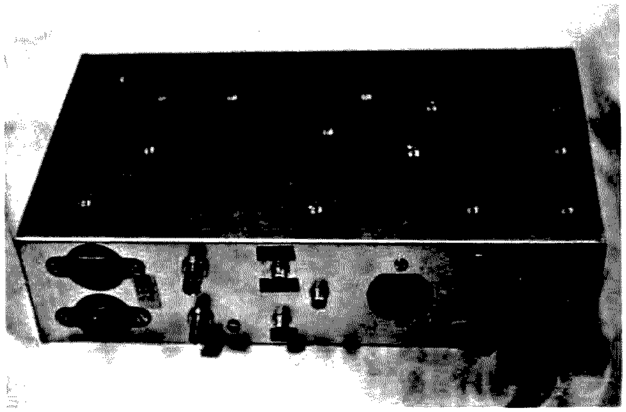


Photo C. Rear view. BNC jacks are for the tuning scope.

2200 Hz from zero beat of the incoming signal. This allows full advantage to be taken of the selectivity offered by the receiver. Audio is coupled into the TU through a small transistor output transformer which matches the 8-Ohm audio to the 1000-Ohm input impedance of the DM-170.

This compact TU has shown itself to be very sensitive, easy to use, and reliable under real operating conditions. Sometimes a totally unrecognizable signal (to the human ear) will provide perfect copy. Under marginal conditions, copy becomes garbled, occasionally, but only at the point where the signal is either buried under the noise or an interfering station is too close in frequency. Considering that the total cost was under $100 (excluding the code converter), the performance is outstanding.

Build one and see! ■

References

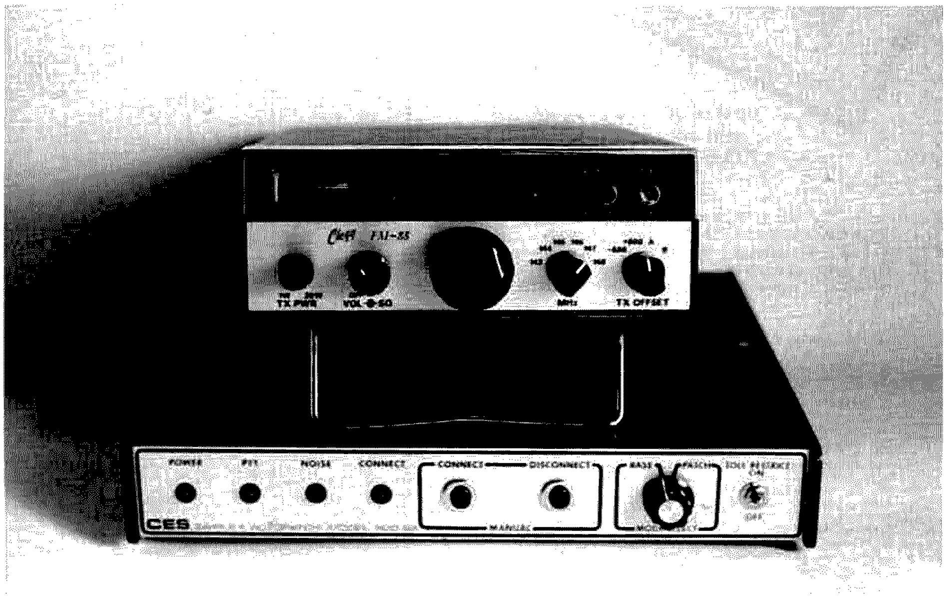
1. New Products, *73 Magazine*, September, 1977, page 14.
2. E. H. Sommerfield, "RTTY Test Station," *73 Magazine*, September, 1977, page 104.
3. J. G. Mills, "Baudot to ASCII Converter," *73 Magazine*, September, 1977, page 80.

Paul Grupp KA1LR
73 Magazine Staff

The CES Simplex Autopatch

—some hot new hardware for two

One of the most controversial devices in a well-equipped repeater is its autopatch. Some hams use autopatch facilities frequently, as part of their daily life, while others are very uncomfortable with autopatch usage for routine communications. Many repeater groups permit their autopatch to be used only for emergency calls or set strict time limits for routine calls. Whatever your views on autopatching are, you have to admit that in congested areas where repeaters receive heavy use, autopatching can create problems. Users trying to carry on a conversation grow tired of being interrupted by people needing the patch, and many a stranded motorist has increased his blood pressure to dangerous levels while trying to break into a long-winded monologue to call for help.



CES Model *500SA simplex autopatch.*

Communications Electronics Specialties, Inc., best known in amateur circles for their microphone-mounted tone pads and autodialers, has come up with a fascinating solution to the autopatch problem, the CES 500SA. The 500SA is a simplex autopatch unit which interfaces an amateur transceiver to a standard phone line. No cavities or other hardware are required. You access the patch just as you would access the patch on a repeater: "*" brings the patch up and "#" disconnects it from the phone line. Now if you think about this for a moment, you might get a little confused. How in the world can you operate an autopatch on a single frequency? It's not as difficult as it first seems.

How It Works

When the autopatch is not in use, it sits there waiting, patiently listening in the receive mode. When it receives a "*", it connects the patch to the phone line and switches the transceiv-

er over to transmit. You hear a dial tone just as you would with a normal autopatch, with one important difference. Once per second, the patch samples its receiver for a "window" of anything from 5 to 100 milliseconds, depending on the squelch characteristics of the receiver. If there is a carrier present during this sampling window, the logic locks the system in the receive mode and doesn't switch back to transmit until the carrier drops. This ensures that the party on the other end of the phone line can't capture the transmitter.

It doesn't take much of an imagination to conclude that the constant switching between receive and transmit will be audible, and indeed it is. *How* audible it is depends on how long it takes the autopatch's transceiver to switch from transmit to receive and back again, and how good the squelch is on the transceiver you use to access the patch. CES provides information on how to modify your own transceiver to work with the patch, or they will sell you a Clegg FM-88 synthesized two-meter transceiver that is already modified. The most important change required for a transceiver to work with the 500SA is a simple mod that allows the receiver to stay on all the time. Using the modified Clegg FM-88 on the patch end and a standard Kenwood TR-7600 in the car, we found that the sampling window is audible, but never interferes with intelligibility. The sampling window makes the 500SA sound different than repeater autopatches, but in practice it works just as well.

In the past, some hams have put together systems that used a VOX circuit and stayed in the transmit mode whenever the person on the telephone was talking. When they stopped talking, the system switched back to receive, allowing the ham to talk. These systems were *not* legal. The person on the other end of the phone line was clearly in control of the transmitter, and if that person chose to talk about things that made you uncomfortable, you and every other ham on frequency had no choice but to listen. With the CES system, the ham is in control of the autopatch transmitter, because he can cause the patch's transmitter to shut down whenever he chooses, in one second or less.

Advantages of Simplex Autopatch

The advantages of a simplex autopatch are pretty obvious, but they are worth mentioning anyway. First of all, the patch only occupies one frequency, rather than a pair. In our increasingly congested amateur allocations, this becomes an important consideration. The ability to use a normal synthesized transceiver with the patch is positively enticing. Since the costs involved are negligible compared to a complete repeater, an individual or small group could easily put such a system on the air, or a repeater group could move autopatching activities off the repeater and onto a simplex frequency, freeing the repeater for normal QSOs.

A simplex autopatch could be extremely useful in an emergency situation when telephone communications fail. Just plug the 500SA into the phone system outside of the affected area, and police, fire, and medical teams can be given access to the phone system.

As it is presently configured, the 500SA cannot be accessed through a repeater, but the manufacturer is developing some modifications to allow that use. Many repeaters are located in remote areas where it is impossible to bring in a phone line, and the 500SA could provide autopatch facilities for these systems.

While the concept of a simplex autopatch is revolutionary, it is only fair to mention that a similar system is presented in Bill Pasternak's and Mike Morris's epic tome, *The Practical Handbook of FM and Repeaters*, and has probably been discussed elsewhere as well. Simplex autopatches have been in use for several years, but the introduction of this commercially-built unit by CES will certainly increase the popularity of the simplex autopatch. With no further ado, let's take a good look at the 500SA.

Description

Physically speaking, there isn't much to the 500SA. It is a well-finished metal box that measures 1-1/2 inches high by 9 inches deep by 10-1/2 inches wide. The front panel is a model of simplicity. On the far right-hand side is a toggle switch marked "Toll Restrict," and it does just that. Inside the patch is a circuit board with 10 spaces available for the insertion of diodes. Our unit had diodes in the "0" and "1" slots. Numbers starting with a 0 or 1 are consequently ignored by the decoder when the Toll Restrict switch is on.

Next to the Toll Restrict switch is a two-position rotary switch marked "Base" and "Patch". This allows you to completely bypass the patch electronics and use the transceiver as a normal base station. Next to this switch are two momentary-contact push-buttons marked "Disconnect" and "Connect" for manual testing of the patch. The last item sharing the front panel is a row of LEDs, to keep you informed of the status of the system's various functions.

Inside, construction is uniformly excellent. The glass-epoxy circuit board, high-quality components, and careful layout all serve as reminders that CES produces a wide range of equipment for the commercial radio services.

Moving to the back of the patch, we find a neatly grommeted hole with telephone wire exiting it. The wire is equipped with a standard modular phone plug, so interfacing the patch to the phone line is not traumatic. Also on the rear panel are two multi-pin connectors for interfacing the unit with transceiver and IDer.

Installation and Use

We used a modified Clegg FM-88 as the transceiver for the patch, and setting up the system couldn't be simpler. CES thoughtfully wired up all the necessary functions to the accessory socket of the Clegg and provided an interface cable as well. Installation consequently took less than five minutes and consisted of hooking up the transceiver to a 12 V dc power supply, an antenna, and the autopatch, and plugging the autopatch into a phone jack. Power is supplied to the patch through the interface cable from the transceiver. The patch can be configured to work with either pulse or touchtone™ phone systems; touchtone is a far-off dream in our area, so we had the optional pulse dialer installed.

Operation of the simplex autopatch is even less challenging than its installation. As with any phone interconnect system that is not full duplex, you have to remind people that if they talk at the same time you're talking, you won't hear them. Because of the once-per-

second sampling of the patch's receiver, you also have to be careful not to cut off the first part of a transmission, particularly when dialing. If you have a fancy tone pad or autodialer with automatic push-to-talk, you'll have to forego the pleasures of that particular feature. Good operating practice with a simplex autopatch requires the transmitter to be keyed a couple of seconds before the first tone is sent, to allow the patch's logic to lock into the receive mode.

The 500SA is equipped with a time-out timer that gives warning beeps after 80% of timeout. The timer can be programmed to reset with a carrier, a "*", or no reset at all. Our unit was programmed to reset with a "*", which seems a good compromise.

One feature of the 500SA that you may not wish to use is its reverse autopatch capability. When someone calls the autopatch, it transmits a beep to let you know that a call is waiting. If you wish to talk to the caller, you simply press the "*" on your tone pad to connect the phone line to the patch. Since this system does not allow a control operator to screen the call before the caller goes on the air, it is doubtful that the reverse autopatch function is legal under present FCC rules and regulations. If you choose not to use this feature, it is easily disabled.

Legal Considerations

Many people I have talked with about the simplex autopatch have questioned the system's legality. After several phone calls to the FCC, I came to the conclusion that within the following limitations, the 500SA is legal. For any autopatch to be legal, simplex or otherwise, a control operator has to be present at a control point for the transmitter. This rather dashes any hopes of simply plugging the thing in at home and having your own private autopatch. A ham will either have to be present in the room with the patch, or you'll have to arrange a control link to turn the patch on and off that is independent of the input frequency of the patch. If you monitor the patch whenever it is up and can shut the thing down if a wild turkey brings up the system, you'll be well on your way to being legal.

The other thing you'll need if you want to be legal is an IDer. CES offers one as an option for the 500SA, and at about 50 dollars, it's well worth the investment. The reverse autopatch feature? As mentioned above, the legality of reverse autopatch is doubtful at best, so you might as well disable that feature right away.

Applications

So how is the average ham going to use the 500SA? Well, the possibilities are almost endless! You could just plug the thing in at a good site and hope that the FCC never catches you operating it without a control operator. That's just asking for trouble, and besides, there are some far more intriguing possibilities that are still within the capabilities of an individual ham.

Install the 500SA at a good site, hook up a 220- or 430-MHz control receiver, and bring in a phone line. Designate anybody you wish as a control operator, and leave the patch normally disabled. Whenever one of the control operators wants to use the patch, he or she can activate it via the control link and then use it normally. This has the advantage of giving instant accessibility, yet it stays well within the letter and intent of the law.

The only disadvantage is that you need to have a transmitter for 220 or 430 as well as two meters to use the patch, since control functions cannot be performed on two meters. The obvious solution is to put both the patch and its control receiver on the same band, say 220 MHz. Install a 220-MHz transceiver in your car or use a handheld, and the one rig can handle both control and operating functions. Dial in the control frequency, bring up the patch, and then flip to the patch's operating frequency to place your call.

This approach seems ideal for the individual or small group with a closed system in mind. If the group grows or decides to make its facility available on an open basis, the patch could be left on all the time, as long as a control operator is monitoring the frequency.

Conclusions

However you use it, the CES 500SA is a versatile and innovative new product. The concept is a logical one, and CES has produced an autopatch system that should give dependable, trouble-free operation at a fraction of the cost of a repeater and its associated autopatch equipment.

If you or your group has ever wanted to have an autopatch system, as a convenience or for emergency use, you owe it to yourself to check out the CES 500SA!

For further information, contact *Communications Electronics Specialties, Inc., 260 W. New England Avenue, Winter Park FL 32789.* Reader Service number 478.■

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Vincentown NJ 08088

About the Beverage

—When you say longwire, mean it. Use the remarkable beverage!

No, a beverage is not a drink! This beverage is a super longwire receiving antenna that is absolutely worth all the time and effort that it takes to put it up.

The advantages of a beverage antenna are that it is highly directional, has extremely low noise pickup, and produces excellent signal-to-noise ratios. Its disadvantage is that it requires a lot of ground to put it up in the direction that you want to listen.

The beverage antenna was invented in the early 1920s by Harold H. Beverage. It was first discussed in a paper titled "The Wave Antenna—A New Type of Highly Directive Antenna," written by Beverage, Chester W. Rice, and Edward W. Kellogg for the journal of the American Institute of Electrical Engineers (Volume 42, 1923, page 215 ff). Other writings on the subject are found only periodically thereafter as an editor or writer "rediscovers" the antenna. The several *Radio Engineering Handbooks* edited by Keith Henney and published by McGraw-Hill also have discussions of the antenna.

Results

As a medium-wave DXer in the late 1950s and through the 1960s, I had heard of beverages. Several National Radio Club DXers used them to good advantage. Probably the most spectacular example was Jerry Conrad's 1500' beverage in an orange grove in southern Florida. I heard one tape of 1550 kHz on which 50-kW CBE, Windsor, Ontario, normally is the dominant North American clear-channel station, but, changing from a random wire to the beverage, 50-kW 4QD in Queensland, Australia, completely took over the frequency! As it was later explained, normal daytime reception included regional-frequency stations from Texas and Oklahoma, and twilight reception normally included California and Hawaii stations.

It was not until my wife and I moved to a new location in 1980 that I had the room to put up a beverage. Despite summertime static, St. Pierre et Miquelon on 1375 kHz was readable most evenings on the beverage, yet there was no trace of a carrier on a random length 120' wire. Europeans on the standard medium-wave band were present most evenings throughout the fall, and Saudi Arabia on 1521 kHz often put a strong heterodyne on WKBW, 1520, Buffalo, New York. Daytime reception of central and northern New England stations on the regional and local frequencies is commonplace.

The results on 75 meters have been equally satisfying. In the fall and winter of 1980, more than 20 new countries have been added to the log just because I can hear them! The best ones include Faroe Islands, Maldive Islands, Reunion, and Djibouti.

Under normal conditions, the beverage scrubs at least 25 dB and sometimes as much as 40 dB off signals to the sides and to the rear of the antenna. In no-signal conditions, the typical atmospheric noise drops from an S6 or S7 on the dipole to an S2 on the beverage.

What is a Beverage?

The beverage is a very long longwire run in the direction in which you intend to listen. To be effective, a beverage should normally be at least two wavelengths long on the lowest frequency on which it will be used. For example, two wavelengths at 1.8 MHz is 1100 feet; at 3.5 MHz, 600 feet.

At less than two wavelengths, the property of high directionality will be lessened. At less than a wavelength, signals to the sides and rear will not significantly be reduced. The

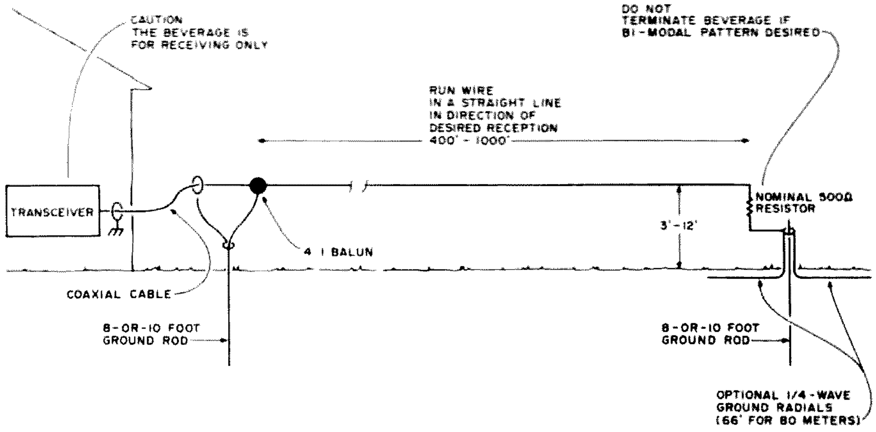

Fig. 1. Installation of the beverage antenna.

advantage of improved signal-to-noise ratio will be retained, however.

Increasing the number of wavelengths on the wire is not normally effective when the number exceeds eight to ten. The front acceptance angle also becomes smaller. That was exemplified here by back-to-back QSOs on October 5, 1980, with XT2AW, Upper Volta, on 40 and 75 meters. Whereas my beverage, running northeast, offered no advantage over the dipole on 40, on 75 it was significantly better and provided solid copy. XT2AW was just barely audible on the dipole.

At certain times, particularly in the twilight hours, the beverage will not appear to be functioning. The changing, tilting ionospheric layers in transition tend to produce high-angle signals without any worthwhile low-angle components.

How It Works

The long antenna wire pointed in the direction of a passing radio wave has a high degree of exposure to the horizontal component of the wave. This induces a continuously building series of voltages that are propagated along the antenna from one end toward the receiver. The effects are cumulative over the long length. Energy collected from a radio wave traveling in the opposite direction is dissipated in a terminating resistor and so does not enter the receiver. Radio waves arriving from the sides have relatively little effect on the receiver.

Installation

Installing a beverage is relatively simple. As a minimum, you will need antenna wire, a 4:1 balun, a ground rod, a 500-Ohm 1- or 2-Watt carbon resistor, and coaxial cable to feed the receiver.

I used a surplus 1000′ roll of insulated #18 hook-up wire. Others use copperweld; almost anything will suffice. The wire should be installed at a more-or-less uniform height 3′ to 12′ off the ground. Mine averages about 8′ so that deer walking through the area won't snag the wire and pull it down.

Run the wire—at least 400′ and preferably 600′-1000′—in a straight line. A few degrees of bending over the course is acceptable but anything more than a 10- or 20-degree bend should be avoided. Run the antenna wire in the direction of primary interest.

At the far end, install an 8′ or 10′ ground rod. Connect the end of the beverage to the ground rod with a nominal 500-Ohm resistor in series. Use a non-inductive resistor if one is readily available, otherwise a small carbon resistor will be fine. The value of the resistor is subject to experimentation; values ranging between 200 and 600 Ohms are normally found to be best.

If you need to improve the effectiveness of the ground because of poor conductivity at the point of the ground rod, connect some 66′ radials to the ground rod. Run one of them away from the ground rod, continuing in the direction that the beverage was pointed.

A terminated beverage is unidirectional in the direction that the beverage runs, i.e., from the receiver end to the terminated end. If you want the antenna to be bi-directional along its axis, leave the far end unterminated.

The beverage is a high-impedance antenna. It will perform by connecting the receiver end of the beverage antenna wire to the inner conductor of the coaxial cable feeding the receiver. I'll leave it to the

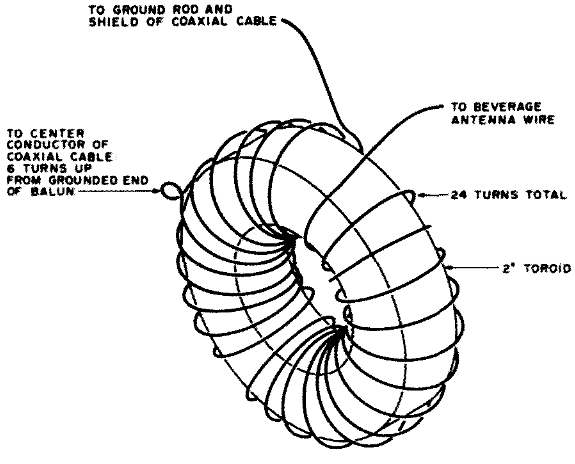

Fig. 2. A homemade 4:1 balun.

engineers to do the calculations on exact impedances and tell you to install either a commercial or homemade 4:1 balun. Almost anything to get the impedance match into the ball park will do.

I wound 24 turns of hook-up wire onto a surplus 2″ toroid, tapping it at 6 turns for the coaxial center conductor (see Fig. 2); it works just fine. If the beverage is only for amateur band use, i.e., above 160 meters, one of the small antenna tuners, such as marketed by DenTron or MFJ, will perform equally well. A fixed balun should be mounted at the receiver end of the beverage wire, whereas an antenna tuner should be placed by the receiver.

Although this beverage antenna is a *receiving-only* antenna, some users will adjust the antenna tuner for maximum by loading a small amount of power (less than 5 or 10 Watts) into the beverage. Don't forget the terminating resistor!

At the receiver, install switches or relays to listen with the beverage and transmit on your normal antenna(s). If you have a separate receiver and transmitter, that task is simple.

If you have a second ground rod available, install it at the end of the beverage wire. Tie the ground side of the fixed balun and the coaxial shield to ground with a short piece of wire.

Some final installation notes are in order here. An ohmmeter connected in series between the receiver end of the beverage wire (temporarily disconnected from the balun) and the second ground rod should read 10k to 15k Ohms, assuming the far end of the beverage is terminated. The circuit is completed through the earth. An infinite reading indicates a break in the beverage antenna wire.

If you install multiple beverages for multiple listening directions, the antenna selection device should ground the beverages not being used. Otherwise, signals built up on the other beverages (or random wires) in the area will be inductively coupled to the beverage in use, causing extraneous signal pickup and blunting of the nulls.

Conclusion

The beverage has opened new vistas for me despite a very modest station installation. The ability to hear is of paramount importance, and I attribute some excellent DX on 80 and 40 meters to that antenna. If you have the room to install a beverage, go ahead and do so. You'll be surprised at what comes out of the noise levels! ■

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Design-a-Dish

—produce a proper home-brew parabola with this BASIC program

After months of chatter on the club repeater, I decided last week to join the computer nuts. They seemed to be having so much fun with their microprocessors that I didn't want to be left out. I bought a TRS-80 with Level II BASIC and 4K of memory, saving a few bucks by using my SSTV monitor instead of buying Radio Shack's monitor.

After a few hours on the manuals, I was off and running. Then, after a couple of hundred games of "Lunar Lander" and "Blackjack," I put something in the machine that ran more along my lines of interest: I wanted my TRS-80 to help me construct a parabolic dish and feed system for receiving the geostationary weather satellites that transmit facsimile on 1691 MHz. Amateur interests (including my own) range from moonbounce to Gunnplexers and even to domestic satellite TV reception (TVRO), so it appeared that the ham without a dish would be missing out on a lot of fun.

If you like to roll your own, you can save a few bucks, learn something about dishes, and not have

```
1 PRINT"DISH AND FEEDHORN DESIGN PROGRAM * RUPERTO W3KH 4/79"
2 GOSUB300
10 PRINT"PARABOLIC DISH DESIGN PROGRAM. "
15 PRINT:PRINT
20 INPUT "DESIRED DIAMETER IN FEET:";D
30 INPUT"DESIRED F/D RATIO";Z
40 PRINT:PRINT"THE FOCUS IN FEET IS";Z*D:F=Z*D
45 PRINT "INPUT RATE OF PLOT ALONG Y AXIS. EVERY ? INCHES":INPUT M
50 PRINT:PRINT"COORDINATE VALUES FOR HALF DISH SIZE ARE AS FOLLOWS:"
60 PRINT TAB(15)"Y";TAB(30)"X"
70 FOR Y=0 TO .5*D*12 STEP M:X=Y*Y/(4*(F*12))
80 PRINT TAB(15)Y;TAB(30)X
90 NEXT Y
100 S=(D/2)[2/(4*F)
110 PRINT "THE SAGITTA OF THE DISH IS";S;"FEET"
114 INPUT"INPUT DISH OPERATING FREQ IN MHZ FOR GAIN FIGURE";T
115 L=11811/T
116 G=.59*(((3.14159*D*12)/L)[2)
117 H=LOG(G)/LOG(10)*10
118 PRINT:PRINT"THE GAIN AT";T;"IS"H;"DB"
119 GOSUB 300
201 PRINT:PRINT"THIS PROGRAM CALCULATES THE PARAMETERS FOR A"
202 PRINT"CIRCULAR WAVEGUIDE TO COAX TRANSITION DEVICE. "
203 PRINT:PRINT"ALL OUTPUTS ARE METRIC. "
208 INPUT"INPUT DESIGN FREQ OF OPERATION IN MHZ. ";F
210 O=30000*(10)[6/(F*(10)[6)
212 D1=O/1.71:D2=O/1.31
214 CS=(D1+D2)/2:D3=CS*1.71
216 G=O/(SQR(1-((O/D3)[2)))
218 PRINT"CUTOFF DIA. FOR DOMINANT MODE IS:";D1;"CM. "
220 PRINT:PRINT"CUTOFF DIAMETER FOR NXT LWR MODE:";D2;"CM. "
225 PRINT:PRINT"GUIDE DIAMETER SHOULD BE BETWEEN";D2;"&"D1
228 PRINT"AVERAGE IS";CS
230 PRINT:PRINT"THE PHYSICAL GUIDE LENGTH,(G/2) IS:";G/2;"CM. "
235 PRINT:PRINT"THE FREE-SPACE WAVELENGTH AT";F;"MHZ. IS";O;"CM. "
240 PRINT:PRINT"THE PROBE LENGTH IS:";O*10/4;"MM. "
245 PRINT"THIS IS ALSO THE DISTANCE FROM PROBE TO CLOSED END. ":GOSUB300
246 PRINT"TO FIND THE CUTOFF FREQ OF A CIRCULAR GUIDE"
247 INPUT"INPUT DIAMETER IN CM. ";X: Z=X/2.54
260 Y=X*1.71:PRINT"CUTOFF FOR DIA";X;"CM. IS";Y;"CM. OR";Y/2.54;"IN. "
261 PRINT"FREQ. IS :";30000/Y"MHZ. "
300 PRINT"INPUT A FOR DISH PARA.,B FOR HORN DESIGN,C FOR DIA VSCUTOFF FREQ"
301 INPUT A$:IF A$="A" THEN10 ELSE 302
302 IF A$="B" THEN 201 ELSE303
303 IF A$="C"THEN 246 ELSE 301
304 RETURN
```

Program listing.

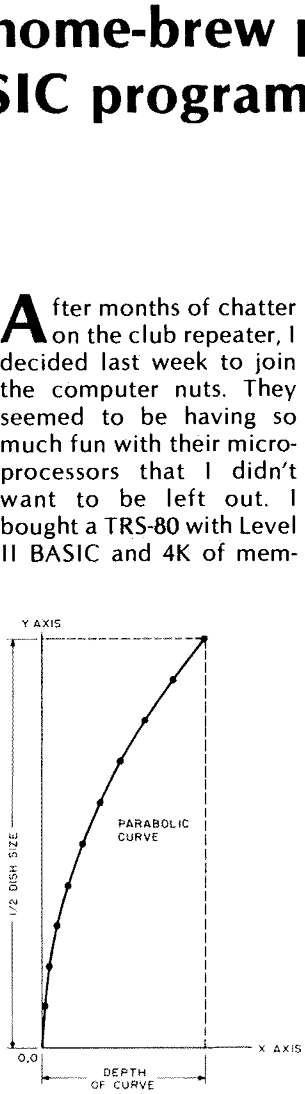

Fig. 1.

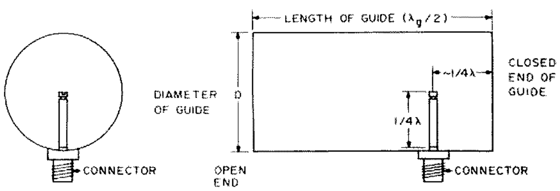

Fig. 2.

to worry about transporting a surplus ten-foot dish across town on the roof of the family Volkswagen. Many good dishes have been constructed using plywood ribs and screen or formed aluminum tubing, but most articles written in the amateur journals usually specified one size of dish and one or, at the most, two frequencies of operation. If after reading them you found that your particular application didn't fall in this category, you looked up a microwave expert or did a lot of reading on the subject.

This program, written in Radio Shack Level II BASIC, takes the drudgery out of the calculations. The hardest things it performs are square root and logarithm conversions, so it should be applicable to Level I BASIC or any other language with little or no modification. It requires the user to select one of three options: A—parabolic dish design, B—feedhorn design, or C—cutoff versus frequency for a specific diameter of waveguide. The program variables are shown in Table 1.

Program A

Program A (lines 10 to 119) allows the user to select dish size and f/d ratio independently. Then it prints out the X and Y coordinates in inches and the focal length and depth of the dish in feet. This allows you to select a specific dish diameter and play around with different f/d ratios while plotting X and Y coordinates for each change. This was always a pain even with a calculator. It then asks the user to specify the desired frequency of operation for a gain figure at this frequency. The computer will give a gain figure in dBi based on a 56-percent dish efficiency; this may be a bit optimistic but it is a good ballpark figure. It may be changed by entering your own percent figure at line 116.

The curve formula is derived from the basic $Y^2=4AX$ definition of a parabolic curve where, in this case, the known Y axis represents one half of the dish size (the other half of the dish is the same curve), 4A is a constant where A represents the focus, and X is our unknown. X represents the depth of the curve along the Y axis. We appropriately substituted F for A in the program. The program asks the user for the number of plots along the Y axis by saying, "INPUT RATE OF PLOT ALONG Y AXIS. EVERY ? INCHES". Depending on the curve perfection desired or your skill with the sabre saw, use whatever value you think necessary. I used every four inches for large dishes and scaled it down for the smaller dishes. See Fig. 1 for curve design.

Program B

Program B (lines 201 to 245) specifies the diameter and length of a circular waveguide-to-coax transition device[1] used by a number of amateurs with great success. Basically, it takes the form of a tin can open at one end and closed at the other. A quarter-wavelength rod is mounted approximately a quarter wavelength from the closed end, perpendicular to the longitudinal axis of the can and mounted on a connector suitable for coax cable. The dominant mode (the one we're interested in) is the TM_{11} mode; it lies between 1.71d and 1.31d, where d is the guide diameter, 1.71 is the cutoff for the dominant mode, and 1.31 is the cutoff for the next mode to develop (the TE_{01} mode). The diameter is based on the H_{11} and TE_{01} limits for the desired frequency of use which is input to the computer by the user. This is done by the prompt, "INPUT DESIGN FREQ OF OPERATION IN MHZ."

For example, we type in "1691", hit the enter key, and the computer prints out "CUTOFF DIA. FOR DOMINANT MODE IS: 10.535 CM." "CUTOFF DIAMETER FOR NXT LWR MODE: 15.212 CM." Aha, my 12-cm diameter lard can will do the trick!

These limits are mathematically depicted in the formulas. The program calculates and prints both limits and their average in cm, thereby giving the user

Formulas Used in Calculations By the Computer

$\lambda_o = 30{,}000/F$

Where F = Frequency in MHz; λ_o is the free-space operating frequency in centimeters (cm).

$D = \lambda_o/1.71 \text{ to } 1.31$

Where D is the diameter of the guide expressed in cm, λ_o is the free-space operating frequency expressed in cm, 1.71 is the cutoff for TM_{11} mode, and 1.31 is cutoff for TE_{01} mode expressed in cm. This gives the limits of the guide diameter.

$\lambda_g = \lambda_o/\sqrt{1-(\lambda_o/\lambda_{co})^2}$

Where λ_g is the length of the guide in cm, λ_{co} is cutoff wavelength expressed in cm, and λ_o is the operating wavelength in cm.

$\lambda_{co} = 1.71 \text{ to } 1.31(D)$

Where λ_{co} is the cutoff frequency expressed in cm. See Fig. 2.

$Y^2 = 4AX$

Where X is the X-axis plot of dish and Y is the Y-axis plot of dish; both are expressed in inches. Y represents one half the dish diameter, input to the computer in feet. Output to the user as "X" and "Y", in inches. See Fig. 1.

$G_{dB} = 10 \log (.59 [12\pi D/\lambda_o]^2)$

Where G = gain of the dish in dB, D is dish diameter in feet, and λ_o is the operating frequency in inches.

Program Line #			Program Variables
20	D	=	Diameter of dish in feet.
30	Z	=	f/d ratio.
40	F	=	Focus of dish.
70	Y	=	Vertical axis; half dish size, in inches.
70	X	=	Horizontal axis; plot points of dish depth along Y axis, in inches.
45	M	=	Input variable to plot a point every (?) inches along the Y axis.
100	S	=	Dish depth in feet.
114	T	=	Operating frequency of dish in MHz.
115	L	=	Operating frequency in inches.
116	G	=	Gain calculation (dBi).
117	H	=	Log multiplier for dB. (RS Level II uses only natural logs.)
212	D1	=	Cutoff calculation for TM_{11} wave in cm (dominant mode).
212	D2	=	Cutoff calculation for TE_{01} mode in cm.
214	CS	=	Wavelength limit average of D1 and D2 in cm.
210	O	=	Alpha character denoting operating frequency calculation in cm.
216	G	=	Physical length of guide calculation; (G/2) gives actual printout in cm.
247	X	=	Input diameter of guide to computer for cutoff and length calculations in cm.
260	Y	=	Output to user: frequency of cutoff in cm.
247	Z	=	Conversion of Y figure to inches.
300	A,B,C	=	Program selection variables.

Table 1. Program variables. Notice that some variables are duplicated, but due to user input they do not conflict in the program.

some leeway on diameter for that particular frequency. The guide length, however, is based on the computer-derived average of these limits. The actual guide length is one half the theoretical guide length, which gives a broader frequency response when tuning the vertical radiator. This was based on work done by DJ1SL.[2] It also prints out the free-space operating wavelength in cm for reference and gives the probe length and distance from the closed end of the guide in millimeters. The program begins at line 201. See Fig. 2 for a schematic of guide and dimensions.

Program C

This program (lines 246 to 261) is designed for the guy who always wanted to know the cutoff frequency of a tomato paste can in the TM_{11} mode and also to know the operating frequency in centimeters and inches, depending on what type of ruler he has in his pocket. I was too lazy to program the input for both inches and cm, so this program looks for only one thing: "INPUT DIAMETER IN CM." All outputs are as advertised. The program begins at line 246.

Initially, after the computer has requested the user to select program A, B, or C and has performed its task, it returns in this configuration for another program selection. This is done at the subroutine on line 300.■

References

1. Vilardi WA2LTM, *QST*, March, 1973, "Simple and Efficient Feed Systems for 1296 and 2304."
2. Griem DJ1SL, *VHF Communications*, Vol. 8, April, 1976, "Tubular radiator for parabolic antennas on the 13 cm band."
3. FAA manual *DFR-33*, "Transmission lines and wave guides."

Mayday!

—help locate downed aircraft with your local repeater

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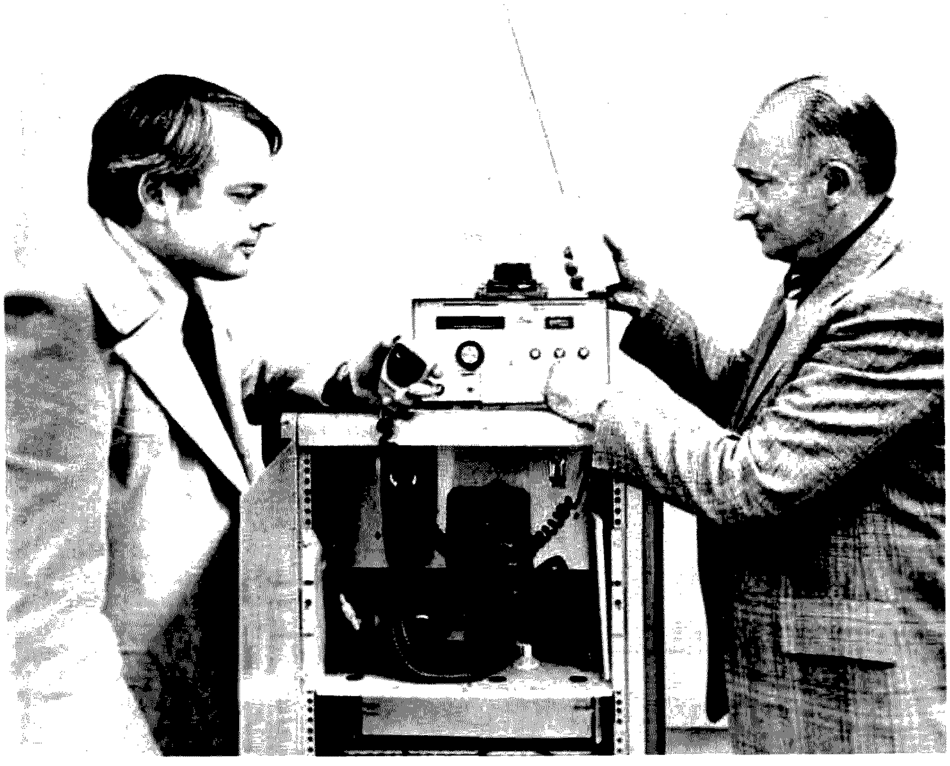

Photo A. Clifford Williams K2UZS (left) and Ed Sommerfield W2FJT check out ELT alert system.

The public, from the beginning of the era of the Wright brothers, has been enthralled with almost all activities related to the airplane. Incidents related to aircraft disasters, especially the rescue of survivors, have always captured front-page headlines. Amateur radio, therefore, is presented with a rare opportunity to demonstrate our active involvement in public service with a project that first and foremost is of lifesaving benefit, and second is

most visible, in a positive light, to our community.

This project is the early detection and subsequent location of downed aircraft by use of the ELT (Emergency Locator Transmitter) beacon transmitter carried by law in all aircraft, and activated under crash conditions.

The MBARC (Mt. Beacon Amateur Radio Club) of Poughkeepsie, New York, was already involved in RDF (Radio Direction Finding), using it to rid ourselves of jammers. A proposal was put before the membership to channel the RDF experience and enthusiasm into the ELT lifesaving program. This proposal was unanimously accepted and within 3 weeks a modified Clegg 22'er was installed and operating at our local repeater site. Since our repeater is microprocessor controlled, we were able to experiment with various control and time functions. As a matter of fact, one of our engineering problems led to an especially humorous innovation as will be explained later.

Implementation

The FCC prohibits the direct rebroadcasting of signals on the amateur frequencies other than those received by the repeater input. We contacted the FCC, and were advised that we could *indicate* the presence of an ELT signal by altering our CW ID.

Referring to Fig. 1, when an ELT signal is received, the increased agc on the Clegg 22'er, amplified by the interface, energizes K1. K1 provides an isolated closure to a digital input port on the microprocessor. If K1 remains energized for 5 minutes, our ID is varied to include an alerting 8 dots followed by a Morse code "ELT" (. .—.. —). This modified alerting signal repeats every 2 minutes. Any ham who hears this signal calls a predetermined list of personnel who, in turn, validate that it is indeed an ELT transmission and not a noise signal and subsequently notify RDF-equipped hams and the FAA.

After this has been done, the ELT mode is "controlled" off and not "controlled" back on until either the FAA advises us that the ELT has been located, or 48 hours have elapsed, whichever comes first. The ELT normal battery life is 48 hours and we don't want a continuous alerting signal, and phone calls, after the FAA has been notified. RDF-equipped hams then track the ELT to its source and take appropriate action. (See Table 1 for complete beacon specifications.)

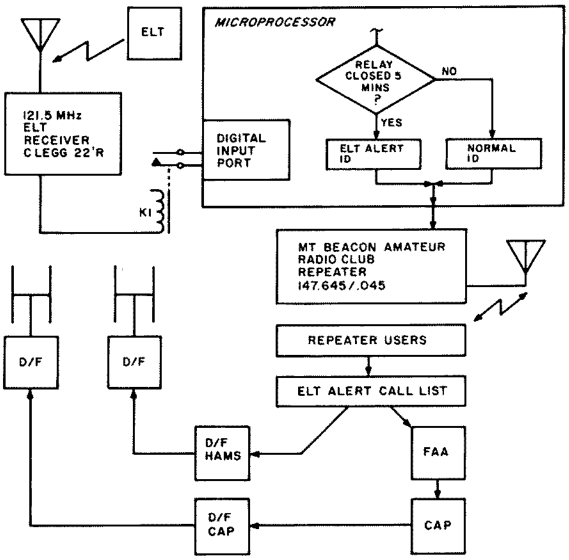

Fig. 1. Emergency Locator Transmitter (ELT) alerting system.

Electrical Interface

The electrical interface (Fig. 3) is very simple. The Clegg 22'er was modified for 121.5 MHz (Fig. 2) and RCA interface jacks added. One jack is for the agc line, and the other for 12.6 V ac to power the interface. The interface isolates and amplifies the dc agc level up to 5 times via Q1A, and feeds it to the inverted input of voltage comparator Q1B. The voltage comparator is adjusted, via R3, such that Q1B output is at −12 volts under no-ELT-signal conditions. This level ensures that Q2, the relay driver, is off.

When an ELT carrier is received, the Clegg 22'er agc voltage becomes more negative, causing the Q1B inverted input level to go more negative than the adjustable non-inverted level as set by R3. The comparator output under these conditions goes to +5 volts. This positive voltage disconnects diode D1 and allows current to flow into the base of Q2 via diode D2, turning on Q2, and in turn K1. The activation of K1 presents a contact closure to the microprocessor digital input.

The flowchart in Fig. 4(a) shows that this digital input port is sampled every second and if *all* samples in a

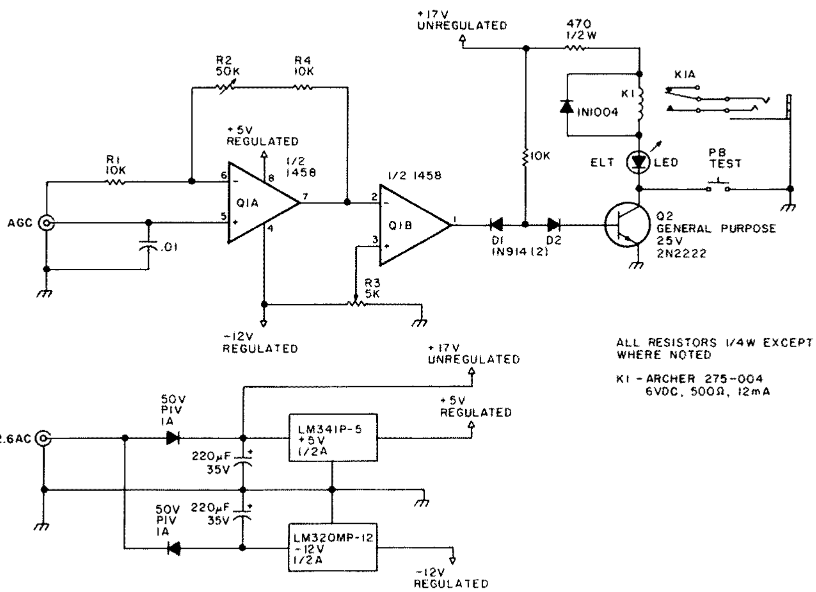

Fig. 2. Interface from Clegg 22'er to microprocessor.

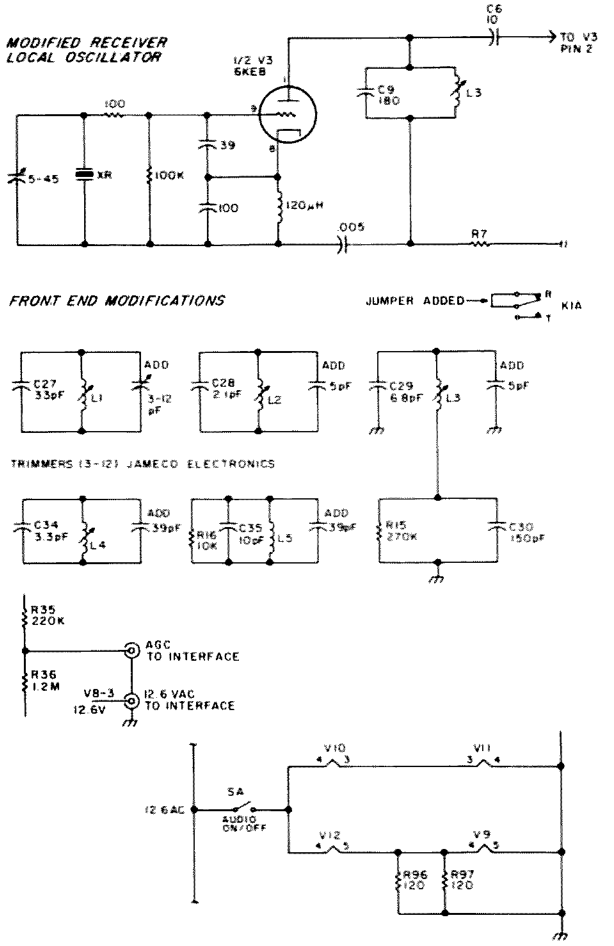

Fig. 3. Modifications to Clegg 22'er for 121.5-MHz ELT reception. XR = 8.262500 MHz for 121.5-MHz input, use International Crystal Manufacturing Co. catalog #433478 (10 North Lee, Oklahoma City OK 73102). Modifications include removal of V13, V14, and V15. Do not remove V12. This turns off audio and reduces heat generated by unused tubes. A small pancake fan was mounted on top of the cabinet to provide cooling required for 24-hour operation.

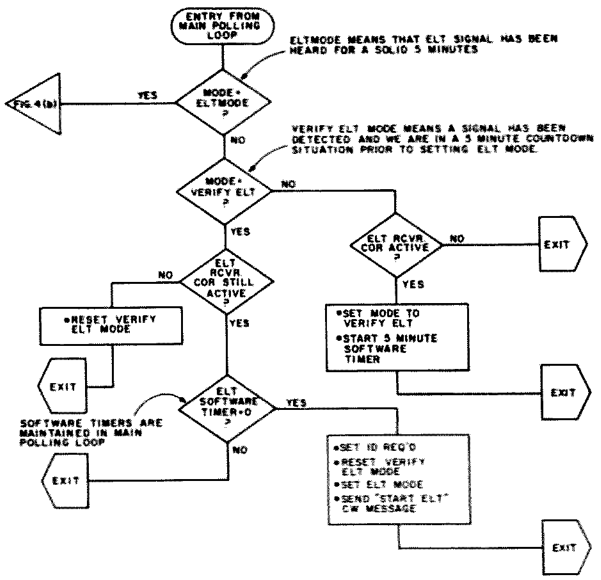

Fig. 4(a). System flowchart.

ELT Beacon Specifications (EBC-102A Data Sheet)

Operating life, room temperature	—Greater than 48 hours
Operating frequency	—121.500 MHz ± .005% and 243.000 MHz ± .005%
Modulation percentage	—100%
Sweep range	—1300 Hz to 400 Hz
Sweep rate	—3 Hz
Modulation duty cycle	—45%
Transmitter duty cycle	—100%
Peak effective radiant power	—Greater than 75 mW on both frequencies
Automatic activation	—Minimum 5 Gs for 12 ms Maximum 7 Gs for 15 ms
Temperature variation test −40° C. to +55° C.	—Frequencies within ± .005% after exposure
Low-temperature performance: −20° C.	Meets room temperature specifications after exposure
High-temperature performance: +55° C.	
Altitude performance: 50,000 ft.	
Decompression: 8200 feet to 40,000 ft.	
High-pressure performance: −15,000 feet	
Shock performance: 50 Gs, 6 axes	
Vibration test: 10 Gs	
Immersion test: 17 hours in salt water	
Waterproofness: drip 20 minutes	

Table 1.

5-minute interval detect a contact closure, then the microprocessor indicates an ELT detection and alters the repeater ID—Fig. 4(b)—as previously described. Once an ELT is detected, it will remain "detected" until the contact opens for a full 5 minutes. This was done to ensure that we wouldn't lose the ELT if someone, or something, caused an intermittent loss of the ELT signal.

Antenna

The humorous incident came about while we were discussing the antenna installation at an engineering planning meeting. In order to achieve a low angle of radiation, necessary to detect signals located on the ground, a large vertically-stacked antenna should be used; this was out of the question at our location. While describing the high angle of radiation attributed to the normal 2-meter ground plane antenna, someone piped up with: "Why don't you mount the ground-plane antenna upside down?" We all laughed, but that's just what we did (see Fig. 5) and it performed far beyond our expectations. In fact, we are considering this approach to repeater antennae in general, since most of our communications is from high to low locations.

Adjustment

With the antenna connected to the receiver, initially adjust R2 to maximum resistance, and R3 to ground level. Then, adjust R3 until the ELT LED in the collector circuit of Q2 just turns off. Adjust R3 an additional 1/8 turn in the same direction. If the ELT LED cannot be turned off, adjust R2 to a lower resistance,

and repeat the R3 adjustment.

Problems

We have encountered only one problem so far. The second harmonic of TV channel 3 is in the 120-to-132-MHz range. TV games on channel 3, incorrectly connected to a TV set with its outside antenna attached, will radiate in the 120-MHz range. We advised our close-in neighbor of this problem, and interference to the ELT receiver stopped.

Operating Experience

ELT transmitters may legally be tested during the first five minutes of every hour. We installed the ELT detector system on a Thursday evening. The following Friday a call was received that the repeater detected an ELT at 1330, which is not within an allowable 5 minute ELT testing period. A call to the FAA confirmed the ELT signal, but before any action could be taken, the ELT was shut off—they thought no one was listening! A second similar incident occurred within 2 weeks. We hope that we never have to hear the 8 dots and the ELT alerting signal, but we routinely test the detector during the legal test time, using a private aircraft transmitter.

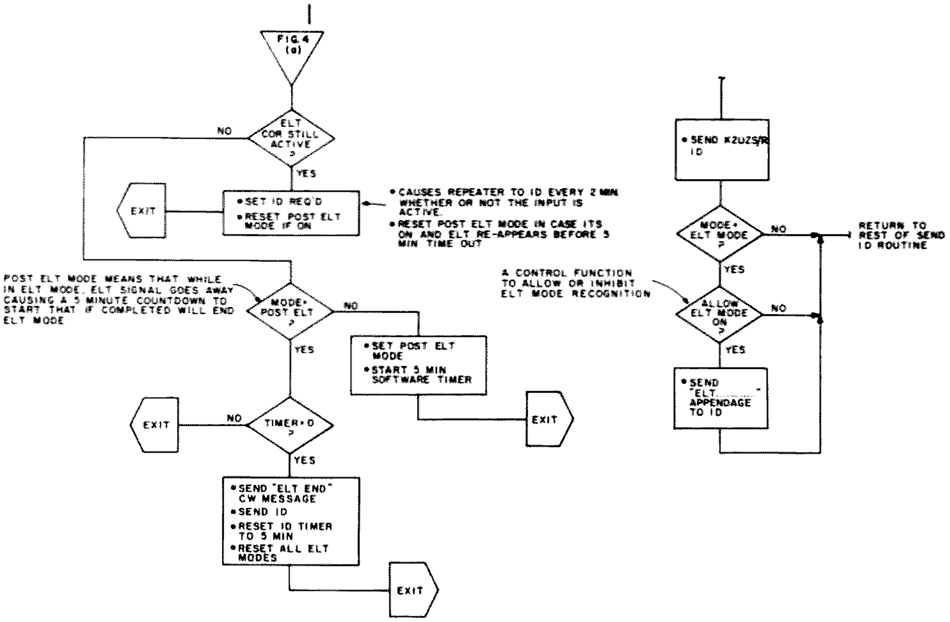

Fig. 4(b). Detail of ELT ID.

Conclusion

Future plans include upgrading the ELT detector installation from the omni-directional antenna to a controlled directional antenna such that triangulation between 2 or more repeaters would point out the initial direction to search. This would cut the search time considerably. Ideally, if we could equip every repeater station with an ELT detector, help could be on the way within 5 minutes after the ELT is detected.

No other organization has the equivalent of an umbrella of actively monitored radio stations, located ideally at high elevations. Also, there are very few organizations around that have the quantity of equipment and number of trained RDF personnel that hams can assemble to detect and search for ELTs. ■

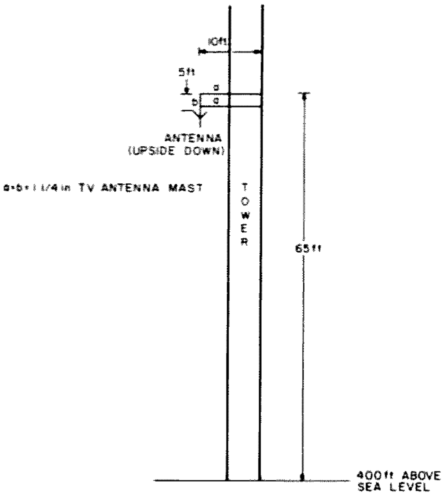

Fig. 5. Antenna mounting details.

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An 820S Remote Vfo

—using the rig's counter and display

While the Clipperton DXpedition was in operation, a friend of mine down the street, Ari VE5AAO, was becoming very frustrated trying to work the split frequency with his Kenwood TS-820S. It was then we realized that an outboard vfo was a necessity for DX work and we set about putting something together from the junk box.

It turned out to be extremely simple, and another friend, Lorne VE5NO, urged (nagged) me to write it up for *73* because of the many 820S owners who might wish to build this simple project. What makes it so simple in this case is that you need not bother making any kind of frequency-readout dial—the Kenwood counter and display do it for you. Other remote vfos that I have built required the construction of some kind of dial and, even with tedious hours of calibration and dial marking (I had no counter then), the resolution and accuracy left a lot to be desired.

Photo A. The completed remote vfo.

All this is eliminated when using the Kenwood with digital readout. When transceiving with the remote vfo, the frequency displayed on the Kenwood will be that of the remote. When transmitting with the Kenwood and receiving on the remote vfo, the display will read the Kenwood vfo when transmitting and the remote vfo when receiving. A front-panel LED indicator shows when the remote vfo is active. So you can see that a mechanical dial on the remote unit would be redundant.

The Transceive/Separate switch allows one to transceive with the remote vfo or, in the Separate position, to receive with the remote and transmit with the TS-820S. The Remote/820 switch allows one to choose which vfo will exercise main control.

The heart of this very stable circuit is the Seiler oscillator; the output level

varies little when the vfo is tuned through its range, and resettability is excellent. The buffer stage uses an FET operated in class A to minimize loading on the vfo. The emitter-follower provides a low-impedance output for driving the Kenwood circuits.

Temperature compensation requirements are minimal because of the high stability of the variable oscillator circuitry. In this circuit, stability is primarily a function of the tuned-circuit components and is only slightly affected by the active device. Although not used in my unit, a negative-temperature-coefficient capacitor could be used in the tank circuit to take care of any temperature-induced drift.

Construction is straightforward but consistent with good vfo construction techniques. My vfo was built inside a 12.7 cm x 17.8 cm (5" x 7") aluminum chassis on a 6 cm x 10 cm epoxy PC board. If you prefer not to use a circuit board, any wiring method should work equally well. Mechanically, everything should be rigid.

C2 should be a good quality variable; mine came from surplus equipment complete with a good gear-reduction drive, a necessity for slow SSB tuning. L1 should be wound on a ceramic form and capacitor C4 should be a silver mica. The values of the tuning circuit components were arrived at experimentally to achieve a vfo frequency of 5.0 to 5.5 MHz. I did not use C3 for calibration purposes in my unit, but simply pruned L1 until the desired range was obtained. Depending on the capacity of your variable, the value of C4 may need altering to bring the vfo into the desired range.

I would encourage you to use parts you have available and experiment a little. In some cases, I have even pulled plates out of the variable capacitor to arrive at the range I wanted—just go slowly, and remember, you can't put the plates back in!

It is not necessary to regulate the voltage to this vfo because the voltage supplied by the Kenwood socket is regulated. The whole unit is connected to the Kenwood transceiver by a 9-pin plug which mates a 9-pin tube socket in the Kenwood rear panel.

Stability has been found to be good. From a cold start my vfo drifts 80 Hz in the first five minutes, and less thereafter. This amount of drift is really not detectable without the aid of a counter.

Good luck with your project and good DX—on split frequencies. My thanks to Brian Dunn for the photography. ■

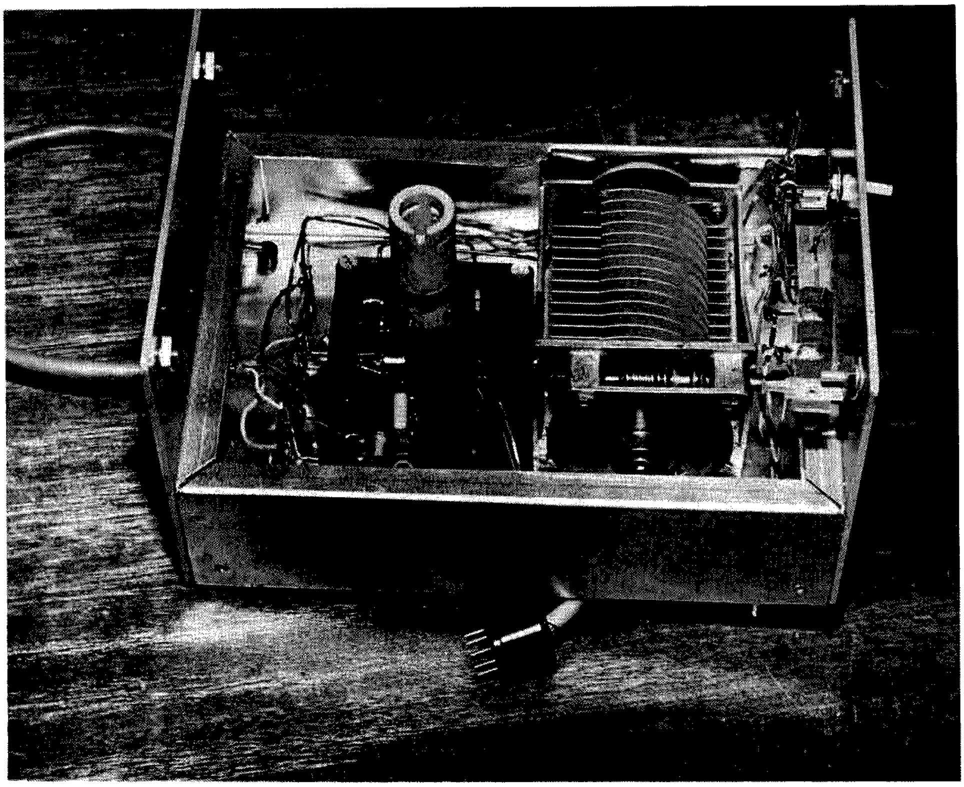

Photo B. Construction details. Oscillator board is mounted at back of chassis. Surplus capacitor (front) includes gear drive.

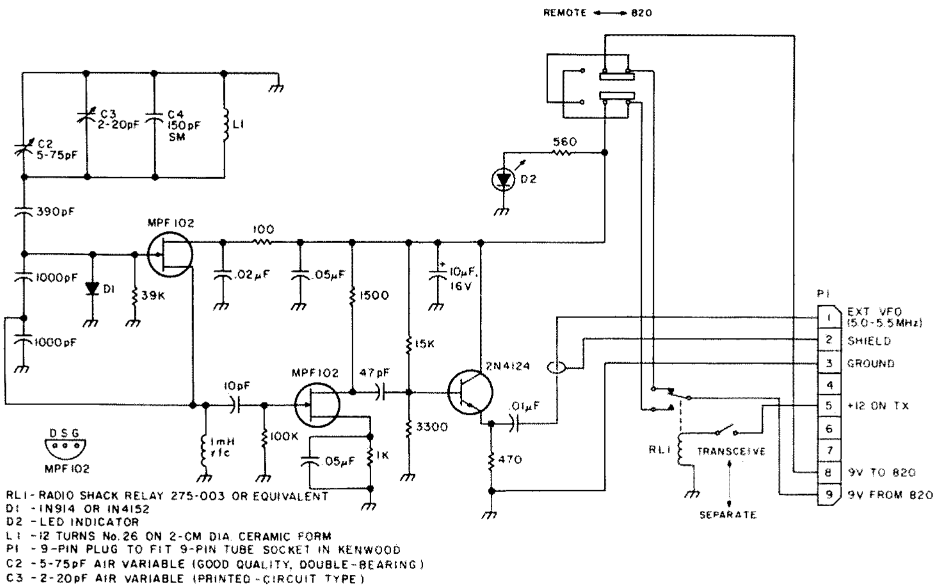

Fig. 1. Schematic for the Kenwood TS-820S remote vfo.

73 Magazine Staff

Maximize That Multimeter

—add a few features the manufacturer forgot

Most amateurs probably have relatively inexpensive solid-state multimeters that fall somewhere in the class between old tube-type VTVMs and the digital generation of multimeters. Such "middle generation" multimeters can still suffice for many noncritical applications around any shack. After all, for occasional troubleshooting one does not need an auto-zeroing, auto-polarity, and auto-ranging digital marvel. So don't look forlornly at your multimeter and wish it were a digital with one-inch readouts; why not add a few little convenience features to it and enjoy the instrument as being a good buy at yesteryear's prices?

This article presents a potpourri of ideas which I have tried on my Heath IM-17. They can be used on almost any multimeter to improve the instrument's performance and convenience in actual use.

One thing that was all too easy to do with the Heath IM-17 was to leave it turned on when not being used and thus run down the three-dollar mercury batteries the manufacturer recommends to power the transistor circuitry. So, one of the first items added was an LED flasher circuit to indicate that the meter was turned on. The LM3909 circuit (Fig. 1) was used. The LED itself was mounted on the front panel of the meter and can be seen in Photo A, just under the letter "M" in "voltmeter".

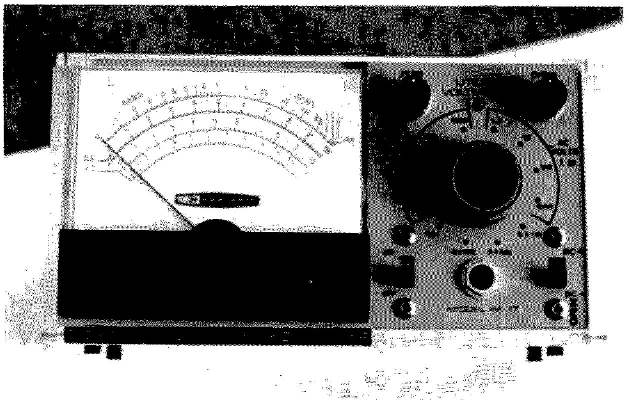

Photo A. Front panel of the IM-17.

The LM3909 itself was mounted on a piece of perforated board stock inside the meter. In the Heath IM-17, the on-off switch also switches the 1.5-volt battery used for the Ohms circuit, so pin 5 of the LM3909 was simply connected to this circuit. The LM3909 can be used with any battery voltage, however, simply by connecting a suitable series resistor to pin 5 (experiment with 1 kilohm for a 9-volt battery). Considering that the whole LM3909 circuitry cost around $1.50, its installation has paid for itself many times over in battery savings.

The IM-17 was housed originally in a plastic carrying case that folded shut. The case was fine for field work, but very awkward for bench work. So, as shown in Photo B, it was rehoused in a home-built Plexiglas™ case. One need not construct such an elaborate housing if a standard-size metal enclosure can be found. However, the Plexiglas was on hand and it is a relatively easy material to work with, using ordinary hand tools.

The next step was to modify the awkward test lead setup in the IM-17. Like many multimeters, it had three test leads: a common lead, one lead for ac/Ohms, and one lead for dc voltage measurements. The number of leads was awkward and the types of leads supplied were more suited to 10-Ampere battery circuits than transistor circuitry. As shown in Fig. 2(a), the only reason for having a separate dc lead was so that a 1-megohm isolating resistor could be used in the dc probe. Most modern multimeters do not have such a resistor, and the usefulness of such a resistor is debatable.

As shown in Fig. 2(b), the resistor was moved back into the inside of the IM-17 circuitry and this resulted in there being only two test leads needed for all functions. The resistor was re-

tained in the circuitry so as not to upset the input impedance of the dc-measuring circuitry. The accessory jack on the front panel was used for connection to the test leads. The use of the jack allows one to use a variety of test leads, shielded or unshielded, and test leads permanently connected to accessory probes.

The ordinary test leads used are small, flexible wire types with grabber-type test clips at the ends of the leads (Radio Shack 278-1160). However, there are instances when a test prod is useful. So, as shown in Photo C, a regular test prod can be used with one of the grabber test clips by means of a short length of wire attached to the test prod. A piece of insulating tubing is slipped over the grabber test clip when it is used with the test prod. This arrangement of test leads has proven to be very handy and a vast improvement over the original test lead setup.

The IM-17 has a front-panel switch marked DC+/DC−. It is simply a DPDT switch which reverses the dc test leads for polarity reversal in case one has connected the leads falsely in a circuit. In reality, I rarely used it. But what did prove to be annoying was the constant need to open and short the test leads several

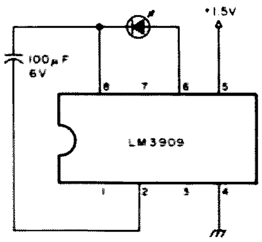

Fig. 1. An LED flasher guards against leaving the battery circuit turned on in a multimeter. The flashing rate is about 1 Hz.

times when making Ohms measurements, so that the ZERO and OHMS controls could be used to set the meter deflection. The polarity reversal switch was simply rewired to short the test leads, when desired, for Ohms adjustments; and it really does get some use in this application.

When testing any solid-state devices using resistances measurements, it is important to know the polarity of the voltage that appears at the test leads. Many VOMs have circuitry such that the red lead is really negative for Ohms measurements. Most solid-state multimeters, such as the IM-17, are wired so that the red lead is always positive. There are exceptions, however, and one should check a given instrument.

A disadvantage of most multimeters for solid-state

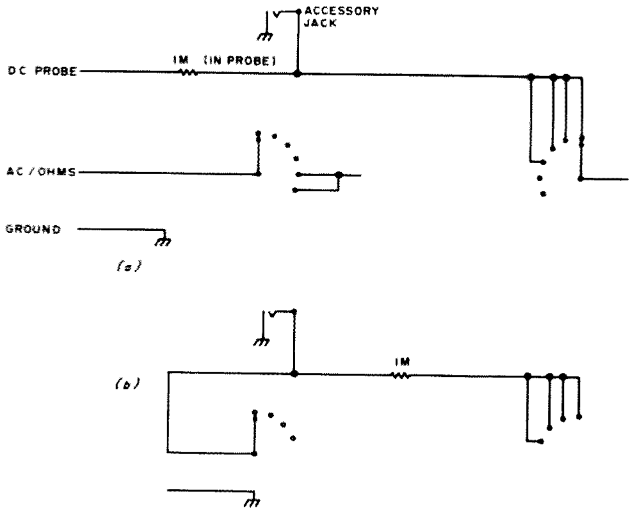

Fig. 2. Moving the 1M resistor inside the IM-17 allows two test leads (plugged into the accessory jack) to be used for all functions.

work is that they place too much voltage across the test leads. For instance, when in-circuit measuring the 10k resistor shown in Fig. 3 using a meter which has 1.5-volt Ohms batteries, the Low-Ohms range produces enough voltage across the test leads to cause the transistor base-to-emitter junction to conduct. The 10k resistor would be shunted and a false resistance reading obtained.

Most digital multimeters, on the other hand, have low-power Ohms ranges where only 0.1 volt appears across the test leads, so that transistor junctions can't conduct. There is no sense in rebuilding an existing multimeter to obtain low-power-Ohms operation, since we can obtain some of the advantages of this feature in other ways. The first thing to do is to study the resistance measurement circuit used in a given instrument. It will normally consist of the usual 1.5-volt battery with series resistances for different resistance ranges and the meter circuitry placed across the series circuit. The series range resistors determine the current that flows and, therefore, the voltage that

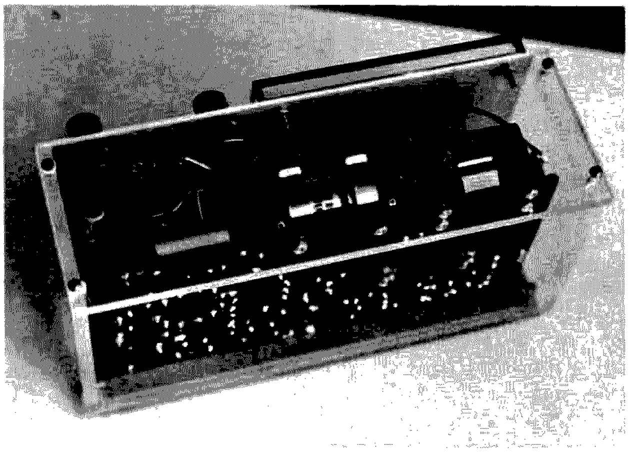

Photo B. The IM-17 mounted in a home-built Plexiglas housing.

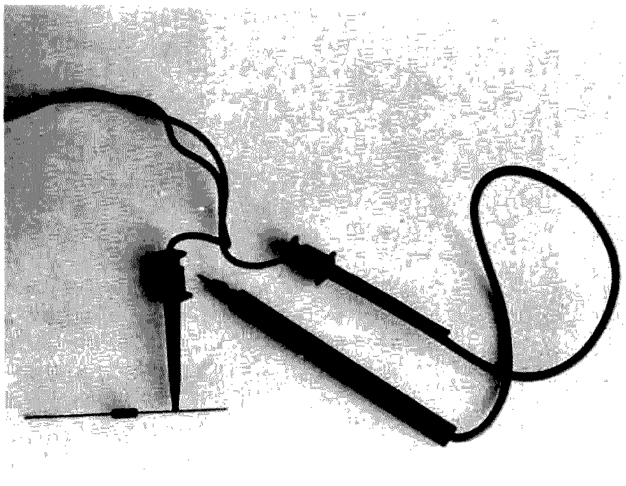

Photo C. New test leads as discussed in the text.

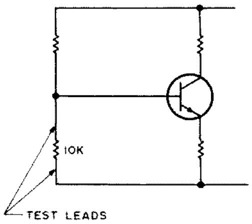

Fig. 3. If the voltage across the test leads causes the transistor base-to-emitter junction to conduct, the 10k resistor cannot be measured in-circuit.

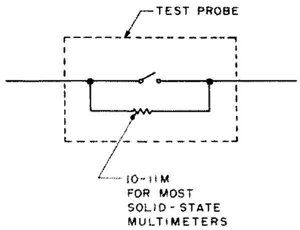

Fig. 4. A simple switchable resistor can add a 2 × range extension feature to a multimeter for dc voltage measurements.

appears across an external resistance being measured.

By exercising Ohm's law a bit, one can readily determine the maximum resistance that can be measured before the voltage across the external resistor exceeds 0.1-0.2 volts. In the case of the IM-17 on the 10 × R range, it is about 75 kilohms. So, if one has a general idea of the value of in-circuit resistors one is trying to measure, a suitable resistance range can be chosen to prevent too much voltage from appearing across the test leads. Another approach is to place a resistor across the test leads which is dimensioned to keep the voltage across it to about 0.1-0.2 volts. Then external resistors are measured as paralleled resistors. Admittedly, this is an awkward procedure but it does work where great accuracy is not needed.

A nice feature of many digital multimeters is an overrange capability when making voltage measurements. So, if one is measuring a voltage just slightly greater than that for which the range switch is set, a reading will still be obtained. Usually one doesn't err that much when setting a range switch. For instance, one might think that a voltage is 9 volts and have it turn out to be 12 volts. So, a range switch might be set to 10 volts, and not to the next step of 100 volts.

A simple way to add an overrange feature to an analog instrument is by means of a series resistor in a test lead as shown in Fig. 4. The value of the resistor has to be found by experiment to suit the input impedance of a given instrument. For the IM-17 on the dc voltage ranges, it is about 11 megohms. When the resistor is in the circuit, the voltage ranges are doubled. The 0-1-volt range becomes a 0-2-volt range, etc. Having the resistor and switch mounted in a test prod housing makes operation very convenient and fast.

Finally, it is often useful to display a brief summary of an instrument's specifications on its front panel. Often when confusing test readings are obtained, the cause is that the loading characteristics of the instrument are affecting the measurement. Note on the front panel of the IM-17 (Photo A) that the ac/dc loading characteristics are shown using a small taped label below the meter. If a given instrument has ac/dc current ranges, don't neglect to note the voltage drop across the various current ranges. Some meters have significant voltage drops on their current ranges which can lead to false readings when measuring currents in low voltage circuits. ■

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Chris Brown KA1D
73 Magazine Staff

Amateur Radio, Super Hobby!

—a breezy new intro to the world of hamming

Amateur Radio, Super Hobby! *by Vince Luciani K2VJ. Cologne Press (PO Box 682, Cologne NJ 08213), 139 pages, $8.95 softcover, $14.95 hardcover.*

You're trying to interest a friend at work in ham radio. You cast about for an adequate definition of what the hobby is like and what it means to you. More often than not, you can't put the right words together. You find it hard to express exactly what it is you get out of hamming. So, you do the next best thing and try to recommend some reading material. Nothing stuffy or technical and certainly none of those frightening license manuals. What you need is a breezy introduction to the world of recreational radio. Unfortunately, breezy introductions to ham radio are hard to find. Most introductory texts get mired in details, hung up on technology, and in a rut over regulations.

Your friend, her interest waning, is beginning to question the appeal of a leisure-time activity that requires tough licensing exams, a fortune spent on equipment, and an affinity for self-abuse. Eventually, she buys a membership in a racquetball club, plays once a month, and avoids the weird electronics freak she works with. You blew it.

What you should have done is given her a copy of *Amateur Radio, Super Hobby!* by Vince Luciani K2VJ. This new book is the easy reading overview all Elmers have been waiting for. Within its 144 pages, most of the aspects and appeal of hamming are isolated, identified, and examined. More importantly, the book keeps its focus on the most intriguing element of our hobby, the people. Almost 1/3 of the book is devoted to interviews with and stories about people who also happen to be hams.

The book contains 42 short chapters. The chapters present the detailed vignettes that make up the larger canvas of ham radio. Chapters cover a broad range of topics, and titles include: What Is It?, Who Can Join, How to Join, DX, Then And Now, Big People—Little People, The Benefits, Ladies in Amateur Radio, Equipment Costs, The Shack, Amateur Magazines, The Novice Exam, FCC Gettysburg, Roll Your Own, and many more.

In a particularly poignant chapter called "The First Time Through," Luciani isolates the moment of the first successful Novice QSO, a moment most of us have experienced but many have forgotten. As I read his account, I, too, remembered.

He writes, "You have stumbled your way through your first CQ call... When you finish, you stand by with fingers gripped unfeeling around a pencil you intend to write with... You almost hope no one will respond so that you might put this off for another, more relaxed, time... and then you find out. 'That's my callsign! Someone heard! Someone is answering!' May I suggest that you savor the moment? It will never come again."

In an equally vivid passage in the same chapter, Luciani captures another moment familiar to most hams but totally alien to the non-ham, the late-night QSO.

"The hour is well past midnight. The house is perfectly quiet... Lights are out, even in your ham shack, except for the soft, reassuring glow of dial lights. This is the supreme moment in which to seek the companionship of another hobby member—one who also is awaiting the predestined crossing of your lives. This, you will find, is a moment in time when the distant world seems entirely at peace. When life itself seems to hang loose and when all seems right within the security of your den. This is the moment in which to make a new friend... This, to me, is truly what amateur radio is about."

Amateur Radio, Super Hobby! is full of such moments. It is one of the few books I've read that successfully telegraphs the enjoyment and excitement of our usually misrepresented hobby in a way the non-ham can understand. As an added plus, the book provides the neophyte with sound advice on the easiest and least expensive ways to get involved with ham radio.

It is written with feeling, adequately illustrated with cartoons, carefully laid out, and produced with attention to quality and detail. It is unique in its people-oriented approach to the subject and, at present, has no equal in the area of introductory amateur literature.

If you have a potential convert to the cause of ham radio within your grasp, this book might just bring them over. At the reasonable price of $8.95, it's certainly worth the investment. And, as you yourself read it, you may find that it evokes some fond and long forgotten memories of your own ham career. It is thoroughly enjoyable and I highly recommend it.■

Alyson Grupp N1BEJ
73 Magazine Staff

A Guide to Amateur Radio

—book review of an English import

A Guide to Amateur Radio by Pat Hawker G3VA. 18th edition, 144 pages, paperback, £2.99 (including postage and handling) from RSGB (35 Doughty Street, London WC1N 2AE, Great Britain) worldwide, published July 25, 1980.

After a steady diet of American radio books, it can be quite illuminating to read a book written from an English amateur's point of view. *A Guide to Amateur Radio* (published by the Radio Society of Great Britain) offers insights into hamming in another country and is an excellent all-around book on ham radio, no matter which side of the pond you stand on. While many American books immediately overwhelm the reader with facts and formulas, this book gives information in a conversational style. The author assumes that your goal is to own and operate your own radio station, not just pass an exam. Theory is described in different terms than American books use, and the fresh approach can lead to a new understanding of technical matters.

The first chapter answers many questions asked by newcomers to ham radio. Subjects covered include cost, callsigns, and how to become an amateur. The second chapter is called "Getting Started," and it prepares the reader to do just that. Propagation and the construction of listening antennas are subjects of special interest to someone who is just beginning to listen to both amateur and shortwave transmissions. Also discussed are station layout, test equipment, and different modes of transmission. Theory is consistently worked into the text at places where questions naturally arise.

A well-illustrated section on the history and development of radio gear is included, and there are short notes on about 250 pieces of radio gear in current use. A chapter entitled "Workshop Practice" covers all aspects of construction. The author describes in detail everything from materials and tools to the aesthetics of a finished product. With this background, the home-brewer can construct a project that is attractive as well as functional.

At the end of the book are tables and charts of, among other things, Q signals, callsign assignments, band allotment, and common abbreviations. There is also a sample of questions from the British license exam, which is not all that different from the US tests.

Rather than a list of abstract theories you must memorize in order to pass an exam, this book offers enticement and encouragement. It concentrates on the practical things you'll want to know as you assemble and operate your own station. After you read this book, you will be prepared to get your license, but more importantly, you'll be ready to actually use it! ■

Reader Service—see page 114

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Get Your Shack Together

There are few occasions when a certain accessory or item comes along which I personally find overwhelmingly exciting; however, the S-F radio desk is something worthy of considerable excitement! Advertisement photos don't do justice to this item; it's a beautiful and sturdy desk which could set you thinking about remodeling the complete ham shack to match this enclosure.

My first exposure to the S-F desk was at the Atlanta Convention. Its warm pecan finish attracted me like a magnet from several booths' distance. I tried everything short of taking an ax to the desk, and it maintained its sturdiness. Armspan to desk width and height was perfect, and the cutaway sides allowed me to sit sideways and stretch out at an angle I personally enjoy. Here, finally, was a desk I could live with regardless of future equipment changes, operating style changes, physical positions, etc.

Before the S-F desk arrived at my home, my gear had been spread on a 7-foot table (a door between sets of file drawers) and stuffed into a shelf unit behind the desk. Although two low-band kilowatt rigs, a QRP rig, an OSCAR rig, 2-meter FM, and two SSTV setups were included, I could only operate one setup without banging knees into drawers or moving gear each day.

My need for numerous drawers coupled with my desire for massive air circulation around a large rf amplifier ruled out the larger S-F desk (48 inches wide, rather than the standard 36-inch version; other dimensions identical). Finally the solution evolved: Install the S-F desk against a wall adjacent to the other desk, shorten the 7-foot desk to 3 feet, and use the area between desks for rf amplifier power supplies and incoming antenna leads. The station's SSTV camera also was placed in this area, permitting it to view either operating position. Then a Yucca tree was added purely for decor. The final result is two complete setups which can be operated independently or simultaneously as desired—without moving gear or banging knees.

The S-F desk is shipped in two approximately 3-foot by 1-foot packages for ease of handling. It goes together in around an hour's time, with S-F furnishing everything but the furniture polish. The desk's bottom struts and braces affix to rear sections, and are thus out of the way regardless of leg position. A small strip also is included for providing "stops" for gear in the angled rear area. Incidentally, I found the simple assembly instructions easy to follow (I'm not mechanically inclined), and all sections were a perfect fit.

Like many amateurs, I do not like to enclose radio gear or obstruct air circulation. Open areas on the S-F desk (particularly around the sides) ensure equipment cooling while also providing room for installing and removing the plastic covers I keep on my gear during periods of nonuse. What else could one ask! Since adding the S-F desk to my shack, I've begun truly enjoying the pleasures of comfortable operating and the benefits of a second desk for working on projects or articles while also tuning the bands. More than once I've fallen asleep at the S-F desk merely because of the new comfortable position never obtainable with other desks. In fact, I've even been thinking of using another S-F desk for the upcoming home office. They're great!

If you're looking for a way to package that prized equipment while also providing an extra measure of in-shack comfort, check out the S-F radio desk.

For further information, contact *S-F Amateur Radio Services, 4384 Keystone Avenue, Culver City CA 90230.* Reader Service number 477.■

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 8

Several of the new modes of communication which I have written about recently have the possibilities for getting amateur radio growing again, the way FM did. I'm most anxious to have ham experimenters get going on these and keep us up to date via *73* on progress. The recent FCC announcement that they would at long last encourage experimentation was a fantastic boost for us. Can someone at the FCC actually be listening? And reading?

MAKING MONEY

Every now and then I hear from a reader who is not making a lot of money. This is a pity when you consider the opportunities out there for making money these days. We are getting into the age of electronics, and certainly radio amateurs have a golden opportunity to take advantage of this change in the world.

A few years back, I wrote in my editorials about the possibilities for getting into the security business. A few readers paid attention to this and went for it, starting, as I suggested, on a part-time basis. Many of them have built large security businesses as a result, some going into millions of dollars.

This is still a very good business for hams to get into. It does not take an electronics genius, and some of our ham equipment is immediately applicable. For instance, while you can buy most of the accessories you need from a few major suppliers, you should know how to tackle any radio links you might want to use for a silent and very secure alarm. This is particularly good for merchants wanting to know when someone has broken into their store.

An understanding of slow scan will enable you to set up systems which will let store owners see what is going on in their place of business over the telephone. This is also invaluable for small businessmen who want to see their offices, warehouses, etc., from afar.

An understanding of microcomputers will enable you to take the next step and have the slow-scan signals processed for change to provide an alarm. The microwave and ultrasonic systems are fine for this, too. With crime increasing, there is an ever-growing need for security for businesses and homes. This is still an infant industry.

The microcomputer business is another natural for hams. The same perversity of human nature which gets people interested in hamming seems to attract people to computers. Our polls show that over 20% of the hams have microcomputers already!

In this new field there are plenty of opportunities... to open and run computer stores, to service computers, to write programs, to get into repping, distribution, designing new circuits, manufacturing, writing books and articles, advertising... it's endless. I know that I am in serious need of a wide variety of skills and interests... needing people for documentation, program evaluation, editing, proofreading, typesetting, drafting, advertising, ad sales, repping, data processing, financial management, legal organization, marketing, packaging, distribution... and so on.

The micro field, which has been growing at a rate of over 300% per year for over five years, shows no sign of slowing down. Micros are now getting into businesses and schools as well as to hobbyists and homes. The big firms are starting to wake up, which will mean all the more sales as IBM, DEC, and others plunge in. There are still abundant opportunities to make a lot of money in this field.

Another field which shows signs of unlimited growth is the satellite communications industry. Like the micro field, it started out with hobbyists, growing initially on their interest. But the *big use for* satellites will very soon be for data communication, and this means more opportunities for entrepreneurs. Hams, who have plenty of opportunity to experiment with microwaves, are in a beautiful position to take advantage of this growth.

My own recent experiments with 10-GHz communications gave me a lot of insight into the use of these microwave frequencies. If you remember, I spent a few months working with Chuck Martin WA1KPS, and we established the still-firm record of communications between New Hampshire and six other states ... seven in all. All contacts were made on paths of over 50 miles and our New Hampshire contact was over 100 miles! Most were made with simple antennas, though climbing to the top of my local mountain was the most grueling part. That was not easy!

The reception of satellite TV for homes is an exciting and fast-growing business. Prices are tumbling as mass production techniques and large-scale integration are applied to this new service. A couple years ago you had to figure perhaps $15,000 or so for a workable installation. Now they have that down to around $5,000. Our own KLM, maker of ham antennas, is one of the pioneers in this field. Many of the pioneers are hams!

As microcomputers proliferate, it will not be long before they are being used for electronic mail. Now, while a one-page message can be encoded so it can be sent over the phone wires in about one second, this still will not speed up the slowness of the phone dialing system. As more and more messages are routed over phone lines, the delays in using the dialing system are going to bog down Ma Bell.

Cool heads tried many years ago to get Bell to use separate signaling systems for dialing up numbers. This would have been much more efficient than using the communications lines. It also would have avoided all of this nonsense Bell is having with customers getting into their switching circuits with blue boxes and such. Well, the Bell folks ignored the wiser heads and now they are in trouble.

The most obvious answer to the coming congestion of the Bell lines will be to go to satellites. First we will be using radio techniques, but I think that it won't be long before the volume of traffic will dictate the use of laser links, since each of them can carry incredible bandwidths of information.

With satellite-system inventing, manufacturing, selling, servicing, installing, and so on becoming one of the biggest industries in the world, and with the ground floor wide open for you, what better business to get into right away? Much of the needed inventing can be done on the ham bands, so this is a particularly valuable opportunity for us. We can invent and pioneer the equipment they are going to be using in ten and twenty years.

Yes, Bell may be able to expand their service by using glass lines instead of wires, but I think the need for communications is going to grow much faster than Bell will be able to cope with. So much of their equipment is hopelessly obsolete... and with a need for a complete redesigning and rebuilding of their switching system, we are looking at 20 years ... and satellites are there right now, ready to handle the needed capacity.

THOSE UGLY AMERICANS

A few years ago, shortly before my first visit to Jordan, I was called on 20m by an American visiting in Israel. I mentioned that I expected to be in Jordan in a few days. He said that he and his wife were touring in Israel and would like to go to Jordan. I suggested that this was not exactly a bright idea, Jordan at that time being almost an occupied country by the PLO. He brushed that aside.

A few days later, after I'd arrived in Amman, I found a note in my hotel mailbox to the effect that this chap had arrived and would like to get together with me. I called his hotel and found that he had come by way of Cyprus. I was scheduled to have dinner with His Majesty that evening and to present my plan for the setting up of amateur radio in Jordan to the government the next day, so I suggested we get together the next evening.

It didn't take long for trouble to erupt. The next day I got word that he had been downtown and

gotten into a fight with the PLO. I'd suggested that he *not* go downtown, as I had been advised. The PLO troops were everywhere and spoiling for trouble, driving around by the truckload. The American library had just been burned out and the American Embassy compound stormed (unsuccessfully, except for a lot of broken windows and a fire-gutted car), so there was a definite strain between the US and the PLO.

Later, I found that two main things had gone wrong. First, his wife had been wearing a miniskirt, despite this being a flat no-no for Arab countries. Second, he had apparently been taking pictures of the PLO and their trucks. These two circumstances led a PLO soldier to get irritated, which quickly escalated to our ham friend being hit over the head with a rifle.

Cooler heads prevailed and the PLO later offered to take our ham and his wife on a tour of the country at their expense, but he was so upset that he told them where they could go and boarded the next plane out of the country.

It took a lot of chutzpah for a Jewish chap to come to Jordan at that particular time...just days before the civil war between the PLO and King Hussein's government. It took more to flaunt the miniskirt in an Arab country...and more, yet, to walk around downtown during the tense time between the PLO and the government...and particularly the PLO vs. the US. Openly taking pictures kind of capped it.

The next thing I heard about this charmer was a rash of complaints from India, where he had gone from Jordan. The Indian amateurs were absolutely furious because he had managed to screw up their long-planned DXpedition to the Laccadive Islands. Apparently he had bragged over the air that he had permission to go to the Laccadives, while the Indian amateurs had been unable to get such permission. The government officials were not amused and canceled the Indian trip, which had been years in the arranging.

As this chap went on around the world, I got similar reports from other countries. He was a moving ham disaster area.

Many of the transgressions of Americans came to roost when the ITU meeting was held in Geneva in 1971 to discuss the amateur use of satellites. Our group (the ARRL) found, much to its surprise, that a situation had built up in the Third World where radio amateurs had a very bad name. The confrontation could have been avoided if representatives of amateur radio had bothered to find out where we stood before the meeting. Much of the built-up frustration could have been vented and ironed out by such preliminary meetings. But, as the president of the League said, "We didn't do our homework."

The fact is that American amateurs have a long history of being arrogant, lying, devious, and ignoring the interests of other countries. One of the reasons that amateur radio is still not legal in Turkey stems from the Americans who operated there after WWII. The Turkish government allowed them to operate, but stipulated that they were *not* to indulge in message handling. So what did they do? Phone patches by the gross. They were repeatedly warned and went right on with phone patches...and amateur radio was lost for over 30 years in Turkey. Yes, those were *American* hams.

In other African countries, we have had DXpeditions come in and ask for special permission to operate, promising propagation studies in return for the permission. These were never delivered...nor were they ever intended for delivery.

Other US amateurs abused countries all over the world by operating without licenses, by signing calls of other countries, by running more power than permitted, and so on. One American ham sat in Casablanca and signed the calls of at least four other countries...contacts that are still honored by the ARRL for their awards. No one knows how many of Don Miller's contacts were invalid—for another example—but they are still accepted by the League.

Another well-known DXpeditioner signed the calls of many African countries he never visited...and even some islands. These cards are all just fine for DXCC.

Well, these transgressions get around and undermine the honor of amateur radio. They came to roost at Geneva when we lost over 99% of our satellite frequencies. They will continue to come to roost if we don't get on the stick and see that they stop. DXers, frantic for a contact with a DXpedition at any cost, do not help. DXpeditions soon discover that they can charge $50 to $100 or more for a "new" country and that everyone on the Honor Roll *has* to go along with the payment. If they don't, they lose their place on the list and the chances are good that they will never again get back where they were.

In case you want to find some uglies closer to home, just tune our DX band any evening or weekend and hear the jamming of rare DX stations by US amateurs. Every DXpedition or operator in a rare country will tell you all about it.

I operated recently from Provo Island in the Turks and Caicos Islands. That's only fairly rare, not real rare. Still, a dozen or so amateurs took the time to try to jam signals...US amateurs. I don't think there is any way to shame the people who are so unfeeling of the fun of others, so perhaps we need a different approach to this. I'm thinking in terms of a jamming certificate for the most enthusiastic jammers. In this way they will get recognition for their skills and nastiness. Also, we'll know just who they are in case we ever come up with vigilante committees, complete with tar and feathers.

I have an advantage when I go on a short DXpedition in that there are many other things which I can do if the jamming gets to be a problem. There are scuba diving trips to the coral reefs, snorkling, going around the islands taking pictures, visiting with local hams, talking with the governments about amateur activity, and eating...ever popular with me. I enjoy hamming, but I also enjoy all the other things there are to do. Chaps who go on a DXpedition and nothing else can only try to jump from one band to another to get away from the harassment.

If anyone has any good ideas on ways for amateurs to clean up our act on a worldwide basis, this forum is open.

DX

Yuri Blanarovich VE3BMV
Box 292
Don Mills
Ontario M3C 2S2
Canada

73 has selected as its new DX Editor Yuri Blanarovich VE3BMV. First licensed in 1958, Yuri has held the callsigns OK3-5292, OK3BU, OK5BU, FØSY, and VE3BMV/VP9, and has operated OK3KGH, OK3KAG, 4U1ITU, CJ3DCB, and XJ3ZZ/1. He is a four-time world champion and the all-time world record holder in the *CQ* WW and WPX Contests, and also holds a number of Canadian and North American records. As a result of his 300,000-plus contacts, Yuri has worked all DXCC countries, holds 5BDXCC, and has collected more than 200 awards.

Yuri is the founder of the Canadian Contest Championship, CAN-AM contest, and CANADX Net. He also has been president of CANADX, the IBM Radio Club, and the Ontario Contest Club, and chairman of the CANADX and CAN-AM contests, as well as a member of the *CQ* contest committee.

We welcome Yuri on board and ask our readers to furnish him directly with as much and as varied DX information as possible.

FUN!

John Edwards KI2U
78-56 86th Street
Glendale NY 11385

THE POSTMAN ALWAYS RINGS 612 TIMES

From every state you answered—612 responses in all—and told us what you think about amateur radio. Now the forms have been tabulated and the results are printed below.

Were there any surprises? Well, the number of you responding was a shock—about twice as many as we projected. We were also pleasantly surprised at the time and care most of you devoted to answering the survey. If letter writing is a dying art, we have tons of evidence to the contrary.

In all, the poll seemed to touch a very responsive chord. A number of letters expressed thanks at being included in a poll for the first time (How come Mr. Gallup never comes to my door?) and urged us to run regular surveys in the future. All of your comments are being given due consideration, but our mailman won't put up with another poll for some time. Come to think of it, with an office full of completed response forms, it'll be some time before we're ready again, too.

ELEMENT 1—BACKGROUND

1) Sex:
A) Male—94% B) Female—6%

No surprises here; ham radio continues to remain a predominantly male hobby. One interesting footnote: Most YL response forms were included in the same envelope with their OMs. Very few were independently mailed.

2) Age:
A) 15 or below—0% B) 16-21—4% C) 22-39—52%
D) 40-59—25% E) 60 and above—19%

What happened to the kids? Are postage rates too high or maybe they just don't know how to write? I hope this particular question doesn't reflect amateur radio in general, or we're doomed.

3) License class:
A) Novice—8% B) Technician—10% C) General—35%
D) Advanced—31% E) Extra—16%

About par for the course.

4) Number of years licensed:
A) 1 year or less—6% B) 1-5 years—38% C) 6-10 years—6%
D) 11-20 years—23% E) 21 years and up—27%

Seems about right.

5) Do you have a new (post-March '78) call?
A) Yes—37% B) No—63%

With more than a third of all responses indicating "new" calls, they shouldn't seem strange anymore. Okay, so tell me why a huge number of replies were directed to "K-twelve-U?" That's not a "one," guys, it's an "eye."

6) How many hours a week do you devote to amateur radio?
A) 0-1 hour—6% B) 2-5 hours—27% C) 6-10 hours—42%
D) 11-20 hours—19% E) 21 or more hours—6%

On the whole, a pretty active bunch.

7) Which HF bands do you use most?
A) 80-75 meters—14% B) 40 meters—18% C) 20 meters—12%
D) 15 and/or 10 meters—44% E) Don't operate HF—12%

Only 12% on 20 meters? Sure doesn't sound that way. Eighty meters seems a bit on the low side, too. But those sunspots really seem to be helping 15 and 10.

8) Which VHF/UHF band do you use most?
A) 6 meters—6% B) 2 meters—68% C) 220 MHz—4%
D) 420 MHz and/or up—0% E) Don't operate VHF/UHF—22%

This question asked which VHF/UHF band you used most, not which band you're on. That might explain why hardly anyone picked D, since most UHF ops are probably also on 2. Nevertheless, the apparent lack of UHF activity is disturbing.

9) Which mode do you use most?
A) SSB—44% B) CW—24% C) FM—26%
D) AM—2% E) Other—4%

SSB is still tops, with FM narrowly squeezing ahead of CW for second place.

10) How much money have you spent on amateur radio within the past year? (Include QSL expenses, magazine subscriptions, club dues, and other incidental expenditures.)
A) 0-$250—32% B) $251-$500—27% C) $501-$1,000—25%
D) $1,001-$2,500—8% E) $2,501 and up—8%

Soft market.

ELEMENT 2—SOCIAL CHARACTERISTICS

11) Has amateur radio influenced your career choice?
A) Greatly—23% B) Somewhat—25% C) Not at all—52%

Even though 52% chose C, try to think of another hobby with as great an influence on its users.

12) If a Novice sent you a QSL after a QSO with no return package (sic), would you answer it?
A) Yes—96% B) No—4%

Return package? Sorry about the typo; we meant, of course, postage. In any event, the old ham spirit still lives.

13) Do you routinely look up the license class of the person you're talking to in the *Callbook*?
A) Yes—21% B) No—79%

A longtime practice, still apparently used, to self-police our bands. Unfortunately, out-of-date Callbooks *can sometimes lead to embarrassing situations.*

14) Do you think amateur radio was better 10 years ago?
A) Much better—19% B) Somewhat better—32%
C) The same—32% D) Somewhat worse—17%
E) Much worse—0%

A question of perception, since many respondents weren't active 10 years ago.

15) Do you think amateur radio was better 20 years ago?
A) Much better—27% B) Somewhat better—23%
C) The same—27% D) Somewhat worse—14%
E) Much worse—9%

Oh, for the good old days!

16) Did you ever use a "cheat book" to upgrade your license?
A) Yes—12% B) No—88%

A slightly misleading result, since many cited the old ARRL License Manual *as a "cheat book." Your FUN! columnist takes no stand on this issue.*

17) If someone offered you a million dollars, tax free, on the condition that you give up amateur radio forever, would you?
A) Yes—61% B) No—39%

Thirty-nine percent say no. Either they're already rich, have a very deep love for amateur radio, or a million bucks doesn't mean much these days. Probably the latter.

18) Has ham radio ever interfered in your personal relationships (i.e., time with your wife, husband, children, lover, etc.)?
A? Yes—54% B) No—46%

Confirming what was widely suspected.

19) Have you ever tried to interest a family member in amateur radio?
A) Yes—88% B) No—12%

An amateur's evangelical urges know no bounds.

20) Do you think most hams have a sense of humor?
A) Yes—90% B) No—10%

Then why are so many QSOs as sharp as a sledgehammer?

21) Do you get upset when you hear hams "kidding around" on the air?
A) Yes—8% B) No—92%

Save the bicarb!

22) Have you ever intentionally jammed a repeater or otherwise purposely interfered with a QSO?
A) Yes—14% B) No—86%

My goodness! Fourteen percent admit it! Heaven save us!

23) Do you think amateur radio lowers your neighbor's opinion of you?
A) Yes—6% B) No—94%

Sure, neighbors just love antenna towers and TVI. That's why they're always trying to pass laws down at Town Hall to limit our hobby. Guess they're just trying to get us to spend more time with them.

24) If your closest ham friend beat you in a major contest, how would you feel?
A) He must be a better operator than me—76%
B) Contesting is just luck—6%
C) The contest was set up unfairly—0%
D) It was easy for him to win; he has better equipment—14%
E) He must have cheated—4%

A response that would have made Jack Armstrong proud.

25) Do you make most of your friends through amateur radio?
A) Yes—25% B) No—75%

See, we do talk to other people besides hams.

26) When attending a ham club meeting, flea market, or convention, do you wear a callsign badge?
A) Yes—76% B) No—24%

Hi! My Name is John, KI2U!

27) If you answered yes to the above question, what size is your badge?
A) 1 line—10% B) 2 lines—72% C) 3 lines—15%
D) 4 lines—0% E) Larger—3%

Wonder what the 3% who indicated E wear? Billboards? Must keep an eye out for them.

28) If your closest friend won a Collins KWM-380 in a contest, would you feel jealous?
A) Yes—37% B) No—63%

What a bunch of liars.

ELEMENT 3—OPERATING HABITS

29) Do you depend on a Morse code reader or microcomputer code display for most of your CW QSOs?
A) Yes—6% B) No—94%

The ear wins!

30) What sort of CW sending device do you use most?
A) Straight key—51% B) Regular keyer—29%
C) Memory keyer—4% D) Keyboard—8%
E) Never send CW—8%

I'm sorry; I'm sorry; I'm sorry. Yes, a thousand apologies for leaving out everybody's favorite CW sending device—the semi-automatic keyer (commonly known as "The Bug"). Please don't pin my coax or set fire to my house. I confess my sin and promise to genuflect daily in front of an ad from the Vibroplex Company.

31) If required, could you solidly copy CW at the speed at which you were licensed?
A) Yes—79% B) No—21%

Hah! I'll bet that all you people who circled B used to dishonestly sign your renewal 610 back when the FCC made you attest to your code speed.

32) Have you ever purposely operated in an amateur subband you weren't licensed to use?
A) Yes—10% B) No—90%

On the whole, fairly respectable.

33) Do you think the FCC affects amateur radio in a positive manner?
A) Yes—44% B) No—55%

Washington, are you listening?

34) What do you think of the new ham exams? (Answer this even if you have never personally taken one of these new tests.)
A) Excellent—6% B) Good—30% C) Fair—38%
D) Poor—18% E) Terrible—8%

So-so marks.

35) Just for the heck of it, have you ever talked to a friend on the wrong sideband (e.g., LSB on 20 meters)?
A) Yes—33% B) No—67%

Give it a try sometime; it's fun.

36) Do you ever speak to foreign, non-English-speaking hams, in their own language?
A) Always—2% B) Sometimes—14%
C) I attempt it—20% D) Rarely—10% E) Never—54%

¿Que? Imagine if those foreign hams had the same attitude.

37) Do you think "gentlemen's agreements" have any value?
A) Always—35% B) Sometimes—63% C) Never—2%

No wonder our bands are in the shape they're in.

38) Do you feel you are competent to replace the finals in a tube-type rig?
A) Yes—88% B) No—12%

And 10% probably can't change a light bulb.

39) Do you feel you are competent to replace the finals in a transistor-type rig?
A) Yes—79% B) No—21%

This 21% probably doesn't own a soldering iron.

40) Have you ever built an electronic project from a kit?
A) Yes—96% B) No—4%

No, wait; most hams do own a soldering iron, but obviously need instructions on how to use it.

41) Have you ever home-brewed an electronic project from a book or magazine?
A) Yes—77% B) No—23%

There's hope yet.

42) Have you ever designed your own electronic project?
A) Yes—62% B) No—38%

Pretty good.

43) After meeting a ham radio acquaintance in person for the first time, do you usually think:
A) He is better looking than you thought—6%
B) He is worse looking than you thought—27%
C) He is about what you expected—67%

To me, it's always a shock: "You don't look like a 'BQV!' "

44) On the whole, compared to the general public, do you think:
A) Hams are much better looking—4%
B) Hams are somewhat better looking—8%
C) Hams are average looking—62%
D) Hams are somewhat worse looking—20%
E) Hams are much worse looking—6%

No matter what the survey shows, hams are ugly. Why do you think most aren't interested in ATV?

45) Have you ever operated a specialized mode (i.e., RTTY, slow scan, etc.)?
A) Yes—40% B) No—60%

Too bad.

46) What do you think of contesting?
A) Great—12% B) Good—17% C) Okay—38%
D) Don't like it—27% E) Despise it—6%

A split decision.

47) What do you think of DXing?
A) Great—27% B) Good—36% C) Okay—25%
D) Don't like it—8% E) Despise it—4%

Seems popular.

48) What do you think of repeaters?
A) Great—38% B) Good—38% C) Okay—20%
D) Don't like them—4% E) Despise them—0%

Best thing since sliced bread.

49) What do you think of traffic handling?
A) Great—15% B) Good—35% C) Okay—35%
D) Don't like it—11% E) Despise it—4%

What's to hate?

50) Do you ever secretly hope that a mild disaster will strike your community just so you could display your amateur radio skills?
A) Yes—25% B) No—75%

Let's move this 25% to low ground.

ELEMENT 4—A CLOSER LOOK

To conclude our poll, we've taken a closer look at these three questions:

12) If a Novice sent you a QSL after a QSO with no return postage, would you answer it? (Poll respondents who spent over $1,001 on amateur radio in the past year, only.)
A) Yes—87% B) No—13%

On the whole, worse than the average respondent. Maybe that's how many get their money—saving on QSL expenses.

19) Have you ever tried to interest a family member in amateur radio (YLs)?
A) Yes—67% B) No—33%

Not as evangelical as OMs.

42) Have you ever designed your own electronic project (Extra-class licensees)?
A) Yes—63% B) No—37%

Virtually the same result as given by hams in general. Are Extras really that much smarter?

Many and deep thanks to everyone who participated. Special thanks to AF2M and WB2LWJ for suggesting questions and counting the results.

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

VK/ZL/OCEANIA RTTY DX CONTEST

Contest periods:
0000 to 0800 GMT Saturday, June 6
1600 to 2400 GMT Saturday, June 6
0800 to 1600 GMT Sunday, June 7

This contest is now being organized and conducted by the Australian National Amateur Radio Teleprinter Society. Entry classes include: single-operator, multi-operator, and SWL. Each station may be worked only once per band, but may be worked on another band for further multipliers.

EXCHANGE:

Serial number consisting of RST, zone number, and time in GMT.

SCORING:

As per CARTG Zone Chart, multiplied by the number of countries worked, multiplied by the number of continents worked (6 max.). After the above calculations, world stations add 100 points for each VK/ZL station worked on 20 meters, 200 points for each on 15 meters, and 300 points for each on 10 meters. Countries count as per the ARRL list of countries, except that each VK, ZL, JA, VE, VO, and W/K district counts as a separate country. Contacts with one's own country count as zero points for multipliers.

AWARDS:

Awards will be issued for 1st, 2nd, and 3rd on a world basis and also on a country basis.

ENTRIES:

Logs must show in this order: date and time (GMT), callsign of station worked, serial number sent and received, points claimed. Logs of multi-operator stations must be signed by all operators, together with a list of their callsigns. Logs of SWL listeners must contain both numbers sent and received by the station logged. Incomplete loggings are not eligible for scoring. Logs must be received by the Contest Committee by October 1st. Address all logs to: W. J. Storer VK2EG, 55 Prince Charles Road, French's Forest, 2086, N.S.W., Australia.

Summary sheet must show callsign of station, name of operator(s), and address of same, bands used (a separate log is required for each band), the points claimed for each band, number of VK/ZL stations worked, total points claimed, and signature(s).

The judges' decision regarding the placings in the contest will be final and no correspondence will be entered into regarding the same. The logs become the property of the Contest Committee on completion of checking.

NEW YORK STATE QSO PARTY

Contest Periods:
1700 GMT June 6 to 0500 GMT June 7
1200 to 2359 GMT June 7

The contest is sponsored by the University of Buffalo Amateur Radio Society. Mobiles and portables changing counties may be worked again. NY stations may work each other.

EXCHANGE:

RS(T), serial number, and QTH consisting of state, province, country, or NY county.

FREQUENCIES:

Phone—3900, 7275, 14285, 21375, 28550.

CALENDAR

Jun 6-7	VK/ZL/Oceania RTTY DX Contest
Jun 6-7	New York State QSO Party
Jun 14-15	ARRL VHF Contest
Jun 19-20	Summer SMIRK Party Contest
Jun 24	The Wednesday Night Contest
Jun 28-29	ARRL Field Day
Jul 1	CARF Canada Contest
Jul 17-23	SWOT QSO Party
Aug 8-9	European DX Contest—CW
Aug 15-16	SARTG Worldwide RTTY Contest
Aug 15-17	Rhode Island QSO Party
Aug 22-23	Ohio QSO Party
Sep 12-13	European DX Contest—Phone
Sep 12-13	G-QRP Club CW Activity Weekend
Sep 12-14	Washington State QSO Party
Sep 26	DARC Corona—10-Meter RTTY
Nov 8	DARC Corona—10-Meter RTTY
Nov 8	OK DX Contest
Nov 14-15	European DX Contest—RTTY
Dec 26-31	G-QRP Club Winter Sports

CW—1810, 3560, 7060, 14060, 21060, 28060.

Novice—3725, 7125, 21125, 28125.

SCORING:

Score 5 points per QSO. NY stations multiply by the number of states, provinces, and countries worked. Others multiply by number of NY counties worked, 62 maximum.

ENTRIES:

Mail logs by July 10th to: Scott J. Bauer WA2LCC, 816 East Fillmore Ave., East Aurora NY 14052. Include an SASE for results and any possible awards.

SUMMER SMIRK PARTY CONTEST
Starts: 0000 GMT June 20
Ends: 2400 GMT June 21

Sponsored by the Six-Meter International Radio Klub (SMIRK). No crossband contacts, multi-operators, or partial contacts. Check logs or dupe sheets are not needed.

EXCHANGE:

SMIRK number and state, province, or country.

SCORING:

Count 2 points for each SMIRK contact, 1 point for non-SMIRK QSOs. Add QSO points and multiply by number of states, provinces, and countries worked for final score.

AWARDS:

Trophy for overall high score. Certificates for high score in each state, province, or country. Note: Unless there are fewer than 3 active 6-meter operators in a state or country, a minimum of 3 valid entries must be received from that state/country or none will qualify for an award.

ENTRIES:

Entries must be submitted on the Fall, 1980, edition of the official SMIRK log. Single copies are available for an SASE and photocopies may be used. Entries received without all requested information, legibly written, will be disqualified. A return address is also requested. Send log requests and entries postmarked by August 1st to: Don Abell WB5SND, 6821 West Avenue, San Antonio TX 78213.

WEDNESDAY NIGHT CONTEST
Starts: 2100 local time, June 24
Ends: 0200 local time, June 25

Submit your best single hour of operation! This contest is sponsored by the Bluegrass Amateur Radio Federation. Any station may contact any other station on any band below 30 MHz. Crossmode contacts are OK.

EXCHANGE:

Signal report and color of your eyes.

SCORING:

W/VE stations count 1 point each; DX stations count 2 points each. Add bonus points of 25 for WAC, 1000 for WAS, and 10,000 for DXCC and WAZ.

FREQUENCIES:

Phone—3890, 7225, 14275, 21350, 28600.

CW—3705, 7105, 14060, 21105, 27105.

All ± 10 kHz.

ENTRIES AND AWARDS:

Any log form may be used as long as the QSO time (GMT), exchange, callsign of station worked, and point value is given. Dupe sheet is not required. A certificate will be awarded to the top 3 entries. Disqualifications for claiming a duplicate contact or (and I quote the contest sponsor!) "logging on toilet paper." Logs must be postmarked within 10 days of the contest and sent to: Scott Wills WA4YOF, 340 Eagle Creek Drive, Lexington KY 40502.

CANADA CONTEST
Starts: 0001 GMT July 1
Ends: 2359 GMT July 1

Sponsored by the Canadian Amateur Radio Federation (CARF), the contest is open to all and everybody works everybody. Use all bands from 160 to 2 meters on CW and phone combined. Entry classes include single-operator, all band; single-operator, single-band; and multi-operator, single-transmitter, all band. All contacts with amateur stations are valid. Stations may be worked twice on each band, once on CW and once on phone. No crossmode contacts, and no CW contacts in the phone bands are allowed.

EXCHANGE:

Signal report and consecutive serial number starting with 001. VE1 stations should also send their province (NS, NB, PEI).

SCORING:

Score 10 points for each contact with Canada, 1 point for contacts with others. Score 10 points for each contact with any CARF official news station using the suffix TCA or VCA. Multipliers are the number of Canadian provinces/territories worked on each band and mode (12 provinces/territories × 8 bands × 2 modes for a maximum of 192 possible multipliers). Contacts with stations outside Canada count for points but not multipliers.

FREQUENCIES:

Phone—1810, 3770, 3900, 7070, 7230, 14150, 14300, 21200, 21400, 28500, 50.1, 146.52.

CW—1810, 3525, 7025, 14025, 21025, 28025, 50.1, 144.1.

Suggest phone on the even hours (GMT), CW on the odd hours (GMT). Since this is a Canadian-sponsored contest, remember to stay within the legal frequencies for your country!

AWARDS:

The CARF Canada Contest Trophy will be awarded to the highest score single-operator entry. Certificates will be awarded to the highest score in each category in each province/territory, US call area, DX country, and to the highest score from a Canadian non-Advanced amateur.

ENTRIES:

A valid entry must contain log sheets, dupe sheets, and a summary sheet showing a chart of multipliers per band/mode and score calculations. Send entry with comments to: Canadian Amateur Radio Federation, 203-1946 York Avenue, Vancouver, B.C. V6J 1E3, Canada.

Results will be published in *TCA*, the Canadian amateur magazine. Non-subscribers may include an SASE for a copy of the results.

RESULTS

RESULTS OF THE 3RD VK/ZL/OCEANIA RTTY DX CONTEST 1980

Single-Operator

1.	DJ6JC	793,282
2.	VK5RY	774,996
3.	JA6GIJ	611,038
4.	VK3KF	539,435
5.	VK8HA	481,184
6.	VK4AHD	388,080
7.	F8XT	352,432
8.	I1TXD	320,082
9.	W5HEZ	266,900
10.	DF2OK	253,680
11.	VK1GM	228,756
12.	G3HJC	227,028
13.	ZL2BR	204,536
14.	JA8ADQ	179,800
15.	VK2AHB	137,984
16.	KØPJ/6	113,164
17.	VK2AJT	122,720
18.	Y43ZK	102,436
19.	JR2TZL	91,484
20.	ZL2ALW	83,424

Multi-Operator Stations

1.	VK2TTY	1,207,340
2.	VK2DGA	520,352
3.	HB9Z	422,900
4.	DKØMM	180,420
5.	OZ8JYL	99,200
6.	LZ1KDP	95,300
7.	OK3VSZ	79,308
8.	DF5LK	37,555

SWL Stations

1. Horst Ballenberger DL SWL 64,472
2. Jaroslav Dedic 62,864

HAM HELP

I want to talk with someone who has successfully solved ignition noise problems in a 1977 Honda Accord which interfere with 2-meter operation.

Jim Weitzman K3JW
11417 Hounds Way
Rockville MD 20852

I have a power inverter/charger, model # KG-666 by Knight Kit, and need a schematic or owner's manual. I will pay any reasonable fee for a copy. Thank you.

Lowell G. Wilson
1104 Wentland Drive
Mason MI 48854

I have a model 210 Bearcat scanner and it doesn't go lower than 146 MHz. My need is from 142 MHz up. If anyone has made a modification of this kind, I would appreciate the help. Thanks.

Wm. Green WØGVT
22055 Cook Lane
Morrison CO 80465

I am interested in finding other hams with a passion for the Middle Ages/Society for Creative Anachronism.

Charles E. Martin AB4Y
PO Box 3370
Bowling Green KY 42101

NEW PRODUCTS

AEA'S PFDF RADIO DIRECTION-FINDER

AEA has announced the first product in a new line of radio direction-finders. The AEA Model PFDF is a highly accurate rf direction-finder using the Doppler spun array technique and featuring a self-contained and preprogrammed computer.

The PFDF offers 1° resolution with a 3-digit LED display. A ring of discrete LED indicators surrounding the 3-digit display gives the operator instant course bearing information.

The PFDF will work with virtually any FM receiver (including the popular scanners) by simply plugging into the receiver external speaker jack. The receiver audio gain control is set for proper level as indicated by the PFDF front-panel level indicators. A built-in audio amplifier and speaker in the PFDF allow the operator to independently adjust the monitor level. The Doppler sample tone gives the experienced operator a good indication of when multipath signals are being received. An audio filter is provided to reduce the amplitude of the tone for more pleasant monitoring.

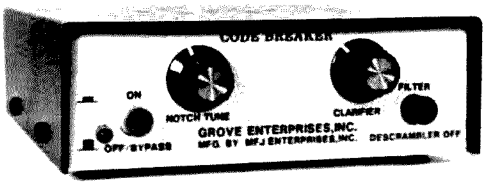
Antenna positioning is not an arduous mechanical task with the PFDF. A calibration offset bearing may be programmed into the PFDF to calibrate the antenna on a known transmitting source. This feature is especially effective in extending the frequency range of a single antenna system. It also allows calibration when the PFDF is used with more than one receiver, each having different phase delays. The offset information is stored with a separate battery keep-alive circuit when the main power switch is turned off.

Three sample modes are offered by the PFDF. A slow sample mode gives an updated bearing once per second. The fast sample mode updates the bearing three times per second on a continuous basis. The sample and hold mode is activated after pressing the function button so that the next time a signal is present (even for a fraction of a second), the PFDF will determine the bearing and display it until reset.

The PFDF is supplied with a VHF high-band antenna that will operate over a frequency range of 130 to 175 MHz. The antenna consists of four dipoles that are switched with PIN diodes driven by the PFDF computer. Other mating antennas will be made available in the future for other frequency bands.

Power for the PFDF can be derived from any 12 V dc source or from an optional internal rechargeable sealed Gel Cell battery pack. BCD output of the three-digit bearing information is available for such things as feeding another computer from more than one source for triangulation purposes.

For further information, contact *Advanced Electronic Applications, Inc., PO Box 2160, Lynnwood WA 98036; (206)-775-7373.*



Grove Enterprises' Code Breaker descrambler.

CODE BREAKER DESCRAMBLER

A product claimed to be the most advanced consumer voice descrambler ever made available to the public has been announced by Grove Enterprises.

The Code Breaker contains an internal speaker and a tunable notch filter. Simply by plugging the Code Breaker into the external speaker jack of a scanner, the listener can restore normal speech to the vast majority of scrambled speech encountered by scanner listeners. Tone masking, frequently used to thwart reception by conventional competitive descramblers, is easily eliminated by the tunable notch filter.

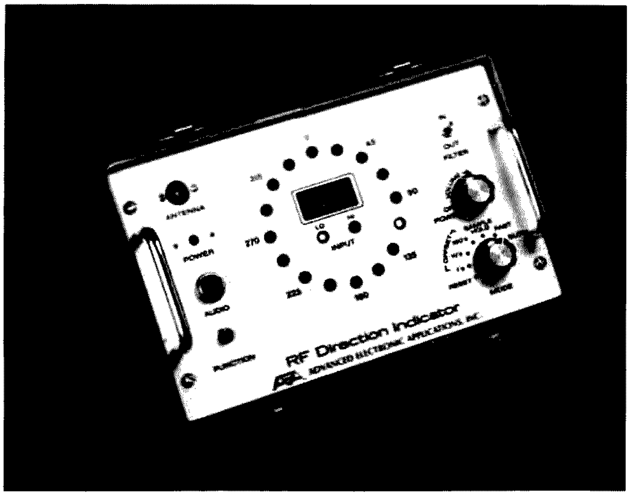
When conventional communications are being monitored, the Code Breaker filter circuit may be used to reject interference from the squeals, whines, and irritating sounds which commonly plague the busy communications spectrum. The Code Breaker is optimized for voice frequencies, improving intelligibility when used with existing receivers.

For further information, contact *Grove Enterprises, Dept. K, Brasstown NC 28902; (800)-438-8155.*

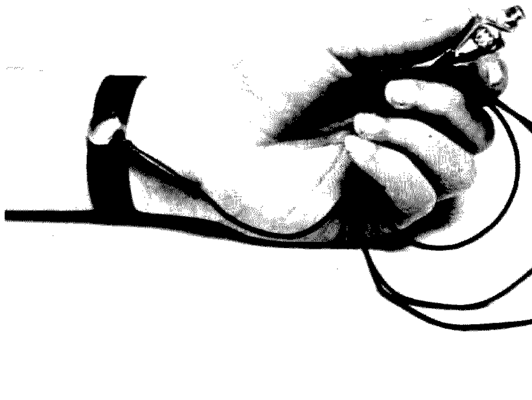
CONDUCTIVE WRIST STRAP PROTECTS DEVICES AND USERS

A new, conductive wrist strap that features an integral resistor to safely ensure constant grounding in static sensitive areas has been introduced by Charleswater Products, Inc. The CP401R conductive wrist strap features a 1-megohm fixed resistor for optimum static dissipation and user safety. Comfortable and lightweight, it attaches with a Velcro® fastener and uses a swivel snap to conveniently disconnect from the ground cord.

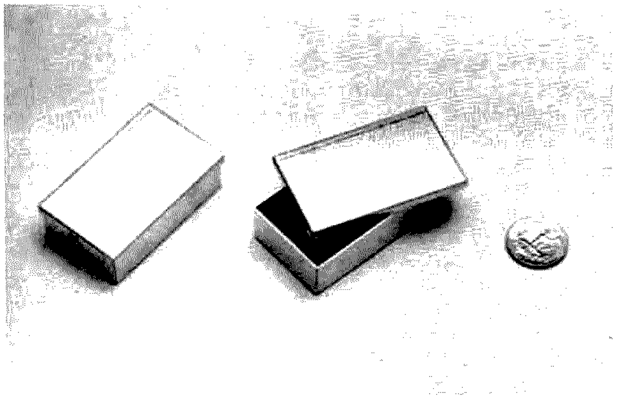
Provided with a battery clip



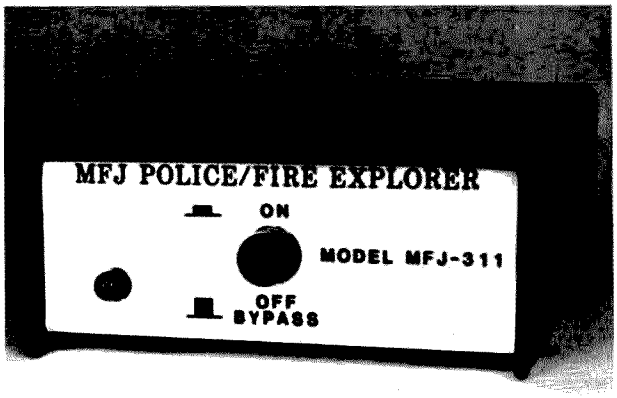
AEA's PFDF radio direction-finder.



Charleswater Products' CP401R conductive wrist strap.



Nordal Electronics' precision packages.



MFJ's Police/Fire Explorer.

for easy grounding. The CP401R has a polyester band and an insulated copper wire cord. The resistor is located close to the band for safety and the strap comes in 4' and 6' lengths.

For further information, contact *Charleswater Products, Inc., 87 Cresent Road, Needham MA 02194; (617)-449-1811.* Reader Service number 482.

PRECISION ALUMINUM ELECTRONIC PACKAGES

Nordal Electronics has introduced a new line of precision aluminum boxes for electronic packaging which can be made in any size with no tooling or setup charges. The boxes and removable covers are made of .032 aluminum and can be used to package rf circuits, amplifiers, filters, oscillators, magnetics, and other electronic circuits. They can be used alone or mounted on a PC board to provide a shielded package with a removable cover. Special packages can be made with holes for connectors, feedthroughs, standoffs, or mounting brackets.

For further information, contact *Nordal Electronics Company, 9995 Monroe Dr. #205, PO Box 20175, Dallas TX 75220; (214)-350-9515.* Reader Service number 487.

MFJ'S NEW POLICE/FIRE EXPLORER

The MFJ Police/Fire Explorer, Model MFJ-311, will convert any two-meter synthesized or vfo rig to cover the VHF high-band police and fire frequencies. If your rig covers 144-148 MHz, just insert the MFJ-311 in line with the antenna, connect power, turn on the converter, and you are ready to receive 154-158 MHz. If your rig covers a larger or smaller section of the band, then with the MFJ-311 you can receive a correspondingly larger or smaller section of the VHF police and fire band. The frequencies between 154 and 158 MHz contain nearly all FCC-allocated VHF high-band police and fire activity.

You have direct frequency readout from your rig. If your rig indicates that you are receiving 145.55 MHz, just turn the converter on and you are receiving 155.55 MHz.

A push-button switch turns the MFJ-311 on and off. In the off position, the converter is bypassed and you are ready to transmit (very low insertion swr). If you forget and transmit with the converter on, it won't burn out (up to 25 Watts).

The new Police/Fire Explorer is small (only 3" × 4" × 1") and has a mobile mounting bracket for installation in your car. It is black and eggshell white and operates on 9-18 V dc.

For further information, contact *MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762; (800)-647-1800.* Reader Service number 483.

CURTIS 8044M ADDS SPEEDMETER OUTPUT

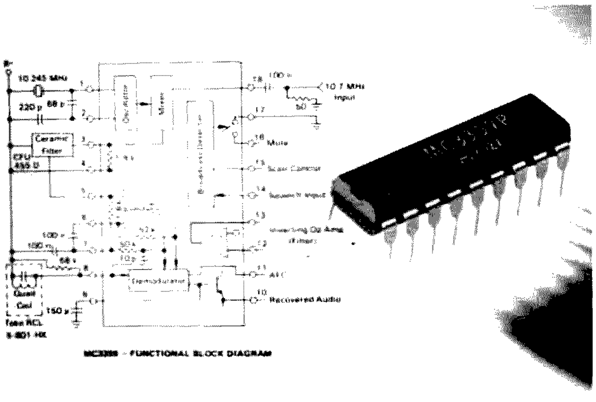
An interesting enhancement of the popular 8044 CMOS keyer has been introduced by Curtis Electro Devices. Called the 8044M, this new integrated circuit adds an output designed to drive an analog meter for speed indication. Speed indication from 6 wpm to as high as 100 wpm can be accomplished by simply adding two capacitors, a resistor, and a 100-uA meter. The meter indication can be calibrated to be well within a 5% tolerance. The reading is stable, even at the lowest speeds.

The addition of two extra pins at the end of the package allows a pin-for-pin fit with the standard 8044. One of the pins is used for a timing capacitor and the other drives the meter directly. This allows retrofitting in many existing keyers with relative ease.

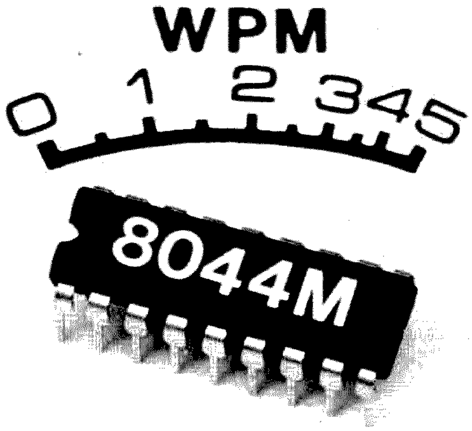
For further information, contact *Curtis Electro Devices, Inc., Box 4090, Mountain View CA 94040; (415)-494-7223.* Reader Service number 481.

IC FOR VOICE COMMUNICATIONS INTRODUCED BY MOTOROLA

Motorola now offers an FM i-f circuit with exceptionally high



Motorola's MC3359 voice communications IC.



Curtis Electro Devices' 8044M speedmeter chip.

gain and low power consumption for narrowband FM receivers and transceivers found in voice-communications and energy-management systems. It is designated the MC3359, and includes oscillator, mixer, limiting amplifier, afc, quadrature detector, squelch scan control, and op-amp (active filter) circuits.

The MC3359 provides a recovered audio output voltage (typical) of 700 mV. Current drain remains low—at 3.0 mA (typical) from a 6.0-V power supply—and the sensitivity is 2.0 uV (typically) for −3.0-dB input limiting.

In actual operation, the mixer-oscillator combination converts the input frequency down to 455 kHz, where, after external bandpass ceramic filtering, most of the amplification is done. The audio is recovered using a conventional quadrature FM detector. The absence of an input signal is indicated by the presence of noise above the desired audio frequencies. This "noise band" is monitored by an active filter and a detector. A squelch-trigger circuit indicates the presence of noise (or a tone) by an output which can be used to control scanning. At the same time, an internal switch is operated, which can be used to mute the audio.

Use of the MC3359 allows the elimination of many discrete components which would normally be employed in a similar voice communications or energy-management system and results in a considerable cost savings.

For further information, contact *Motorola Semiconductor Products, Inc., PO Box 20912, Phoenix AZ 85036.* Reader Service number 488.

SWITCHCRAFT PUBLISHES NEW CONNECTOR CATALOG

Switchcraft, Inc., has published a new 36-page catalog on audio and general-purpose connectors and ac receptacles. The catalog (No. C502f) includes product descriptions, full engineering specifications, detailed drawings, and mating charts showing connecting compatibility with similar products.

The catalog includes such Switchcraft products as Tini "Q-G" miniature connectors and accessories; "Q-G" audio connectors (including a variety of panel and wall-plate receptacles, adapters, inserts and accessories); "Slim-Line" audio connectors and accessories; various other microphone connectors, CB connectors, and phone plugs and jacks; and ac receptacles for electrical/electronic applications.

For further information, contact *Switchcraft, Inc., 5555 N. Elston Ave., Chicago IL 60630.* Reader Service number 486.

FOUR-CHANNEL REMOTE CONTROL SYSTEM

Advanced Analog Systems, Inc., has announced a four-channel remote control system kit with radio frequency carrier. It is capable of two channels of analog and two channels of digital control through the use of a pulse code modulation technique. The transmitter modulates the rf carrier with a unique series of pulses and the receiver decodes the pulses and generates appropriate analog and digital signals for the devices being controlled.

The analog information is represented by pulses of varying duration, while digital information is encoded and decoded by means of a pulse-counting technique. The pulse-counting technique was chosen to avoid the costly timing circuitry required at both the transmitter and receiver with other digital encoding schemes. The digital commands are implemented via open/short connections (SPST switches, relays, etc.). The analog information is encoded by varying a control potentiometer.

The rf carrier is modulated to produce a pulse train which consists of one long pulse (for synchronization) followed by several shorter pulses. The first two shorter pulses are pulsewidth modulated and contain the analog information for channels 1 and 2. Following the two analog-encoded (PWM) pulses, there will be either 1, 2, 3, or 4 short pulses representing the 4 possible combinations of the two digital inputs (2 SPST switches, open or closed).

A unique feature of the transmitter is a regulator which keeps the radiated output power constant even under varying supply voltages. This is very desirable in battery-powered remote control applications. Maximum output power is achieved when the transmitter is operated from a 9-V battery. The rf output is down only about 1 dB when the supply voltage drops as low as 5 V. Typical sideband amplitudes 10 kHz from the center frequency are 50 dB down, allowing close physical proximity on closely-spaced channels.

The receiver provides latched outputs for the digital information. Two bidirectional servo amplifiers with internal pulse-width detection completely decode the two analog channels. The servo amp's output is capable of bidirectional operation yet still requires only a single supply. Each servo amplifier output is capable of a 400-mA load. The dead band of each servo amp can be modified independently by changing one capacitor on the receiver card.

Amplitude modulation of the pulse-modulated waveform of up to 60% results in continued error-free transmission and decoding of the signal. The AM rejection provides a high degree of protection from interfering signal sources. This feature is extremely important for operation in industrial environments. Typical operating "radio range" is 150 to 200 feet. The digital outputs of the receiver card are capable of sinking 100 mA—sufficient for driving small lamps, buzzers, relays, etc.

Typical applications include remote switching, data recovery systems, medical data monitoring, toys and games, alarm systems, remote temperature sensing, carrier current systems, remote peripheral monitoring, environmental controls, remote motor control, communications systems, etc. The kit includes a transmitter and a receiver PC board and all components necessary to develop a complete 4-channel remote control system (antenna and battery clips are not included).

For further information, contact *Advanced Analog Systems, Inc., 790 Lucerne Dr., Sunnyvale CA 94086; (408)-730-9786.* Reader Service number 484.

KAHANER REPORT

Larry Kahaner WB2NEL
PO Box 39103
Washington DC 20016

POWER PLAYS, PLOYS, AND PARLEYS

By the time you read this, the whole thing might be resolved. The FCC would have consolidated its offices and moved into new surroundings. Although they wanted to move just across the Potomac to Rosslyn VA and the idea seemed like a shoe-in, it ran into a little trouble.

You may have heard or read about the Rosslyn incident, how the FCC decided at the last minute to reconsider the move. This was all true. But here's the story your newspaper didn't tell you.

It all started last year when the FCC decided it needed more office space. Believe me—it does. Not only that, but it's scattered over five buildings in downtown Washington DC, making communications between some bureaus difficult.

So the Commission did what it's supposed to do. It asked the General Services Administration for help in finding new digs. That's the GSA's job, procuring everything from paper clips to real estate.

But the GSA, according to FCC officials, wasn't responsive. It dragged its red-taped feet and kept the situation in abeyance. Why? Who knows. Maybe just bureaucracy. In any event, the FCC got angry, enlisted some friends in high places, and got a rider attached to an 11th-hour Congressional appropriation bill that gave the FCC special dispensation to find its own property within two miles of the District, sign the lease, and move in.

Now the FCC doesn't know much about finding property, so they did what they thought was right. They used contacts, friends of contacts, uncles of friends of contacts. They used consultants, $680-a-day consultants, and they used newspaper ads. They received about ten offers, narrowed it down to two

choices, and finally decided upon a beautiful piece of land known as Rosslyn Towers. It's a beautiful place, great view of the District, and besides, most of the commissioners live in Virginia.

So, when it came time to sign the lease, they were ready. However, a new administration took control and some congressmen took a dim view of the way the FCC cut the deal.

For one thing, they believed the FCC's actions might set a bad precedent. After all, you can't have an agency getting things done quickly and efficiently—albeit a little unorthodox and perhaps straddling the ethical fence just a tad. Also, the new representatives didn't get a piece of the action and neither did their friends.

The Subcommittee on Buildings and Grounds held a hearing on the move to Rosslyn. Representing the FCC were Acting Chairman Lee, Commissioners Jones and Washburn, staff, and their lawyer.

Lee did most of the talking, related his tale of woe, and told subcommittee members that the FCC planned to vote on the move the next day and he would recommend to his fellow commissioners that they OK the lease. Subcommittee members didn't like that at all and asked Lee to hold off for a while until further studies could be undertaken.

Lee said the Commission was tired of waiting and would go ahead with the move. Subcommittee members didn't take to that either, and Representative Solomon (R-NY) asked, "Even if we brought legal actions to stop the move?"

Lee said he would stick to his guns.

Solomon didn't like that even more and said: "If you meet tomorrow and sign that lease a few days later, I guarantee that legal actions will be taken."

Lee said he would still do it.

Then Solomon, his face a little red, said: "This *is* a threatened injunction!"

And Lee, swallowing just a bit harder, said he would still recommend to his colleagues that they sign the lease and move in.

You can't just say that to a congressman and get away with it. These guys have egos, you know.

So, the subcommittee chairman, Representative Fary (D-IL), listening coolly, put on his best tough high-school principal face and said he wanted to see *all* the commissioners at a special meeting of the subcommittee tomorrow at 9:30 sharp. But Lee said that the FCC's meeting was at that time, and Fary said: "OK, after the meeting; 2:30."

And the gavel hit the wood. Hard.

Never before has a congressional subcommittee threatened a governmental agency with an injunction. Nobody even knows if they can. But it really didn't matter because the next day the FCC, in closed session, voted 3-2 not to sign any leases until the new chairman, Mark Fowler, takes office. Incidentally, Commissioners Lee and Jones voted against the measure. And the special subcommittee meeting in which the other commissioners were supposed to attend was canceled.

And that, ladies and gentlemen, is how things are done at the Center of the Empire.

SOME MORE FRIENDS IN HIGH PLACES

The Capitol Hill Amateur Radio Society, which not only has friends in high places but has members in high places, petitioned the FCC to repeal recent rules that disallow new club licenses.

Sitting at the March 19 Commission meeting, you hardly noticed the commissioners say "dismissed." They said it so fast you barely heard it. You could, however, hear them say: "Next on the agenda."

BILLS, BILLS, MORE BILLS

Every year, hundreds of bills are introduced in Congress and most of them never make it out of committee. You usually get a newsletter from your representative saying that he submitted this bill and that, and "Hey, it's not my fault if they didn't go along with my proposal to cut taxes 50%."

Such might be the case with H.R. 2203. It's not a new idea. It was submitted last session as H.R. 8445.

The new bill amends the Communications Act of 1934, permitting the FCC to use volunteers—hams and CBers—for purposes of monitoring violations of the Act by hams and CBers. It also would permit hams to administer license tests to the "least privileged class of amateur stations operator license." If I'm not mistaken, don't we already do the testing portion?

The bill got a positive response from Gerald Reese, executive director of REACT, whose letter of praise for the bill was written into the *Federal Register* but not orated on the House floor.

The ARRL also had its response to H.R. 2203 read into the *Federal Register*. The group supports the bill.

GOOD NEWS FOR BAD GUYS

HFers take note: At last word, the FCC was running fast, trying to escape Reagan's budget ax. The dust hasn't cleared, but Acting Chairman Lee said that the FY '81 budget included a program to phase out five special enforcement teams and reallocate their resources to establish ten smaller offices. Two were just opened—Little Rock and St. Louis—and they must be closed due to lack of funds. The following, that were to be opened, won't be: Phoenix, Des Moines, Salt Lake City, Tulsa, Nashville, Greensboro, Spokane, and Albuquerque.

In addition, two heavies, special enforcement teams in Detroit MI and Powder Springs GA are being closed.

Lee also said that the current program of traveling to about 77 cities on a monthly, quarterly, or annual basis to give ham and commercial license tests would be cut to an annual basis only.

How much of this will really happen is anyone's guess. All agencies plead "worst case" when their budgets are about to be reduced. However, it's fairly certain that proposed cuts will curtail FCC services, especially in Private Radio which takes a back seat to other bureaus like Broadcast or Common Carrier. If it means the FCC will leave us alone more, perhaps we should be thankful.

SOME INTERESTING THINGS

—The FCC is receiving complaints from hams that bootleggers are riding the high seas. It seems that amateur radio is sc efficient for long-haul marine traffic that some private mariners toss out the HF marine band and check into maritime mobile nets for phone patches sans ham licenses.

—A firm in Vienna VA is bouncing signals off meteor trails, using them as reflectors. Links are available 24 hours a day even though bursts are random. The key is the number of burst—billions every day! Operating under an FCC test license in the 30-50-MHz range, Telcorn, Inc. is sending data on a regular basis between its Virginia headquarters and the Watts Bar TN office, about 700 km away.

The company uses a computer-controlled uplink to automatically scan the sky for a usable meteor trail. When it's found, the company "illuminates" the trail with rf. Then data transmission begins.

Trails hover around 90 to 110 km above the Earth, each with a useful life of about 0.2 seconds. Data is sent at 4,800 bits per second. The system can't be used for voice but is full duplex.

Experiments show best results at 1 kW with a 5-element yagi. The system is cheap and easy to use, the company says. One kink is that sometimes you have to wait several minutes for a usable trail. Telcom says the system is no longer in the prototype phase and is all set for commercial application.

—In the first legal decision that long-term microwave exposure can cause death, NY State Workers' Compensation Board has awarded a $30,000 settlement to the widow of a Bell Telephone supervisor. Samuel Yannon of Staten Island died as a result of working near microwave towers atop the Empire State Building for eight years.

He left work in 1970 and filed a workers' compensation claim in 1971 saying that exposure led to his illness and inability to hold his job. He died in 1974, and his widow filed for death benefits. Bell will appeal the decision.

—In case you think teletext, the system in which words and graphics appear on your TV screen after you push the decoder box buttons, is still in the Buck Rogers mode, you're wrong. More than 25 different tests worldwide are in the works, but those tests will become part of everyday life very soon. Everyone's got a different name for it: Viewtron, Viewdata, Telidon, Antiope, Data Vision, Bildschmirtext,

Continued on page 115

KAHANER REPORT

from page 108

Electronic Information Service II, but it's all the same. Some travel over phone lines, others are broadcast by TV stations.

Right now, wars are predicted in Chicago where WGN and WFLD are in competition for their piece of the videotext pie. And in Texas, the Texas Newspaper Publishers are trying their darndest to keep Bell from testing their own information system, afraid that it will eventually cut into their classified ad revenues. (You not only can present news on videotext, but shopper's ads, movie listings, yellow pages—anything.)

Perhaps the most fascinating confrontation is between WGN in Chicago and United Video in Tulsa. UV receives WGN, one of those satellite superstations, and retransmits it to their cable customers. However, in the process they "strip" the empty, unused TV lines that WGN uses for its teletext test. Now, that doesn't bother the folks receiving the station directly, but those who pick it up on cable won't be able to receive the teletext information.

WGN is claiming copyright infringement in that the unused lines are still part of their transmission and that UV alters it without permission. UV claims that unused lines aren't part of a bona fide signal and since they have permission to retransmit the picture, they can do what they like. The courts will decide that one.

AWARDS

Bill Gosney WB7BFK
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

WORKED CYPRUS AWARD

This award is available to all licensed amateurs and requires the applicant to work 5B4 and ZC4 stations representing Cyprus. Based on the point system (see Table 1), all contacts must be made on and after July 1, 1962, to be valid.

Applicants outside Cyprus require 32 points if all contacts were on one band, 24 points if on two bands, and only 16 points if three bands were utilized. A total of 12 points must be earned for a four-band accomplishment. Stations may be worked only once per band. There are no mode endorsements.

To apply for this award, prepare your list of contacts and have it verified by at least two fellow amateurs. Forward this list and 10 IRCs to Cyprus Amateur Radio Society, Andy Panayotious 5B4BM, PO Box 1267, Limassol, Cyprus.

WORKED FAEROE ISLANDS AWARD

Known as the WAOY Award, applicants in Europe must attain a total of 35 points while all others must accumulate 20 points. To be valid, all contacts must be made on and after April 11, 1965. Mixed-mode and cross-band contacts are not allowed.

For European stations, each Faeroe Radio Association member contacted counts one point for each band, and club stations OY6FRA and OY6NRA count two points on each band. For stations outside Europe, each FRA station counts one point on 28, 21, and 14 MHz and two points each on the 7- and 3.5-MHz bands. OY6FRA and OY6NRA club stations count 4 points on each band.

Applicants are asked to have their list of contacts verified by at least two radio amateurs. Forward this list along with an award fee of 10 IRCs to FRA Awards Manager, Post Box 184, Torshavn, Faeroe Islands.

DANISH CROSS COUNTRY AWARD

Tage Eilman OZ1WL has sent us details for the Danish Cross Country Award. To be valid, all contacts must be made on or after April 1, 1970. The award is issued for either all CW or all phone. There are no band restrictions.

European stations find that the callsign is the basis for this award. Each call prefix OZ1-OZ9 and OX3 must be contacted. Two contacts with each prefix are permitted on each band with the exception of OX3 where nine contacts may be made on each band. For amateur applicants outside Europe, three contacts are permitted in each of the OZ call districts. OX3 may be worked nine times on each band. Each contact counts one point. Only OX3 stations in Greenland count for this award.

That's only the basis for the award. As for the requirements, European amateurs need to make contacts totaling 50 points while applicants outside Europe must obtain a 40-point total.

To apply, make a list of contacts and have it verified by at least two amateurs. Enclose this application and an award fee of $2.00 or five IRCs to Diploma Manager of EDR, PO Box 213, 5100 Odense, Denmark.

9G1 AWARD OF GHANA

Applicants the world over are encouraged to work toward the Ghana Award. Confirmed contacts are required with five different 9G1 prefix stations of Ghana using a minimum of two amateur bands. There are no band or mode restrictions, but this award is available for all CW, all phone, or mixed modes.

To be valid, all contacts must be made on or after January 1, 1958. The QSL cards must be submitted with your application, along with an award fee of seven IRCs. Forward your request to 9G1 Awards Manager, Postbox 3773, Accra, Ghana.

4 x 4 = 16 AWARD

Members of the Israel Amateur Radio Club are proud to announce the requirements of their four-by-four award. There are no band, mode, or time restrictions for this award, but to qualify applicants must work a minimum of 16 stations in Israel with four bands represented. Four stations on four bands each will meet the minimum requirements.

Do not send QSL cards. Prepare a list of claimed contacts and have them verified by at least two amateurs or a local radio club official. Enclose this application and an awards fee of $2.00 or 10 IRCs to the Israel Amateur Radio Club, Postbox 4099, Tel Aviv, Israel.

5N AWARD FROM NIGERIA

The Nigerian Amateur Radio Society wishes to announce its very popular 5N Award. To qualify for this award, applicants are required to work a minimum of five separate 5N stations of Nigeria. This award also is available to SWL stations on a heard basis. This award is issued for all CW, all phone, and mixed-mode contacts. There are no band or mode limitations or time restrictions.

Once you have attained the required number of contacts, have your list verified by at least two local amateurs and forward your list with an award fee of five IRCs to the Nigerian Amateur Radio Society, Oyekunie Ajayi 5N0NAS, PO Box 2873, Lagos, Nigeria.

9H1 AWARD FROM MALTA

A couple months ago, I listed awards from Malta and failed to

Zone	1.8 MHz	3.5 MHz	7 MHz	14 MHz	21 MHz	28 MHz	144 MHz	432 MHz
20	4	2	0	1	2	4	16	32
1, 2, 3, 6, 7, 10, 12, 19, 24, 25, 26, 27, 28, 29, 30, 31, 32	16	8	4	2	4	8	—	—
All other zones	8	4	2	1	2	4	16	32

Table 1. Points for Cyprus Award.

Zone	1.8 MHz	3.5 MHz	7 MHz	14 MHz	21 MHz	28 MHz	All other bands
14, 15, 16, 33, 34	5	3	2	1	3	5	25
All other areas	15	12	6	2	6	10	45

Table 2. Band points per 9H1 contact.

mention probably their most popular award program. Sponsored by the Malta Amateur Radio Society, all contacts for the 9H1 Award must be made on or after September 21, 1964 (Malta Independence Day).

The same station may be counted only once per band; only five bands may be used. Fifty points are required for one-band achievements. Forty points for two bands; 30 points for three bands; 20 points for four bands. (See Table 2.)

To apply, prepare your list of contacts and have it verified by at least two fellow amateurs. Forward this list along with your award fee of $2.00 and 10 IRCs to L. Smith 9H1BB, Malta Amateur Radio Society, Doreen House, New St. off Ganu, B'Kara, Malta.

BUDAPEST AWARD

From Hungary, we receive word about the Budapest Award being offered by BRAL (Budapest Radio Amateur League). Only contacts made after January 1, 1976, will be valid. European stations must work a total of 75 different HA5 or HG5 stations to qualify for this award. Duplicate QSOs do not count. There are no band, mode, or time limitations. Endorsements will be made if requested at the time application is made.

Have your confirmed contacts verified by at least two amateurs or a local radio club official. Send your list and award fee of 10 IRCs to BRAL Award Manager, Dezso Tarcsay HA5HA, PO Box 2, H-1553 Budapest, Hungary.

WORKED RAAG MEMBERS OF GREECE

Sponsored by the Radio Amateur Association of Greece, this award is made available to amateurs in three categories. Class 1—European stations must work 100 RAAG members, DX stations need to work 50 stations; Class 2—Europeans must work 75 SV RAAG members, DX stations require 30 member stations; Class 3—Europeans must work 50 SV RAAG members, DX stations must work 15 SV RAAG members. There are no band or mode restrictions. The club station SV1SV counts three award points and five contacts for European stations in all three classes.

Do not send QSL cards. Prepare a list of contacts and have it verified by two radio amateurs or a local club secretary. Enclose this list with an award fee of $2.00 or 12 IRCs to RAAG Awards Manager, Anastasios Panos SV1IG, PO Box 564, Athens, Greece.

PAAC AWARD

From The Netherlands, we learn of an awards program being made available by the very popular organization known as VERNON.

Sponsored by VERNON, this award requires all contacts to be made on or after June 1, 1945, to be valid. The basic PACC Award requires that the applicant establish contact with at least 100 separate PA/PI stations from The Netherlands. Endorsements also are made available for each increment of 100 stations worked.

Do not send QSL cards! VERNON asks applicants to prepare a list of qualifying contacts and have it verified by two amateurs or a local radio organization. Forward your application and the award fee of seven IRCs to Traffic Manager, VERNON, A. Sanderse PA0MOD, Obdammerdijk 2, 1713 RA Obdam, The Netherlands.

4-2-70 SQUARES AWARD

In the stack of mail received last week, I found a very interesting letter explaining a unique award being offered by our friends in England.

While this award may be impossible to achieve for the majority of western stations, operators throughout Europe who read this column might find the rules extremely challenging and within reach.

To qualify for the award, all contacts must be made after December 31, 1978, to be valid. QSL cards must be submitted at the time of application and be arranged in alphabetical order along with a checklist of the QTH squares claimed. There is no award fee, but adequate postage is required for the safe return of your QSL cards. All applicants must be RSGB members.

Awards are issued in four categories: fixed stations, alternative stations, portable stations, and mobile stations. These categories cannot be mixed. Award requirements are:

70 MHz—20 squares, 4 countries
25 squares, 6 countries
30 squares, 8 countries
35 squares, 10 countries

144 MHz—40 squares, 10 countries
60 squares, 10 countries
80 squares, 18 countries
100 squares, 20 countries

432 MHz—30 squares, 6 countries
40 squares, 10 countries
50 squares, 13 countries
60 squares, 15 countries

Forward your award claim to Award Manager J. Hum G5UM, 27 Ingarsby Lane, Houghton-on-the-Hill, Leicester LE7 9JJ, England.

MAN ON MOON

We will once again be operating from the Neil Armstrong Air and Space Museum in Wapakoneta OH, the home town of Neil Armstrong, first man to set foot on the moon.

This is the 12th anniversary operation in commemoration of Neil Armstrong's historic feat [feet, too—yuk, yuk—Ed.]. The dates and times of operation are as follows: July 18-19, from 9:00 am July 18 to 8:00 pm July 19.

We will be operating two stations on the following frequencies depending on propagation conditions.

CW—7.075 to 7.125
phone—7.250 to 7.300
phone—3.950 to 4.000
CW—14.1 ± 10 kHz.
phone—14.300 to 14.350
phone—21.400 to 21.450

All frequencies may not be used, but we will operate on as many as possible. We will use the callsign WD8RVZ. A commemorative QSL will be available, SASE required.

US and Canadian amateurs QSL direct to WD8RVZ, all others please use the bureau. Visiting amateurs may check in on 147.93/.33. "The World of Amateur Radio" will be shown. For further information, contact Gary W. Stolzenburg WD8RVZ, 717 W. Benton Street, Wapakoneta OH 45895.

HIGHLAND GAMES AWARD

Local amateurs in Midlothian IL will be operating a Special Event Station during the Scottish Highland Games in that community.

A commemorative certificate suitable for framing will be issued for any contact made with a Midlothian station during the Games. Look for them on 10 through 80 meters Novice and phone, 0000 GMT June 13 until 2400 GMT June 14, 1981.

To receive this certificate, send QSL and postage—no envelope—to the amateur contacted. For further information, contact Bill McGreevy KA9DES, 14820 Trumbull, Midlothian IL 60445.

FIELD DAY AWARD

The Puget Sound Council of Amateur Radio Clubs will issue a handsome certificate for contacting any three of the six participating council clubs in the 1981 Field Day. Those clubs and their calls are: Boeing Employees Amateur Radio Society (K7NWS); Hams Amateur Mobile Service Club (WA7LAW); Mike & Key Amateur Radio Club (K7LED); Mt. Baker Amateur Radio Club (K7SKW); N. Seattle Amateur Radio Club (W7DA); Radio Club of Tacoma (W7DK).

To qualify for the certificate, you must exchange QSL cards with those three Field Day stations you have contacted. Send those QSLs and one dollar to Scotty Huntley K7CYZ, 802 S. Lawrence St., Tacoma WA 98405. Your QSLs will be returned with the certificate.

TOM SAWYER DAYS

The Hannibal Amateur Radio Club, Inc., will issue a special events certificate from the National Tom Sawyer Days celebration operating from Mark Twain's boyhood home town, Hannibal MO, on July 4-5, 1981. Hours: 1500-2100 UTC on Satur-

day, July 4, and 1700-2100 UTC on Sunday, July 5. Frequencies: 7.245, 14.290, 21.390 MHz, and Novice CW on 7.125 and 21.125 MHz. To receive the certificate, send a large 9" x 12" SASE and your personal QSL card confirming the contact to Hannibal Amateur Radio Club, Inc., WØKEM, 2108 Orchard Avenue, Hannibal MO 63401. For information, contact Clifford H. Ahrens NØBQN, President, Hannibal Amateur Radio Club, Inc., (314)-221-4060 or (314)-221-8618.

FORT NECESSITY

The Uniontown Amateur Radio Club (W3PIE) will be sponsoring a special event on July 4, 1981, starting at 1201 GMT through 2100 GMT to commemorate the historic Fort Necessity American Revolutionary War battlefield. A commemorative certificate will be available to amateurs sending an SASE (4" x 9" or larger) and postmarked not later than July 31, 1981. The operating frequencies (±QRM) will be: CW—21,145 MHz; phone—14,345 and 28,545. Please send correspondence to Uniontown Amateur Radio Club, PO Box 433, Republic PA 15475; Attention: John Cermak WB3DOD.

GLENDIVE MT CENTENNIAL

In observance of the Glendive MT centennial, the Lower Yellowstone ARC will be operating a special event station on July 4, 1981, amidst the festivities in the downtown area. Operating period will be from 1600Z to 2300Z on 7240 and 14280-290, and exchange will be name and signal report. Send a 4" x 9½" SASE to Larry Melton KB7BO, 711 Snyder Ave., Glendive MT 59330, for commemorative QSL.

THREE RIVERS FESTIVAL

The Fort Wayne Radio Club of Fort Wayne IN will have on the air special event stations to celebrate the annual Three Rivers Festival. There will be two operating stations on the air simultaneously, using the calls W9TE and W9IWX. At the time of this writing, 10, 15, and 20 will be used.

A special certificate will be offered to all amateurs contacting these stations during the special event. All amateurs wishing a certificate should send QSLs and a self-addressed, stamped business-size envelope to Fort Wayne Radio Club, PO Box 15127, Fort Wayne IN 46885.

The dates of the special event stations' operation will be July 18-19, 1981. Transmission times are constant during the two days, including the nighttime hours on the 18th.

FRIENDSHIP DAY

Friendship Day 1981 is being celebrated this year by the Allegany Highlands Amateur Radio Club by setting up a commemorative station (KA2CGV) in Friendship NY. This station will be on the air to make as many QSOs as possible on August 2 from 1700 UTC to 2400 UTC. KA2CGV will operate on the following frequencies: phone—7.280, 21.380, and 28.680; CW—7.060, 21.060, and 28.060. To get your special commemorative certificate, send a QSL card and an SASE to Allegany Highlands Amateur Radio Club, PO Box 373, Friendship NY 14739.

Allow me to remind readers of this column that the *73 Magazine* Awards Portfolio is in full swing. If you are interested in learning about one of the most comprehensive programs available, experience the challenge offered by more than twenty individual award incentives, then turn to the September and October, 1980, editions of *73 Magazine*. There's something in it for everyone!

LOOKING WEST

Bill Pasternak WA6ITF
c/o The Westlink Radio Network
Suite 718
7046 Hollywood Blvd.
Hollywood CA 90028

There is a rather important piece of legislation before the US Congress right now. It's titled H.R. 2203, and it has a direct bearing on the future of the US Amateur Service. Its purpose is actually twofold: First, it permits the FCC to legally utilize the talents of volunteer amateur radio operators as "auxiliary ears for the FCC" in monitoring both the Amateur and Citizens Radio Service for those who violate the rules of either.

The bill also addresses another important problem, that of legally continuing the Novice Licensing Program using volunteer examiners. You might remember that an FCC lawyer found the latter to be an illegal program since the current law strictly forbids the use of non-FCC personnel to perform FCC duties. While the Commission has continued to issue Novice class licenses using volunteer examineers, it has been looking for a permanent solution.

The bill you are about to read is the answer. It deals with both problems in a simple, uncomplicated way. It makes use of the talent available within the amateur community, while keeping ultimate authority on regulatory matters within the purview of the Commission itself.

Ray Frost WA6TEY has worked closely with Congressman Dannemeyer's staff in regard to its preparation. To that end, Frost had solicited input from the amateur community. The result of many months of preparation is now before Congress itself. The bill reads as follows:

H.R. 2203

A bill to amend the Communications Act of 1934 to permit the Federal Communications Commission to employ voluntary services for purposes of monitoring violations of the Act by amateur and citizens band radio service station operators and for purposes of preparing and administering examinations for certain amateur station operator licenses.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section 4(f) of the Communications Act of 1934 (47 U.S.C. 154(f)) is amended by adding at the end thereof the following new paragraph:

"(4)(A) For purposes of monitoring any violation of any provision of this Act, and of any regulation made by the Commission pursuant to this Act, relating to amateur station transmissions, the Commission, without regard to part III of title 5, United States Code, may (i) recruit and train any individual licensed by the Commission to operate an amateur station: and (ii) accept and employ voluntary and uncompensated services of such individual. For purposes of recruiting and training such individual, the Commission, without regard to part III of title 5, United States Code, may accept and employ voluntary and uncompensated services of any amateur station operator organization.

"(B) For purposes of monitoring any violation of any provision of this Act, and of any regulation made by the Commission pursuant to this Act, relating to transmissions of any citizens band radio service station, the Commission, without regard to part III of title 5, United States Code, may (i) recruit and train any individual licensed by the Commission to operate a citizens band radio service station: and (ii) accept and employ voluntary and uncompensated services of such individual. For purposes of recruiting and training such individual, the Commission, without regard to part III of title 5, United States Code, may accept and employ voluntary and uncompensated services of any citizens band radio service station operator organization.

"(C) For purposes of preparing or administering any examination for the least privileged class of amateur station operator license established under section 303(1) of this Act, the Commission, without regard to part III of title 5, United States Code, may accept and employ voluntary and uncompensated services of any individual who is licensed by the Commission to operate an amateur station and whose license is not of such class.

"(D) Any person who provides voluntary and uncompensated services under this paragraph shall not be considered, by reason of having provided such services, a Federal employee for any purpose.

"(E) For purposes of this paragraph, the term 'citizens band radio service station' has the meaning given such term in sections 95.401 and 95.603 of title 47, Code of Federal Regulations, including any amendment

to such term as hereafter may be made by the Commission.".

Sec. 2. Section 605 of the Communications Act of 1934 (47 U.S.C. 605) is amended by adding at the end thereof the following new sentence: "This section shall not apply to any receipt, divulgence, publication, or utilization of the contents of any amateur or citizens band radio service station transmission by any individual in the course of providing voluntary and uncompensated monitoring services to the Commission under subparagraph (A) or (B) of section 4(f)(4) of this Act."

From my point of view, H.R. 2203 is a necessity. First, it's a very cost-effective measure in these inflationary times. If passed, it will mean that the FCC will no longer be able to cry poverty in regard to the enforcement of its rules. This is especially important in regard to cases of chronic malicious interference. Cutbacks in the FCC's budget already have been announced.

In mid-March, retiring FCC Chairman Robert E. Lee told a congressional subcommittee that the Reagan budget ax will force a 25% reduction in the agency's Compliance Program, and Field Operations Bureaus in Beaumont TX, Savannah GA, Cincinnati OH, Pittsburgh PA, and Washington DC will be closed down in fiscal 1982. Also, the Monitoring Station in Anchorage AK will be terminated, as will a number of the Commission's Special Enforcement Teams.

The FCC also is dropping quarterly travel to 77 cities for the administration of amateur and commercial exams. In fiscal 1982, these trips will become *annual* occurrences. Some sources say that they may be terminated entirely if monies are not available. This would mean that obtaining an amateur ticket other than Novice could become almost an impossible task for some. Either travel whatever distance is necessary at your own expense or wait for "next year" should you fail! And, if all this were not enough, Lee predicts that the processing time for an amateur license, which is currently 41 days or less, will increase significantly. Expect it to become a minimum of 65 days at best.

Obviously, the Reagan budget places the FCC in a bind. It also places the amateur community in a similar position since these cutbacks seriously endanger the vitality of our service. At least in part, H.R. 2203 offers some relief from this. If enacted, it will take part of the burden off the Commission's shoulders. It will mean continuance of Novice license testing. It will mean that we can expand our efforts to self-regulate our service, and that those who violate the terms of their licenses will not be permitted to continue their activities just because the Commission doesn't have the funding to weed them out. It can help keep our amateur bands from becoming carbon copies of the 11-meter band.

Whether you like or dislike the measure, I urge that you reread it several times and voice your opinion on it. In regard to the latter, your comments should be addressed to the members of the Congressional Subcommittee on Telecommunications, Consumer Protection and Finance. A complete list of all those involved with this committee appears at the end of this column. Also, if you find yourself in support of the measure, why not drop a QSL card to its sponsor, Congressman William E. Dannemeyer, 1032 Longworth Bldg., Washington DC 20515. This as a way of saying thanks to the congressman for his active interest on our behalf.

Also, another QSL to Ray Frost WA6TEY, 14421 Hope St., Garden Grove CA 92643, might be apropos in this case. Without Ray's input, there is no telling what H.R. 2203 might have read like. Thanks to him, it's a rather positive step that helps foster a vital Amateur Service while helping to continue the deregulation process. As you can guess, I support the bill. You must make up your own mind.

Subcommittee on Telecommunications, Consumer Protection, and Finance
Room B-333
Rayburn Office Bldg.
Washington DC 20515

Congressmen

Timothy E. Wirth, Chairman
Ronald M. Mottl
James H. Markey
Thomas A. Luken
Al Swift
Henry A. Waxman
Cardiss Collins
W. J. Billy Tauzin
John D. Dingell, Chairman, 97th Congress
James M. Collins
Matthew J. Rinaldo
Carlos J. Moorhead
Marc L. Marks
Thomas J. Tauke
Thomas J. Bliley
James T. Broyhill

FCC

FCC ENCOURAGES AMATEUR RADIO EXPERIMENTATIONS

Consistent with a recent Commission amateur radio definition that, "The Amateur Radio Service is for technically-inclined persons who wish to learn about and experiment with radio communications equipment and operating techniques" (Commission Order of November 6, 1980), interested radio amateurs are encouraged to experiment with new methods of transmission and new radio technologies.

The Commission realizes that in certain instances proposed experiments may conflict with existing rules, and may therefore require a Commission rule waiver. The Commission is willing to grant rule waivers for many different experimental purposes, including:

- Spread-spectrum modulation techniques
- Packet-switching networks
- Radioteleprinter codes, other than ASCII and Baudot
- "Beacons" for propagation studies
- Medium-scan television
- Frequency and/or amplitude "compandoring"
- Digitized voice techniques
- Digitized video techniques
- "Trunked" repeater systems
- EME communications

For example, on March 6, 1981, the Private Radio Bureau granted Special Temporary Authority (STA) to 25 radio amateurs affiliated with the Amateur Radio Research and Development Corporation (AMRAD) to experiment with spread-spectrum transmission. (Spread-spectrum is an application of broadband transmission that appears to make more efficient use of congested frequency bands than does conventional narrowband transmission.)

On August 15, 1980, an STA was granted for two years to a radio amateur to conduct experiments in digital phase-shift keying in the HF phone band, where slow-scan television is authorized. During November, 1980, four amateur licensees were granted a rule waiver to permit transmissions of the digital teleprinter code for the purpose of conducting experiments to develop an error-free mode of amateur teleprinter communications. These recent examples represent only a small segment of the many avenues of experimentation open to licensees in the Amateur Radio Service.

Licensees wishing to conduct experiments within the amateur bands should first refer to the Commission's rules to determine if a Commission rule waiver is required. If the experiment may be conducted in accordance with the rules, no communication with the Commission is required. However, if a proposed experiment will conflict with any of the Commission's rules, the licensee conducting the experiment must write to the Commission and request a waiver of the specific rule(s). Waiver request letters should be addressed to: Federal Communications Commission, 334 York Street, Gettysburg PA 17325; Attention: Technical Section.

The content of the waiver request letter should cover complete details of the proposed experiment, including all technical parameters, specific frequencies to be used, and a justification for the project. The Commission will approve or deny your request in writing, and no experimentation may commence until the written approval is received.

FCC NO LONGER ISSUES LICENSES TO NEW AMATEUR RADIO CLUB, MILITARY RECREATION, OR RACES STATIONS

Due to the large number of inquiries the Commission is re-

ceiving pertaining to the licensing of club, military recreation, and RACES stations in the Amateur Radio Service, the following information is provided.

In May, 1980, the FCC adopted a Third Report and Order amending Part 97 of the Commission's rules. This action simplified the licensing and callsign assignment system for such stations in the Amateur Radio Service. Section 97.37 was amended with a new paragraph (b) which reads as follows:

> (b) Only modification and/or renewal station licenses will be issued for club and military recreation stations. No new licenses will be issued for these types of stations.

The text of Section 97.171 was amended also, with the addition of a new paragraph (b) which reads as follows:

> (b) Only modification and/or renewal station licenses will be issued for RACES stations. No new licenses will be issued for RACES stations.

A change in the trustee of a club, person in charge of the military recreation station, or responsible civil defense official will be treated as a modification to the existing station license.

In addition, a change in the station location or a change in the name of an existing station will be construed as a license modification. No new callsign will be assigned.

The desire for a new license seems to arise most often in connection with club stations. The club members can select a licensed amateur radio operator as a trustee for the station and then use the trustee's primary callsign as the club's callsign. This would be considered as a modification to an existing license.

The Federal Communications Commission Private Radio Bureau Chief, Carlos V. Roberts (second from right), presents a Special Temporary Authority to experiment with spread-spectrum transmission to Hal L. Feinstein WB3KDU (far left) and Paul L. Rinaldo W4RI. Dr. Michael J. Marcus (far right), Chief, Technical Planning Staff of the Commission's Office of Science and Technology, witnesses the ceremonial occasion at the Commission's offices, March 6, 1981. Messrs. Feinstein and Rinaldo are two of 25 amateurs affiliated with the Amateur Radio Research and Development Corporation granted the Special Temporary Authority for experimentation.

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
4006 Winlee Road
Randallstown MD 21133

It's June! And with the month come all kinds of good things, not the least of which is this month's edition of RTTY Loop, which marks the beginning of our fifth year!

I sincerely appreciate the interest you all have expressed in RTTY, and in this column, over the past four years. Many newcomers have asked about the availability of older material from the column. Art Galvez KA7GTP of Eugene OR is one who writes that he received an old copy of *73* as a gift, and was interested by the magazine's contents, especially RTTY Loop. He wonders if an index to old columns is available, or if we plan to publish a compilation of old columns in book form.

Well, Art, that is exactly what is planned. Over the next few months I hope to extract what I can from the first few years of RTTY Loop, and we hope to offer it in book form to those who may have missed it or who want to add it to their libraries. Watch this column for details. Don't forget the other *73* Radio Bookshop publications on RTTY, which are advertised in the magazine. They provide a valuable source of RTTY information. Above all, I hope you plan to continue reading *73*, where more articles of interest appear than anywhere else, not to mention the continuing saga of RTTY Loop.

Moving right along, another big item in June is Field Day. I know that many of the clubs are gearing up for that big weekend, June 27-28, but how many of them are actively courting the press? One of the biggest complaints I hear at gatherings of hams is that this paper or that magazine carried an article that somehow cast a bad light on amateur radio.

One of our boosters, the Stark RTTY Group out in Massillon OH, did a bang-up job of publicity in last year's effort, as Fig. 1 shows.

Why don't you try it? Write up a press release, five hundred words or so, describing your club and its efforts and send it off to local publications. Don't just concentrate on the big daily papers—send one to the neighborhood weeklies and shopping center giveaways. They are all eager to receive news of local activities, and something like this is that much good news for the readership. Send it in early, don't forget to provide some means of contacting an individual for clarification or more detail, and enjoy the spotlight.

Way back when, it took a boat-anchor transmitter and a clunky old grease-monger machine to get on RTTY. Now, with computer-controlled stations and video terminals, more and more hams will be giving it a fling. To this end, Dr. R. B. Gober W5ZNN, a dentist who is the Mayor of Corsicana TX, sends in a letter with several questions. "Will," he writes, "interference from automatic, computer-controlled RTTY stations become a problem when these stations come on the air with no operator present?" Much as nets now declare certain frequencies in the 75-meter phone band unto themselves, he wonders about claims of frequency ownership by mailboxes, ASCII groups, and the like. He also wonders about providing DX windows, and possibly revamping the band segments.

I really don't know the answer to these questions. I would hope


Stark RTTY to participate in nationwide ham radio field day
Nationwide field day set for ham radio clubs
Hamming it up
Stark radio unit in U.S. event
Ham radio club to conduct test

Fig. 1. Samples of positive amateur radio publicity by the Stark RTTY Group of Massillon OH.

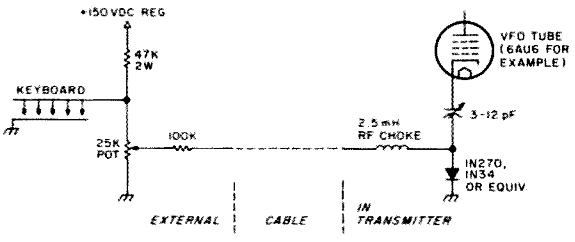


Fig. 2. Shift-pot circuit.

that as RTTY becomes more common, and I have no doubt that with the popularization of ASCII it will, some form of band plan will emerge that will keep everybody happy. It would seem as though a frequency hog is a frequency hog, whether operating SSB on 75 or RTTY on 20, and that to solve that problem we have to deal with the basic relationships hams have with hams, rather than trying to put down this group or that.

Clearly, when and if automatic stations become common, it will still be the operator, present or not, who will be responsible for preventing interference. I am afraid that if we do have a proliferation of interference-causing automatic stations, the powers that be will step in and we won't have the problem any more, because we won't have the privilege of running such a station. I would encourage anyone developing an automatic station to provide for ample monitoring to prevent stepping on others.

Okay, gang, let's get practical now, and down to basics. Francis W. Sorovec WD9HPA from Fort Wayne IN is frustrated as the devil in his attempts to get onto RTTY. Francis states that he currently operates upside down on 20 meters, with his Swan 350. He got an old Ranger II transmitter and would like to know how to hook the whole thing together.

The shift-pot circuit has been covered before in this column, back in January, 1978. It uses a diode switch to place a small capacitance on the frequency-determining circuit of a vfo, thus lowering the frequency. By applying the bias voltage during space, a correct (low—space; high—mark) FSK signal is produced. Because of the characteristics of the circuit, you can vary the voltage applied to the diode, and thus vary the apparent capacitance, changing the obtained shift. A simple diagram of such a circuit is shown in Fig. 2.

The transmitter in question, the Ranger II, resembles many other transmitters of its era in that it uses a pentode, a 6AU6, as the vfo tube. Connecting the high end of the capacitor to pin 7 of the 6AU6, the cathode, will enable the circuit to shift the frequency appropriately. Why a trimmer? Different circuits need different amounts of capacitance. Once it is adjusted, the trimmer need never be touched again, and I have built these shifters using a small, fixed mica capacitor in the 12-pF range. The potentiometer, located external to the capacitor-diode assembly, should have enough range to allow adjustment to either 170-Hz or (shudder) 850-Hz shift. Hope this helps, and maybe we will work on the air.

As I write this column, the second Greater Baltimore Hamboree and Computerfest has just ended. Last year's meeting was highlighted by the appearance of Wayne Green; the ARRL graced this year's group. I was quite impressed by the increased showing of digital equipment among the flea-market offerings. We are, at long last, beginning to see an end to the World War II boat anchors, and more and more of the "first-generation" computer equipment, circa 1975, is showing up for secondhand purchase. I was stunned by what many of the guys were asking, though. It will take some time for the market for recycled computer hardware to develop, but it will only do so if items are offered for what they are worth, not what they cost originally or what it would cost to replace them now.

For example, I saw several older computer terminals being offered for close to what they cost *new* during the mid 1970s. Now, I know that a new fancy terminal may cost five or six hundred dollars, or more, but that does not mean that an old one that cost $250 new is still worth it.

Flea-market and secondhand equipment provides a valuable function in amateur radio, getting newcomers started with a minimum of investment. Much of the equipment is used for a year or two, then resold to another ham down the line to get him started. I am afraid that offering equipment five years old and several levels out of date at nearly new prices does little to encourage such trade. That's my opinion. Any comments?

In the way of new equipment, I have purchased several items, and a few things have become available, for review in the future. I hope to examine more than the "strict" RTTY equipment, that is, terminals, demodulators, and the like. Any or all equipment that is of interest to the RTTYer is fair game here, and, hopefully, I will be able to cast some light where none was before. In the planning stage now, for example, are reviews of several items usually ignored by the magazines, but vital to the functioning of a RTTY station. More on that in the months to come.

Next month I will conduct my annual (it seems) session on how to get your computer onto RTTY. Many of you have written with interesting experiences in computer RTTY, and I hope to share many of them with the readership and pass along a few tips of my own. Where's that gonna be? Why, right here, in RTTY Loop!

FCC

Reprinted from the Federal Register

Amendment of the Commission's Rules To Provide for Exception to the 50-Watt Power Limitation in Two Additional Military Areas, and To Provide for Communications With Satellites by Amateur Radio Stations Within Certain Military Areas

AGENCY: Federal Communications Commission.

ACTION: Final rules.

SUMMARY: The Commission is adopting rules in the Amateur Radio Service to relax a limitation to allow stations located in restricted areas near designated military installations and operating, in the future, in the Amateur-Satellite Service to communicate with satellites with power up to 1,000 watts (equivalent isotropically radiated power). The Table of Frequency Allocations is also amended to specify two additional areas. Amateur-Terrestrial communication in the restricted areas will remain subject to a 50-watt power limit.

EFFECTIVE DATE: April 8, 1981.

ADDRESS: Federal Communications Commission, Washington, D.C. 20554.

FOR FURTHER INFORMATION CONTACT: John B. Johnston or Maurice J. DePont, Private Radio Bureau, (202) 632-4964.

SUPPLEMENTARY INFORMATION:

Adopted: February 11, 1981.

Released: February 26, 1981.

In the matter of amendment of § 97.61(b)(7) of the Amateur Radio Service Rules to provide for exception to the 50 watt power limitation in two additional military areas, and to provide for communications with satellites by amateur radio stations within certain military areas; amendment of § 2.106, Table of Frequency Allocations.

By the Commission: Chairman Ferris not participating.

1. The Commission received a letter from the Radio Amateur Satellite Corporation (AMSAT), requesting the Commission's assistance in removing the 50 watt transmitter power limitation, in § 97.61(b)(7) of the Rules, applicable to amateur radio stations in certain parts of the country operating in the 420–450 MHz band. AMSAT states that, in order to use any new satellites that will be launched in the future, user stations will require 500–1,000 watts effective radiated power, an order of magnitude higher than that required to use previous amateur satellites. As a consequence, it anticipates that there will be as many as several thousand amateur radio stations using the new Phase III–A satellite that will require a waiver of § 97.61(b)(7) to permit higher power than 50 watts. AMSAT feels that amendment of the rule would eliminate the need for rule waivers.

2. The Frequency band 420–450 MHz is allocated to the Amateur Radio Service on a non-interference basis to the Government Radiolocation Service (See § 2.106 of the Commission's rules, Table of Frequency Allocations and Footnote US 35 thereto). Within this band, the frequencies 435–438 MHz are allocated to the Amateur-Satellite Service (ASAT), on condition that no harmful interference is caused to the other services, Government Radiolocation and Amateur Radio (See § 97.415, Footnote 1). Section 97.61(b)(5) requires that amateur radio stations operating in the frequency band 420–450 MHz not cause interference to the Government Radiolocation Service. Section 97.61(b)(7) identifies certain areas of the United States where amateur radio stations must have special authorization from the FCC Engineer in Charge (EIC) and the Military Area Frequency Coordinator (MAFC) before the station may transmit

in the 420–450 MHz band with more than 50 watts input power.

3. In its request for assistance, AMSAT suggests that the Commission pursue the matter with the Interdepartment Radio Advisory Committee (IRAC) to determine whether the military would have any objection to deletion of the 50 watt power limitation. AMSAT offers three alternatives that it would consider to be suitable. They are:

A. Modify § 97.61(b)(7) to increase the transmitter power limit from the present 50 watts to 250 or 500 watts in the 420–450 MHz band.

B. Modify § 97.61(b)(7) to delete the 50 watt limit in the 435–438 MHz ASAT frequency band. Then the 1,000 watt limit specified in § 97.67(a) would apply between 435-438 MHz.

C. Modify § 97.61(b)(7) to apply only to amateur stations transmitting with antenna radiation patterns below elevation angles of 10 degrees, thus removing the 50 watt power limit for amateur radio stations communicating with the satellite.

4. The Commission took the matter up with IRAC. IRAC reported that the current restrictions, upon which § 97.61(b)(7) is based, are valid and are required by the military services. In addition, IRAC determined that two additional areas must be added to those now specified in § 97.61(b)(7) where power must be limited to 50 watts, unless, as mentioned in paragraph 2, special authorization has been obtained. The first area is within a 50 mile radius around Otis Air Force Base, Massachusetts. The other is within a 50 mile radius around Beale Air Force Base, California.

5. IRAC also said that it could permit amateur radio stations within any of the military restricted areas to communicate with satellites, on ASAT band frequencies 435-438 MHz, with power not to exceed 1,000 watts equivalent isotropically radiated power. However, those amateur radio stations would have to maintain a minimum transmitting antenna elevation angle of 10 degrees.

6. Amateur radio users who engage in amateur satellite operations will benefit from the relaxation of the rules herein ordered. Even though they are within any of the military restricted areas they can use 1,000 watts power as long as their antennas comply with the elevation angle specified. However, amateur radio users whose stations are located in the specified military areas and who engage solely in terrestrial operations will be required to accept the 50 watt power limit (unless waived) since amateur usage of frequencies in the 420-450 MHz ban is predicated on a non-interference basis to the Government Radiolocation Service in that band.

7. We are also amending § 2.106, Table of Frequency Allocations, Footnote U.S. 7, to reflect in that rule section the two additional military areas.

8. The specific rule amendments that we are adopting are set forth in the Appendix. Authority for the amendments is contained in Sections 4(i) and 303 of the Communications Act of 1934, as amended. We are dispensing with the prior notice and public procedure provisions of the Administrative Procedure Act as unnecessary (see 5 U.S.C. 553(b)(3)(B)) since the military services: (1) require a power restriction for terrestrial communications of amateur radio stations located near military installations; and, (2) could not permit, because of potential interference to military activities, any further concessions for amateur satellite operations.

9. Accordingly, it is ordered, effective April 8, 1981, that Parts 2 and 97 of the Commission's Rules are amended as set forth in the attached Appendix.

10. It is further ordered That this proceeding is terminated.

11. Information concerning these rule changes may be obtained from John B. Johnston or Maurice J. DePont, (202) 632–4964.

(Secs. 4, 303, 307, 48 Stat., as amended, 1066, 1082, 1083;k 47 U.S.C. 154, 303, 307)

Federal Communications Commission.

William J. Tricarico,

Secretary.

A. Part 2 of Chapter I of Title 47 of the Code of Federal Regulations is amended, as follows:

Section 2.106 is amended by adding new paragraphs (e) and (f) to Footnote U.S. 7 to read as follows:

§ 2.106 Table of frequency allocations.

* * * * *

U.S. Footnotes

* * * * *

U.S. 7 * * *

(e) In the State of Massachusetts within an 80-kilometer (50 mile) radius around locations at Otis Air Force Base, Massachusetts (latitude 41°45' N., longitude 70°32' W.).

(f) In the State of California within an 80-kilometer (50 mile) radius around locations at Beale Air Force Base, California (latitude 39°08' N., longitude 121°26' W.).

* * * * *

B. Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended, as follows:

1. In § 97.61, paragraph (b)(7) is amended by adding new subparagraphs (v) and (vi), as follows:

§ 97.61 Authorized frequencies and emissions.

* * * * *

(b) * * *

(7) * * *

(v) In the State of Massachusetts within an 80-kilometer (50 mile) radius of 41°45' N., 70°32' W.

(vi) In the State of California within an 80-kilometer (50 mile) radius of 39°08' N., 121°26' W.

2. In § 97.421, a new paragraph (c) is added as follows:

§ 97.421 Telecommand operation.

* * * * *

(c) Stations in telecommand operation may transmit from within the military areas designated in § 97.61(b)(7) in the frequency band 435–438 MHz with a maximum of 611 watts effective radiated power (1,000 watts equivalent isotropically radiated power). The transmitting antenna elevation angle between the lower half-power (−3 decibels relative to the peak or antenna bore sight) point and the horizon must always be greater than 10°.

3. A new § 97.422 is added to Subpart H of Part 97, as follows:

§ 97.422 Earth operation.

Stations in earth operation may transmit from within the military areas designated in § 97.61(b)(7) in the frequency band 435-438 MHz with a maximum of 611 watts effective radiated power (1,000 watts equivalent isotropically radiated power). The transmitting antenna elevation angle between the lower half-power (−3 decibels relative to the peak or antenna bore sight) point and the horizon must always be greater than 10°.

[FR Doc. 81-6850 Filed 3-3-81; 8:45 am]

BILLING CODE 6712-01-M

Type Acceptance of Equipment Marketed for Use in the Amateur Radio Service

AGENCY: Federal Communications Commission.

ACTION: Final rule (second report and order).

SUMMARY: This document extends the effective date of the existing regulations that require type acceptance of all external radio frequency power amplifiers and amplifier kits capable of operation below 144 MHz, affecting primarily those amplifiers used in the Amateur Radio Service. This extension is necessary as the present regulations are due to expire on April 28, 1981. The expiration of these regulations would allow the marketing of external amplifiers designed for illegal operation in and around the Citizens Band Radio Service.

DATES: The effective date of the order is April 28, 1981.

ADDRESS: Federal Communications Commission, Washington, D.C. 20554.

FOR FURTHER INFORMATION CONTACT: John A. Reed, Office of Science and Technology, Washington, D.C. 20554 (202) 653-6288.

SUPPLEMENTARY INFORMATION: In the matter of amendment of Parts 2 and 97 of the Commission's Rules to require type acceptance of equipment marketed for use in the Amateur Radio Service.

Second Report and Order

Adopted: March 23, 1981.

Released: March 28, 1981.

By the Commission: Chairman Ferris not participating; Commissioner Jones absent.

1. On March 20, 1978, the Commission released a Report and Order in the above entitled matter (FCC 78–107, 43 FR 12662). That document implemented type acceptance procedures and certain technical requirements for external radio frequency power amplifiers and amplifier kits that are designed for operation below 144 MHz. The effect of that order was to require type acceptance for the majority of amplifiers used in the Amateur Radio Service (ARS). Type acceptance is a procedure whereby the Commission approves radio transmitting equipment as being capable of complying with the necessary technical specifications. Such approval, where required, is necessary before the equipment may be marketed. See 47 CFR 2.901 *et seq.* In this specific case, the type acceptance procedure allows the Commission to determine whether the external amplifiers are capable of meeting those FCC technical standards that are designed to minimize the possibility of interference and, also, to determine whether the amplifiers are intended for use only in the ARS and not in or around the Citizens Band (CB) Radio Service.

2. As noted above, compliance with the revised technical standards to allow for the commercial manufacture and marketing of these external amplifiers is enforced, in part, through our type acceptance procedures. The standards were implemented due to the large number of amplifiers being marketed and promoted for illegal operation in and around the CB Radio Service. Such illegal use of external amplifiers created a severe interference problem to television reception and to the reception of other radio services. It was estimated that in fiscal year 1976 that about four million persons and perhaps as many as ten million persons experienced interference to televisions reception from CB radio stations. About half of this interference was caused by or intensified by the illegal use of these amplifiers. It was also predicted that this interference would significantly increase unless countered by Commission action.

3. These interference problems are detailed in earlier reports, as cited in the reference Report and Order in paragraph one and in the Notice of Proposed Rule Making (released February 28, 1977) for this docket, and will not be further repeated here. It was clear that when the Commission issued its Order on the subject in 1978, it was faced with resolving a serious national problem. In fact, the interference caused by the illegal use of external amplifiers was so severe as to require immediate implementation of the technical standards and type acceptance requirement by this Commission. Because of this rapid implementation, the technical regulations and the type acceptance requirement were made effective for only three years so that the effects of this action would be subject to a mandatory review prior to the expiration date of April 28, 1981. It was expected that this three year period would allow the Commission additional time to investigate other methods of controlling the promotion and use of external amplifiers in radio services other than the ARS and to monitor the effectiveness of the new regulations.

4. During this three year investigation period, other methods of controlling the manufacture and marketing of external amplifiers were studied. One such method was to require the showing of an appropriate amateur license prior to the purchase of amateur transmitting equipment (FCC 79-586). However, as we concluded in our first Report and Order in this Docket, no other method was considered to offer the effectiveness provided under the current type acceptance program. The problem with attempting to require retailers to ask potential buyers of amateur equipment to display their amateur licenses before they may make a purchase is that it is uncertain whether this Commission has the legal authority to impose this requirement.[1] Even if the Commission had such authority, there are two other problems. First, this type of regulation would be burdensome for retailers. Second, it is more effective for the Commission to enforce its regulations through contact with a limited number of manufacturers (i.e., through type acceptance) than with a vast number of sellers.

5. The effectiveness of the current type acceptance program in halting the promotion of external amplifiers for illegal applications has led this Commission to believe that the program should be continued. Numerous manufacturers and distributors of amplifiers designed for illegal operation in and around the CB service have ceased manufacture and marketing, although legal action was required in some instances. The majority of this litigation has already been detailed in previous Commission releases and will not be repeated in this item. Other cases are still under investigation with court actions pending and, therefore, will not be discussed. However, certain manufacturers are still promoting their non-type accepted amplifiers for illegal operations. Some U.S. Attorneys have questioned the advisability of prosecuting these manufacturers for violation of the existing type acceptance requirement due to the impending cut-off date of the regulations. These U.S. Attorneys feel that it would be inappropriate to prosecute a manufacturer for violation of a temporary regulation. Instead, most prosecutions have been for violations of the regulation that prohibits the manufacture and marketing of any external amplifier with amplification capability between 24.00 MHz and 35.00 MHz § 2.815(b) of the Commission's regulations). This form of prosecution would be sufficient provided all of the amplifiers promoted for CB operation operated within that banned frequency range. Unfortunately, many do not operate within that frequency range as manufactured. For example, without the type acceptance requirement, manufacturers would have no restrictions on producing amplifiers that can be easily altered by purchasers to operate with CB radio equipment even though those amplifiers are designed to operate above or below the prohibited frequency range. Thus, it is necessary to invoke a violation of the type

[1] The provision in the Communications Act of 1934, as amended, that provides the chief support for this requirement is Section 302(a) (47 U.S.C. 302(a)). This Section authorizes the Commission to "* * * make reasonable regulations governing the interference potential of devices * * *" and further states that these regulations apply to the sale of devices. This Section has been relied on by the Commission to establish standards for radio "devices" and to prohibit retailers from selling noncomplying devices.

acceptance regulation to cover all of the available amplifier models. That action requires a removal of the cut-off date for type acceptance in order for these regulations to be more generally effective. In light of this and the information contained in the preceding paragraphs, a continuation of the present type acceptance requirement would be in the public interest.

8. The Administrative Procedure Act permits federal agencies to forgo the usual notice and comment procedures in rule makings if "* * * public procedures thereon are * * * unnecessary." (5 U.S.C. 553(b)(3)(B)). Prior notice and comment procedures concerning a continuation of the current type acceptance requirement are unnecessary for a variety of reasons. First, the possibility of a permanent type acceptance requirement was previously subject to public comments in this Docket in the original Notice of Proposed Rule Making, 42 FR 12204, released February 28, 1977. It is not anticipated that requesting additional comments on the subject would provide the Commission with further useful information. Second, in our Report and Order in Docket No. 21117, adopted February 18, 1978, released March 20, 1978, 43 FR 12682, we indicated that the Commission might make the temporary type acceptance requirement permanent. In paragraph 12 of that Order, we stated "If at the end of this three year period it is determined that the type acceptance requirement is still necessary and that it has indeed reduced the problems caused by these amplifiers, this program can be continued by further Commission action." During this three year period, we have not received any adverse comments regarding the type acceptance requirement. Third, in our Report and Order in Docket No. 21117, we found that the type acceptance requirement itself imposed only a slight burden on manufacturers.

In paragraph 13 of that Order (while discussing § 2.1005(b) of our regulations), we stated:

> * * * No piece of radio equipment from any service should be marketed before a number of samples are tested to determine that the equipment is in compliance with our regulations. As these tests should be performed regardless of the requirement for type acceptance, the only additional expense that type acceptance would cost the manufacturer or supplier is the few hours of paperwork to compile the application and the time delay in marketing during which the Commission processes this application.

Fourth, all the Commission is now doing is making a rule permanent that was found to be in the public interest in our Report and Order in Docket No. 21117. Since we are merely continuing an existing rule, there will be no additional impact on manufacturers. Finally, as discussed above, after extensive and protractive consideration, we do not believe that there are any viable alternatives to a continuation of the type acceptance requirement.

7. The enforcement actions by the U.S. Attorneys and the Commission's Field Operations Bureau against the manufacturers of those amplifiers intended for operation around the CB service and the reduction in the availability of these amplifiers to the public have demonstrated that this method of controlling the illegal operation of these amplifiers is effective. However, the continued, though smaller, illegal market necessitates retaining these regulations. Therefore, the expiration date of the type acceptance requirement for external radio frequency power amplifiers and amplifier kits is deleted, as shown in the attached appendix.

8. Other changes to these regulations, as also shown in the appendix, will be made in accordance with the provisions of Subsections 553(b)(3)(A) and 553(b)(3)(B) of the Administrative Procedure Act (5 U.S.C. 553). These subsections allow the Commission to finalize regulations without the necessity of providing prior notice or seeking comments when the changes involve interpretative rules or "* * * when the agency for good cause finds (and incorporates the finding and a brief statement of reasons therefor in the rules issued) that notice and public procedure thereon are * * * unnecessary, or contrary to the public interest." When the regulations establishing type acceptance requirements for external amplifiers were implemented, there was a considerable rush in their preparation in order to place them into effect at the earliest possible time. This rush was due to the large number of manufacturers promoting their amplifiers for illegal operation and because of the severity of the interference problems resulting from the use of those amplifiers. As a result, some editorial errors in the regulations occurred and some regulations that were either awkward or unclear were adopted. The language of these regulations has therefore been reworded to correct the editorial errors, to clarify the requirements and to refine the statement of the requirements. Since the meaning of the regulations remains unchanged, it is considered unnecessary to issue a further Notice of Proposed Rule Making on this matter. Additionally, the prompt clarification of the existing regulations is in the public interest since the changes will make the regulations more understandable and encourage compliance. Any new problems which may arise in the specific wording of the Part 97 regulations can be considered under Docket No. 80-729 which looks toward a rewrite of the amateur regulations into a "plain language" format.

9. It should also be noted that the Commission's policy concerning waivers of the amplifier technical requirements or the type acceptance requirement is unchanged. The type acceptance requirement may still be waived for those amplifiers designed for industrial, scientific or medical (ISM) applications. Additionally, waivers of the technical requirements will be considered for those amplifiers designed to operate within the frequency range of 50.00 MHz to 54.00 MHz as long as the amplifiers can not be easily converted to operate at lower frequency ranges.

10. In view of the foregoing, this Commission is of the opinion that the amended regulations, as described above and in the attached appendix, are in the public interest, convenience and necessity. The authority for these amendments is contained in Sections 4(i), 302, 303(e), 303(f) and 303(r) of the Communications Act of 1934, as amended. Accordingly, it is ordered, effective April 28, 1981, that Parts 2 and 97 of the Commission's Rules and Regulations are amended as set out in the attached appendix. It is further ordered that this proceeding is continued.

(Secs. 4, 303, 307, 48 Stat., as amended, 1066, 1082, 1083; 47 U.S.C. 154, 303, 307)

Federal Communications Commission.

William J. Tricarico,

Secretary.

Appendix

PART 2—FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS

A. 47 CFR Part 2 is amended as follows:

1. Section 2.815 is amended by revising paragraph (c) to read as follows:

§ 2.815 External radio frequency power amplifiers.

* * * * *

(c) No person shall manufacture, sell or lease, offer for sale or lease (including advertising for sale or lease) or import, ship or distribute for the purpose of selling or leasing or offering for sale or lease, any external radio frequency power amplifier or amplifier kit capable of operation on any frequency or frequencies below 144 MHz unless the amplifier has received a grant of type acceptance in accordance with Subpart J of this Part and Subpart C of Part 97 or other relevant Parts of this Chapter. No more than 10 external radio frequency power amplifiers or amplifier kits may be constructed for evaluation purposes in preparation for the submission of an application for a grant of type acceptance.

Note.—For the purposes of this part, an amplifier will be deemed incapable of operation below 144 MHz if the amplifier is not capable of being easily modified to increase its amplification characteristics below 120 MHz, and either:

(1) The mean output power of the amplifier decreases, as frequency decreases from 144 MHz, to a point where 0 decibels or less gain is exhibited at 120 MHz and below 120 MHz; or

(2) The amplifier is not capable of even short periods of operation below 120 MHz without sustaining permanent damage to its amplification circuitry.

* * * * *

2. Section 2.1001 is amended by revising paragraph (f)(2) to read as follows:

§ 2.1001 Changes in type accepted equipment.

* * * * *

(f) * * *

(2) Modifications made pursuant to this Paragraph are limited to equipment used at licensed amateur radio stations.

* * * * *

3. Section 2.1005 is amended by revising the introductory text of paragraph (c) and paragraph (d) to read as follows:

§ 2.1005 Equipment for use in the Amateur Radio Service.

* * * * *

(c) Any supplier of an external radio frequency power amplifier kit as defined by § 97.3(z) of this Chapter shall comply with the following requirements:

(1) * * *
(2) * * *
(3) * * *
(4) * * *
(5) * * *

(d) Type acceptance of external radio frequency power amplifiers and amplifier kits may be denied when denial serves the public interest, convenience and necessity by preventing the use of these amplifiers in services other than the Amateur Radio Service. Other uses of these amplifiers; such as in the Citizens Band Radio Service, are prohibited (CB Rule 21 of this Chapter). Examples of features which may result in the denial of type acceptance are contained in § 97.77 of this Chapter.

PART 97—AMATEUR RADIO SERVICE

B. 47 CFR Part 97 is amended as follows:

1. Section 97.75 is amended by revising the introductory text of paragraph (a) to read as follows:

§ 97.75 Use of external radio frequency (RF) power amplifiers.

(a) Any external radio frequency (RF) power amplifier used or attached at any amateur radio station shall be type accepted in accordance with Subpart J of Part 2 of the FCC's Rules for operation in the Amateur Radio Service, unless one or more of the following conditions are met:

* * * * *

2. Section 97.76 is amended by revising the introductory text of paragraph (a) and subparagraphs (a)(1) and (a)(5) to read as follows:

§ 97.76 Requirements for type acceptance of external radio frequency (RF) power amplifiers and external radio frequency power amplifier kits.

(a) Any external radio frequency (RF) power amplifier or external RF power amplifier kit marketed (as defined in § 2.815 of this Chapter), manufactured, imported or modified for use in the Amateur Radio Service shall be type accepted for use in the Amateur Radio Service in accordance with Subpart J of Part 2 of the FCC's Rules. This requirement does not apply if one or more of the following conditions are met:

(1) The amplifier is not capable of operation on any frequency or frequencies below 144 MHz. For the purposes of this part, an amplifier will be deemed to be incapable of operation below 144 MHz if the amplifier is not capable of being easily modified to increase its amplification characteristics below 120 MHz, and either:

(i) The mean output power of the amplifier decreases, as frequency decreases from 144 MHz, to a point where 0 decibels or less gain is exhibited at 120 MHz and below 120 MHz; or

(ii) The amplifier is not capable of even short periods of operation below 120 MHz without sustaining permanent damage to its amplification circuitry.

(2) * * *
(3) * * *
(4) * * *

(5) The amplifier is purchased in used condition by an equipment dealer from a licensed amateur radio operator who constructed or modified the equipment in accordance with § 2.1001 of the regulations and the amplifier is further sold to another amateur radio operator for use at their licensed amateur radio station.

* * * * *

(FR Doc. 81-9469 Filed 3-25-81; 8:45 am)

BILLING CODE 6712-01-M

HAM HELP

$5 reward for information leading to the successful conversion of a Hallicrafters SR-42A to FM.

Neil Johnson WA4ZTN
PO Box 154
Glenwood FL 32722

Needed: schematic and/or manual for a Dumont Model 304-A oscilloscope. I will reimburse copying cost or purchase manual.

S. Capasso
67 Perkins St.
New Haven CT 06513

I need an ac power supply for a Gonset G-76 transceiver.

R. L. Wartburg K6LLO
1425 N. Harwood
Orange CA 92667

LETTERS

QUASIMODO

Cal Ritchey's story in the January issue ("Over the Hump and into History") was good reading. Aircraft crews were indeed scattered over several countries, including India, Nepal, Bhutan, Burma, and what is now Bangladesh, while flying the Hump from India to China, during WWII. Stories that today sound like amusing after-dinner anecdotes once were crises in the lives of flying personnel of the Air Transport Command.

The ATC carried war supplies from India to fighting bases in Burma and China from July, 1942, until August, 1945. More than 650,000 tons of critical material were airlifted from India to beleaguered China. This incredible feat kept China in the war, a reality which kept more than one million Japanese troops in occupied China until the end of hostilities. The irony of political developments in that area of the world since WWII can never diminish the accomplishments of the relative few who wrote the ATC chapter in the chronicle of the Hump.

The Army Airways Communications System (AACS) with 4th Wing headquarters at Hastings Mill near Calcutta, India, played a very important part in the history of Hump flight communications. Col. Mandelbaum commanded from early 1942 until the end of 1945 when the remaining squadrons were transferred to European Wings. During this period, AACS provided the equipment, men, and services to install, maintain, and operate flight facilities, including control towers, homing beacons, radio ranges, and instrument landings systems, at some of the larger airfields. Point-to-point facilities, (voice, CW, and radioteletype) were also AACS activities. At some bases, in India, all Army Air Force administrative and operational communications were handled by AACS.

Many of the men in AACS were amateurs before they came into that service. Many became hams after leaving the Air Force. The AACS operation under the 4th Wing covered India, Burma, China, and Thailand, and immediately after Japan's surrender, French Indo-China (Vietnam) and Singapore.

The 4th AACS Wing had four groups, each with several squadrons. The squadrons had a large number of detachments, with operational and maintenance personnel varying from 6 to 25 men. They were radio transmitter, receiver, power-generator, maintenance, and installation people, as well as operators for CW, voice, and radioteletype. Crypto equipment was also in many of these installations. Operational personnel were mostly involved in control-tower and point-to-point communications. Squadrons had their own aircraft for transportation and flight checks of navigational aids.

Having worked in the 128th AACS Squadron of the 4th Wing, as assistant operations officer, I can appreciate Cal Ritchey's story of flights over the Hump with 19-year-old kids, in the C-46, C-47, DC-6, and the infamous B-24/C-87! The 128th was scattered over the Assam Valley and was operational in all the ATC bases closest to the Hump. Therefore, it handled all of the bad flight mishap contacts from the three established air routes from India to Kunming, China, and one to Chengtu, China.

But there were fun times also. As CO of the detachments located in Saigon, Bangkok, and Singapore, we used the Collins 2-kW point-to-point transmitters (with rhombics!) on 20-meter phone and CW in early 1946! At Bangkok, we had HS1S$ (*Here Siamese One Sad Sack*) and at Singapore, VS1QEU. About 300 stateside contacts were made, with traffic to next of kin, mostly about returning back to Uncle Sugar!

AACS continued as an Air-Force operation until July 1, 1961, when it was changed in name to Air Force Communications Command, with headquarters at Scott Air Force Base, Illinois. The old AACS veterans now enjoy annual reunions and a weekly ham net. Those interested in the '81 get-together or getting on the AACS mail roster should contact me.

Peter K. Onniglan W6QEU
1236 40th Avenue
Sacramento CA 95822

CODE OR LATIN?

I just finished reading Leaky Lines from the April issue and thought I'd pass along my thoughts regarding no-code requirements.

I have no objections to a no-code requirement as long as the theory exam is tough as nails. I think a ham should be more proficient in the theory of electronics and radio than the average ham is now and I see no profit in making someone learn the code to get a license, if he never intends to use it, as long as he is very technically proficient. An exam similar in difficulty to the FCC 2nd Class Radiotelephone exam would suit me just fine as an alternative to someone learning code. As a matter of fact, I would prefer to talk on the air (verbally) with someone who was technical rather than someone who "knew the code once" and memorized the technical exam.

The statistics are that only one in three passes the 2nd Class Radiotelephone exam, this in spite of the tremendous number of Q & A manuals available for memorization purposes. I tried to memorize a Q & A manual to get my First Class license but gave that up and enrolled in a CIE course and passed my license exam on the first try because I had learned, not memorized, the theory. This also makes me not care if Dick Bash wants to help out the memorizers with his Q & A books. I don't really see much difference between his books and other Q & As for the commercial ticket.

I am not in favor of making it easier to get a license by removing the code requirement if at the same time the theory exam is not made much tougher. Perhaps a two-class system similar to the telephone vs. telegraph licenses of the commercial portion of the FCC licenses would be an idea. If you want to send via telegraphy, you have to take a code test in addition to the comprehensive theory exam. This way, we might start eliminating those who talk to the backside of the mike, those who constantly hold the mike 2 feet away to cure "over-deviation" on 2-meter FM, and those who think that if the swr is 1:1 the antenna must be radiating.

Do you really see much advantage in making doctors learn Latin in this day and age?

Thom Page W6KXS
Los Angeles CA

WEEDING OUT

The April *73* article by Andrea Favara HR1ADF, "The Honeymoon Is Over—hints and kinks for ham husbands" (p. 98), is good advice and may help a wayward male ham.

Now having been single for eight years after being married for eight should qualify, to address the subject of introducing a girl friend to your mistress: the amateur radio fraternity. The article by Andrea did *not* address the dating picture. I was not a ham when I was married, lest any Monday-morning quarter-back thought *that* caused the little Ms. to depart our modest home.

When I meet a lady who seems to enjoy my company as much as I like hers, I don't get into the hobby until we have found other common ground like biking, hiking, plays, or whatever it might be. Soon thereafter I will say that I have a mistress in my basement I would like her to meet.

Usually they just leave—never to be seen again. Simple phone calls go unreturned. This is part of the "weeding-out" process. Now the confident and self-assured lady follows me down the steps and meets my shack. I fire up the low-band rig and chat a few moments with a fellow ham. Then I pull the plug and prepare to close down the shack and head upstairs.

Now the real moment of truth is near. Some have said, "Gee, that's neat, but isn't it expensive?" Just a few have asked me why we were leaving and insisted we stay and make more contacts. They ask how the keyer works and press for a demonstration. "Let's see the antenna." "What's this two-meter stuff?" "What are you building over here?" "Gee, these cards are neat?" "Did you read all these books?" "What's a ham-

fest?" and on and on. One beloved friend brought an expensive bottle of wine after an upgrade.

At least these are women with whom my hobby would not hinder a more serious relationship. I never badger them into the hobby. They know they are invited at anytime into my strange radio world. All of these women I have met who appreciate my hobby themselves have hobbies of a similar intensity.

I would consider it a great honor to be with a women who might say to me, "Today I'll be in the studio painting. No phone calls. Don't bother with lunch and don't stay up for me. I'll be out when I am done. And, yes, I love you."

I could understand, appreciate, and respect a woman with such a drive!

Tim Skoning KB9PA
Dundee IL

WRINKLES

"The Great Aluminum Cover-Up," March, 1981, by Don Stauffer WB0YTH was read with interest. But I do not plan to abandon the simple, easy processes I have developed in this shack, over the past 25 years as a ham.

When we take a mini-box that is crappy, cruddy, painted-over, ratty looking, or whatever, we give that box a brand-new professional finish, quick as one, two, three.

All surfaces of the old box are thoroughly sanded with a swirling motion, then dried with either a paper towel or shop towel. Then we simply take G. C.'s "Wrinkle Finish," either grey or black, and give it a good even coat. Momma's oven force-dries and wrinkles our work beautifully!

We set the oven on the lowest temperature, which is a tad under 200°, put the work into the oven, and close the door, peeking in around ten minutes later to see how the cracking is coming along.

When the entire piece has wrinkled evenly and beautifully, we simply slip the plate holding the box from the oven and then cool it on top of the cooktop of her kitchen stove.

God only knows how many beat up boxes we have turned into new pieces, a delight to behold. We also have thoroughly cleaned with detergent some of the Heathkit® cabinetry, sprayed them with black wrinkle finish, and baked them into new pieces. I guess I have the only black, wrinkled Heathkit cabinetry in the world—unless some other hams happened to dream up the idea used by the quickie car painting firms, where they run your newly-sprayed car through a bank of heat lamps and promptly dry the newly painted finish.

I experimented with a scrap piece of metal many years ago, and when this turned into a beautiful wrinkle job, other projects followed. Microphone cases and bases, anything and everything around the shack that needs a *new look* is now resprayed and shoved into the oven.

A final helpful hint, though, if you plan to re-crackle or re-wrinkle any of the Heathkit wrap-around cabinetry. Take a new drill bit and re-perforate the top and bottom areas of the cabinetry above and under the rf cage. Your Heath gear will run much, much cooler.

Paul Marlowe K4SDW
Altamonte Springs FL

SELFISH ATTITUDE?

Last year, 1980, the ARRL executives made a submission to the FCC requesting an extension of phone privileges to certain grades of American radio amateurs in the 20-meter band. In my opinion, this will merely extend the California kilowatt QRM further down the band at the expense of "rest-of-world amateurs." It may be considered a selfish attitude, but I hope the FCC rejects this proposal because I think that rest-of-world amateurs are entitled to some spectrum space free from "American kilowatt SSB."

If radio amateurs outside the United States wish to work American amateurs on SSB, it is only necessary to operate in the American phone band. However, to work rest-of-world amateurs on SSB, it is usually necessary for rest-of-world amateurs to operate between 14100 and 14200. The proposed expansion of US phone operations will increase the difficulties of rest-of-world amateurs when working DX stations outside the US, and I wonder if the ARRL executives considered this when they put forward the proposal. Remember, the whole band is available for CW, and I personally see no reason to increase the number of SSB operations in that portion of the 20-meter band, i.e., 14100 to 14200.

R. J. Jeffers ZL2AAQ
Tauranga, New Zealand

NEXT WEEK

I'm taking this moment to thank you for your help in my getting my Novice license. What help?—you might ask. I'm referring to the Beginning and 6+ code tapes.

Six weeks ago, I was despairing with regard to the International Radiotelephone Code, as it is known in much of the world (I don't hear the term used here), and then I received your tapes. I was then enrolled in a ham class the next day and my instructor said that if I had the 73 tapes, I should have no problem and would not need to purchase the tapes that the class had.

How true! On the fifth week of class—surprise! It was time for the Novice exam, and I had thought it was "next week"! I was certain that I could not pass the code exam that night, and I almost postponed it a week. I am very glad I did not! I took both elements of the exam, and now I'm waiting for my call! I'm also continuing my class and should be a Technician in another month or so.

I'm so enthusiastic about the *73* code tapes that I'm going to buy a set for my brother when he gets back home on leave, and my girl friend is using my tapes to learn the code. Also, let me add that I tried—and failed—learning the code ten years ago using (I believe) both the ARRL and USN courses (all those tapes!), but the *73* tapes made me feel comfortable with code immediately.

Once again, thank you.

Keith Glen Littlejohn
Huntington Beach CA

WRITE

In the November, 1980, issue of *73 Magazine*, as part of Wayne's editorial, the ham community was told about the House of Representatives Bill 7747. I, being a congressional letter writer since Mr. Carter put a 5.5% pay cap on the military (I was on a Fleet Ballistic Missile Submarine, the *USS Stonewall Jackson SSBN 634*, at the time), have become quite good at it.

I wrote to every congressman listed in your editorial. The best reply that I received came from a congressman that I didn't write to, by the way. I believe you should continue through your editorials to tell the hams what became of H.R. 7747, and thank those who wrote for making the system work. That might make it easier for them to write next time.

Thomas I. Nofsinger KA2ERV
Virginia Beach VA

INVERSION!

There have been a number of band plans discussed in *73*'s pages in recent months, but none so simple and effective as the one that occurred to me last night: Invert the 40m band! Rather than have Extra CW from 7.000 to 7.025, Advanced/General CW from 7.025 to 7.300, Novice CW from 7.150 to 7.200, and any phone from 7.150 to 7.300, put the Extras on 7.300 to 7.275, the Advanced/General CW on 7.275 to 7.000, the Novice band on 7.200 to 7.150, and phone operation from 7.150 to 7.000.

The benefits are enormous! SSB activity, requiring more bandwidth and therefore wider filters, is now operating free from the ravages of the megawatt foreign broadcast stations. The CW operators would be able to work around the broadcasters with much less significant QRM problems.

The drawbacks to such a plan are not as important, but need to be enumerated: 1) Any change must overcome inertia, a serious potential difficulty. 2) The most likely change to existing antennas will be lengthening—harder to do than shortening. 3) Crystal users will be displaced—hopefully not significant. 4) Our overseas friends, presently able to use the lower portion of the band for phone operation, will have more company they may not like. 5) The 40m band plan would then be a maverick, different than the other HF bands.

I feel that these drawbacks are very minor in comparison to the gain: a usable 40m phone band. I am quite serious in this proposal. What do you think?

Larry Franks N7BGZ
Issaquah WA

Plain Talk on Plain Language Rules

Tim Daniel N8RK
73 Magazine Staff

Editor's Note: The opinions expressed in this article do not necessarily reflect those of 73 Magazine.

In 1963, the amateur radio community was stunned by RM-499. This FCC proposal resulted in a furious debate over the merits of "incentive licensing." For many hams, these changes were a bitter pill to swallow. It was the mid 1970s before many old-timers accepted the inevitability of incentive licensing that RM-499 brought about.

A few years ago, the CB craze swept the nation and it was time for yet another FCC bombshell to arrive. The prospect of a no-code license reared its ugly head in Docket 20282. Other proposals included a simplified "dual-ladder" license structure and a new way to measure transmitter power. With the implications of incentive licensing in the back of many minds, amateurs presented overwhelming opposition to 20282 and the no-code license.

Enter the 1980s, and a sweeping proposal to convert the present rules into "plain-language" form. Because of Docket 80-672's length, it cannot be reproduced here in its entirety. Instead, this article will present an overview of how the plain-language rules came about and what substantive changes are proposed.

The obvious question is: "Why do hams need new rules?" The Commission's answer is: "The existing rules are not written to take into account the wide range of applicants and licenses. For this reason, the rules are not as useful as they should be." Are the current rules "unnecessarily complex and difficult to understand"? The FCC thinks so, how about you?

First CB, Now Amateur Radio

The drive to remove gobbledygook from FCC regulations began in December, 1976, when Part 95 was divided into four subsections, encompassing mobile radio, radio control, Citizens Band, and technical standards. By early 1978, the Carter administration's executive order to make all government regulations understandable to John Q. Public had begun to sink in. Among the first examples of "FCCese" to be rewritten were the CB rules.

According to John Johnston of the Private Radio Bureau, the CB rewrite was the product of cooperation between involved citizens and FCC staffers. The final version was, in the words of the Commission, "met with widespread acclaim." The new CB rules now serve as an example for other government departments.

The style and format of the new Citizens Band rules were duplicated when a plain-language version of the radio control rules was proposed. When the Commission turned its attention to the amateur rules, they were convinced that their formula was a proven success. The exact details of who authored Docket 80-672 and how long it took are not known. However, the Commission does claim that direct citizen involvement was not needed nor used in preparing the proposed rules.

New Words for Old Rules

The basic format for the plain-language rules involves presenting a rather general question, followed by a detailed answer. The new rules are oriented to a target audience that is probably younger and less educated than the average ham. Simplifying the rules so that they could be more easily understood involved using the grammatical first and second person. To emphasize the difference between required actions and permissible actions, the Commission makes heavy use of the words "may" and "must."

The proposed rules contain a total of 111 questions and answers. The majority of the questions fall under Subpart A—Amateur Radio Service. Subparts B and C deal with RACES and ASAT,

the Amateur Satellite Service. The fourth subpart, D, offers an explanation of the technical standards that your amateur station must meet. Topics include the 10-meter amplifier ban, power measurement, and standards for video or digital emissions.

In order to make the new rules consistent with international regulations, the proposed title for Part 97 is "Amateur Telecommunications Services." If you have recovered from the shock of a new name for your hobby, then you might want to consider the suggested description of amateur radio.

PROPOSED RULE

§ 97.1 (AR Rule 1) What is the Amateur Radio (AR) Service?

The AR Service is for persons interested in the technical side of radio communications. They use the service only for their own personal satisfaction and get no financial benefit from its use. They learn about radio, communicate with other operators around the world, and find better ways to communicate by radio.

For some unexplained reason, the new definition offers no mention of enhancing international goodwill or the valuable role that amateurs play when there is a disaster. These two areas shouldn't be overlooked.

In almost the same breath that the FCC claims that "we do not propose to change the structure of the Amateur Radio Service in this rulemaking," they give details about three changes that are found in the new rules.

Eliminate Logging

"First, we propose to eliminate all logging requirements. We are substituting for the existing logging rule a new rule requiring licensees to keep certain items in their station records."

PROPOSED RULE

§ 97.57 (AR Rule 57) What do I have to keep in my station records?

(a) You must keep the following items in your station records for all types of operation:

(1) A copy of each letter telling the FCC of your name or address change;
(2) Your license (or other authorization) or a photocopy;
(3) A current copy of the Amateur Telecommunications Services Rules, with amendments;
(4) A copy of each response to an FCC discrepancy notification;
(5) Each written permission you receive from the FCC; and
(6) A copy of any other correspondence to or from the FCC about your AR station license or your license (or other authorization).

(b) When your AR station is in repeater operation, you must keep a computation of its AHAAT and ERP (see AR Rule 44) in your station records.

(c) When your AR station is being remotely controlled (see AR Rule 43), you must keep the following items in your station records:

(1) The names, addresses and AR station call signs of all control operators you have authorized;
(2) A functional block diagram and a technical explanation that describe operation of the control link; ("Control link" is the equipment that accomplishes remote control between a control point and a remotely controlled station.)
(3) A description of measures taken to protect the station from access by unauthorized persons;
(4) A description of the measures taken to prevent unauthorized operation by activating the control link or by some other means;
(5) A description of the measures for shutting down the station if the control link stops working correctly; and
(6) A description of the means used to monitor the transmitting frequencies.

(d) You must keep your station records for the term of your license (or other authorization).

Rules Must Be On Hand

"We propose to require licensees to keep an up-to-date copy of the Amateur Telecommunication Service Rules. This proposed requirement should help licensees know and understand the rules better and promote self-regulation by licensees. This, in turn, will result in better radio operation and more efficient use of the limited radio spectrum."

PROPOSED RULE

§ 97.51 (AR) Rule 51) Do I need to have a copy of the Amateur Telecommunications Services Rules?

(a) You must keep a current copy of Part 97, FCC Rules for the Amateur Telecommunications Services, in your AR station records. The Amateur Telecommunications Services Rules are published periodically by the Government Printing Office.

(b) You must stay up to date with changes to the Amateur Telecommunications Services Rules. Changes are found in the Federal Register and in other publications.

Station Inspections Detailed

"Finally we propose to exercise the authority granted in Section 303(n) of the Communications Act and require that licensees make their stations available for inspection by an FCC representative. We think that this requirement is necessary to encourage compliance with the rules."

PROPOSED RULE

§ 97.56 (AR Rule 56) Do I have to make my AR station and its records available for inspection?

(a) If an authorized FCC representative requests to inspect your AR station and its records, you or the control operator must make the station and its records available for inspection.

(b) The FCC may inspect your station and its records at reasonable times. The FCC considers that a reasonable time to inspect your station is any time during the business day or any time your station is transmitting or has just finished transmitting.

Unnecessary and Unintended Hardships

The proposed changes that are acknowledged by the FCC are just part of the story. Unfortunately, the authors of the plain-language rules changed key words and phrases that result in some very different meanings than you find in the old rules. Unless these areas are clarified, the operation of many amateur radio stations could be adversely affected. Because of the varied nature of ham radio, it is almost impossible for any one individual to spot all the slipups. Here are several problem rules that have been brought to the attention of *73*:

Proposed AR Rule 41 requires that "at the end of two-way AR communications, you must also transmit the callsign of the station you were communicating with." WA8MHO points out that this rule does not account for the needs of roundtables or nets. The present rule (97.84) allows the use of a "generally accepted network identifier." In this case, the simplified rule ends up being a hindrance for some amateurs.

W2JTP notes that proposed rule AR 33 takes away the privilege to "retransmit either live or delayed, transmissions of any AR station, except when your station is in repeater operation or auxiliary operation."

This rule would eliminate the storage and retransmission of RTTY and slow-scan TV pictures. It would put an end to the practice of having another station record and then retransmit your audio for test purposes. This rule would also eliminate the retransmission of ARRL and other bulletins.

The existing rules prohibit only the *automatic* retransmission of signals from a nonrepeater or nonauxiliary station. Drop the word "automatic" and a new and bothersome regulation is born.

A third example of the attempt to simplify gone sour can be found in AR Rule 30 as noted by both WA8MHO and W2JTP. The existing rules allow antennas to be as high as 200 feet unless you live near an airport. If you want antennas higher than 200 feet, then, in some instances, a special application is needed. The proposed rule is worded such that it discourages the installation of any antenna that will be more than 20 feet higher than the building it is attached to. This new rule amounts to little more than a poor imitation of the Citizens Band rule governing antennas.

The proposed Technical Standards give a lengthy description of the technique the FCC will use to measure power levels and bandwidth. There is no mention of the techniques that the average ham can use to ensure that he or she operates legally. To be absolutely certain that your emissions do not exceed the power or bandwidth limits, you need the same kinds of sophisticated test equipment the Commission uses.

Your Vote Counts

Many, if not all, of Docket 80-672's flaws could have been eliminated if the FCC had involved the public (i.e., active hams) in an advisory capacity. Instead, we have been presented with rules that are a near carbon copy of the appliance operator approach the Commission used with CB.

Declaring the proposed rules to be a total loss is unfair. In many cases, the process of simplification has rid the rules of ambiguities. Docket 80-672 goes a long way to eliminate the phenomenon of three FCC officials giving three different interpretations of the same rule. It would be foolish to criticize the idea of reducing the complex jargon that confuses people instead of informing them. While it is hard to challenge the motive behind the new rules, it is unfortunate that the methodology and resulting proposal leave something to be desired.

Rather than condemn or accept the proposal in its entirety, you should scrutinize every rule that affects your operation. Ask questions. Does the new rule make sense? Will it hinder my enjoyment of ham radio? Is unofficial FCC policy being turned into an official rule?

Let the FCC know what you think. The deadline for comments is June 19, 1981. To be a formal participant, you should file the original and five copies of your comments by the June 19 deadline. If you would like each Commissioner to get your remarks, file 11 copies. The FCC will consider all input, regardless of the number of copies submitted. If you have something to say, now is the time to speak out. Be sure to let *73 Magazine* know, too.■

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received two months prior to the month in which the event takes place. They should be sent directly to Editorial Offices, 73 Magazine, Pine Street, Peterborough NH 03458, Attn: Social Events.

ROCHESTER NY
MAY 15-16

The Atlantic Division/New York State Convention, combined with the Rochester Hamfest, will be on Friday and Saturday, May 15-16, at the Monroe County Fairgrounds, Rte. 15A, Rochester NY. Commercial exhibits will be open from 1:00-9:00 pm Friday and from 8:30 am until 6:00 pm Saturday. A huge outdoor flea market will open at 1:00 pm Friday and run continuously until closing Saturday evening.

Programs include an NTS Forum with Bob Halprin K1XA, Asst. Comm. Mgr., ARRL; a League Forum with Pres. Harry Dannals W2HD, Directors Jesse Bieberman W3KT, Stan Zak K2SJO, and others. Other programs wil be on antennas, transmitters, VHF, and for beginners, presented by Bill Myers K1GQ, Pete O'Dell KB1N, and Ray Heaton WAØDYZ. There will also be an ARES forum and section and local net meetings. A highlight of the day will be the 2nd annual W2RUF Memorial Code Contest. Ladies' programs will be presented all day at hamfest hotel headquarters, the Marriott Thruway. Bus transportation will be provided from the fairgrounds to the hotel and to shopping malls.

The annual awards banquet will be Saturday evening at the Marriott. At midnight the Wouff Hong ceremony will be presented. All are welcome to participate.

Registration is $5 at the gate. The banquet will be $11. Flea market permits will be $2 per parking space. For info, write PO Box 1388, Rochester NY 14603 or call (716)-424-1100.

RICHLAND WA
MAY 30-31

The Tri-City Hamfest Council will hold its second annual Tri-City Hamfest and Computer Fair on May 30-31, 1981, beginning at 9:00 am at the Community House, Richland WA. Admission is $3.00 and children under 15 will be admitted free. The Saturday evening banquet will feature as speaker the NW ARRL Director, Mary Lewis; tickets are $15.00 each. Other features will include seminars, a door prize and raffle, a swap shop, antiques, vendors, and computer demonstrations. Talk-in on .04/.64, .16/.76 and .52.

MUNCIE IN
MAY 31

The Muncie Area Amateur Radio Club will hold its second annual hamfest on Sunday, May 31, 1981, at the Field and Sports Building on the Ball State University Campus, Muncie IN. Tickets are $3.00 at the door and tables are $2.00. There will be over $2,000 in prizes, and plenty of parking and hamfest space.

GRAND RAPIDS MI
JUN 6

The Independent Repeater Association will hold the Grand Rapids Spring Swap & Shop on Saturday, June 6, 1981, at the National Guard Armory, 44th Street, just 1/4 mile west of US 131. There will be door prizes, dealers, food, and indoor swap area, forums, and trunk sales. Reserved dealer area is available. Doors open at 8:00 am. Tickets are $2.00 and indoor tables are $5.00. Talk-in on 147.765. For further information, contact David Jenista WD8NZZ, 437 Airview SE, Wyoming MI 49508.

MANASSAS VA
JUN 7

The Ole Virginia Hams Amateur Radio Club, Inc., will hold its annual Manassas Hamfest on Sunday, June 7, 1981, at the Prince William County Fairgrounds, Route 234, Manassas VA. Booths are available. Admission is $3.00, children under 12 will be admitted free, and tailgaters will be charged an additional $2.00. Features will include a ladies' program, indoor and outdoor exhibit areas, a full breakfast and lunch, children's entertainment, CW proficiency awards, and QSL bureaus. Talk-in on 146.37/146.97 repeater (W1CRO) and 146.52 simplex. For booth reservations, contact Joseph A. Schlatter K4FPT, Ole Virginia Hams ARC, Inc., PO Box 1255, Manassas VA 22110.

CHELSEA MI
JUN 7

The Chelsea Swap and Shop will be held on Sunday, June 7, 1981, at the Chelsea Fairgrounds, Chelsea MI. Gates will open for sellers at 5:00 am and for the public from 8:00 am until 2:00 pm. Admission Is $1.50 in advance or $2.00 at the gate. Children under 12 and non-ham spouses are admitted free. Talk-in on 146.52 simplex and the 147.855 Chelsea repeater. For more info, write to William Altenberndt, 3132 Timberline, Jackson MI 49201.

ROME NY
JUN 7

The Rome Radio Club, Inc., will hold its 29th annual Ham Family Days on June 7, 1981, beginning at 9:00 am at Beck's Grove, 10 miles west of Rome, just off Route 49 adjoining Beck's Grove Airport. There will be a flea market and displays. Talk-in on 146.28/.88, 146.34/.94 and 146.52.

CIRCLEVILLE OH
JUN 7

The Teays Amateur Radio Club will hold the fourth annual King of the Pumpkin Hamfest on Sunday, June 7, 1981, from 9:00 am to 5:00 pm at the fairgrounds coliseum, Circleville OH. Advance admission is $2.00; at the door, $3.00. Tables are available at $3.00 per 8-foot space and tailgating is $2.00. There will be an indoor and outdoor flea market, new and used equipment, door prizes, refreshments,

and free parking. For advance reservations and further information, contact Dan Grant W8UCF, 22150 Smith Huise Road, Circleville OH 43113, or phone (614)-474-6305.

SHARONVILLE OH
JUN 12

The Hamilton County Amateur Radio Public Service Corp. will sponsor the first annual Cincinnati ARRL '81 Convention at the Scarlet Oaks Vocational Campus, Sharonville OH, on Saturday, June 12, 1981. This event will *not* be replacing the Cincinnati Hamfest which will be held on Sunday, September 20, 1981, at the usual location at Stricker's Grove, Ross OH.

STATEN ISLAND NY
JUN 13

The Staten Island Amateur Radio Association will hold its flea market on June 13, 1981, from 9:00 am to 4:00 pm on the grounds of All Saints Episcopal Church, Victory Boulevard and Wooley Avenue (take I-278 to the Victory Boulevard exit, then go ½ mile east on Victory Boulevard). There will be no admission charge for buyers. Sellers' admission is $3.00 and sellers must provide their own tables. Talk-in on 146.28/.88 and 146.52. For further information, send an SASE to WA2AMJ, PO Box 495, Staten Island NY 10314.

MIDLAND MI
JUN 13

The Central Michigan Amateur Repeater Association will hold its seventh annual hamfest on June 13, 1981, from 8:00 am to 2:00 pm at its new location in the "Great Hall" in the Valley Plaza complex, just off US Rte. 10 in Midland, Michigan. Tickets are $3.00; children under 12 will be admitted free. Tables are available for $6.00 ($3.00 for half a table). Trunk sales will be $2.00 in a designated area. There will be plenty of free parking. The Valley Plaza Complex offers motel accommodations, RV hookups, swimming, dining, a bowling alley, theaters, and a picnic area. The major prize drawing will be at 1:30 (for an HT); there will be hourly drawings for other prizes. Videotapes of the Saturn fly-by will be shown. Talk-in will be on 146.13/.73 and 146.52 simplex. For information, contact Carol Hall WD8DQG, 4651 Cardinal Drive, Mt. Pleasant MI 48858; (517)-772-0363.

GUELPH ONT CAN
JUN 13

The Guelph Amateur Radio Club will hold the 6th annual Central Ontario Amateur Radio Fleamarket and Computer Fest on Saturday, June 13, 1981, at the Centennial Arena, College Avenue West, Guelph, Ontario, Canada. Admission is $1.00, with children 12 years and under admitted free. Admission for vendors is an additional $2.00. Tables are $5.00 each on a first-come basis. The hours are 8:00 am to 4:00 pm; vendors may begin setting up at 6:00 am. There will be commercial displays, computer software and hardware, surplus dealers, indoor and outdoor displays, and door prizes. The refreshment concession will open at 12:00 noon. Talk-in on .52/.52, .37/.97 (VE3KSR), and .96/.36 (VE3ZMG). For further information, contact Dennis Gore VE3DGA at (519)-836-6226 or Andy Janosik VE3GDY at (519)-824-3227.

BELLEFONTAINE OH
JUN 14

The Champaign Logan Amateur Radio Club, Inc., will hold its annual hamfest on Sunday, June 14, 1981, at a new location, The Logan County Fairgrounds, South Main Street and Lake Avenue, Bellefontaine OH. Admission is $1.50 in advance and $2.00 at the door; trunk and table sales are $3.00. Available this year will be a bid table, door prizes (grand prize is $300.00), and free parking. Talk-in on 146.52 and Hi-Point repeater. For more information, contact John L. Wentz W8HFK, Box 102, West Liberty OH 43357, or Paul F. Amerine WD8NEB, Box 185, West Mansfield OH 43358.

WILMINGTON OH
JUN 14

The Clinton and Highland County Radio Clubs will sponsor their annual hamfest and flea market on June 14, 1981, rain or shine, at the Clinton County Fairgrounds, State Route 22, Wilmington OH, from 1200 to 2100 UTC. Admission is $3.00 and flea market space is free with admission ticket. There will be a sheltered display area, a food concession, an auction, and door prizes. Camping is available at nearby Cowan Lake State Park, as well as at private campgrounds and motels. King's Island Park is also nearby. Talk-in on 147.72/.12, 147.81/.21, or 146.52. For further information, contact Bob Lewis KE8E, 192 Northview Road, Blanchester OH 45107, or phone (513)-783-2740 evenings.

SANTA MARIA CA
JUN 14

The Satellite Amateur Radio Club will hold the Santa Maria Amateur Radio Swapfest at the Newlove picnic grounds (Union Oil Company), Santa Maria CA. For information on prizes, swap tables, dinner tickets, etc., mail inquiries to Santa Maria Swapfest, 1600 E. Clark #49, Santa Maria CA 93455.

AKRON OH
JUN 14

The 14th annual Goodyear A.R.C. Hamfest will be held on Sunday, June 14, 1981, from 10:00 am to 5:00 pm at Goodyear Wingfoot Lake Park, near Rtes. 224 and 43, east of Akron OH. Family admission and donation is $3.00, which includes flea-market and dealer-area spaces. Features will include major prizes as well as ladies' and hourly door prizes, a picnic area, concession stands, and ample free parking. Talk-in on .04/.64. For further information, contact Don Rodgers WA8SXJ, 161 S. Hawkins Avenue, Akron OH 44313.

WILLOW SPRINGS IL
JUN 14

The Six Meter Club of Chicago, Inc., will sponsor the 24th annual ABC Hamfest on Sunday, June 14, 1981, at Santa Fe Park, southwest of Chicago, 91st and Wolfe Road, Willow Springs IL. Advance registration is $1.50; the cost is $2.00 at the gate. There will be picnic grounds, refreshments, and parking available. Featured will be a large swappers' row, displays in the pavillion, and AFMARS meeting, and prizes of a color TV and an IC-2A or Bearcat 210. Talk-in on 146.52 or WR9ABC .37/.97 (PL2A). For more information and advance tickets, contact Val Hellwig K9ZWV, 3420 South 60th Court, Cicero IL 60650.

GRANITE CITY IL
JUN 14

The Egyptian Radio Club will hold their annual hamfest on Sunday, June 14, 1981, at their clubhouse in Granite City Il. The events begin at 8:00 am and include main prizes (your choice of a TRS-80 Level III, Kenwood TS-130S, or Panasonic PV-1200 video tape recorder), many other prizes, free coffee and doughnuts, flea market, bingo, and children's activities. Admission is $1.00 advance and $2.00 at the door. Talk-in on 146.16/.76, .52, and 3993. For tickets or info, write Bess J. Nelson KBØPG, 4 Covey Court, Florissant MO 63031, and include an SASE.

MONROE MI
JUN 14

The annual Monroe County Radio Communications Hamfest will be held on June 14, 1981, from 8:00 am to 3:00 pm at the Monroe Community College on Raisinville Road, Monroe MI. Tickets are $2.00 at the gate, $1.50 in advance, and XYLs and children will be admitted free. There will be free parking, contests, an auction, displays, and plenty of table space. Talk-in on 146.13/.73 and .52. For more information, contact Fred Lux WD8ITZ, PO Box 982, Monroe MI 48161, or call (313)-243-1088.

ALLENWOOD PA
JUN 14

The 10th annual Milton Amateur Radio Club Hamfest will be held on June 14, 1981, rain or shine, at the Allenwood Firemen's Fairgrounds, located on US Route 15, 4 miles north of I-80, Allenwood PA. Hours are from 8:00 am to 5:00 pm. Registration for sellers is $2.50 in advance or $3.00 at the gate. XYLs and children will be admitted free. Featured will be a flea market, an auction, contests, cash door prizes, a free portable and mobile FM clinic, and supervised children's activities. An indoor area will be available for food and beverages. Talk-in on .37/.97 and .52 simplex. For further details, write Harold C. Dennin AC3Q, c/o Milton Amateur Radio Club, PO Box 235, Milton PA 17847, or phone (717)-538-5455.

OXFORD ME
JUN 20

The Yankee Radio Club will hold its Yankee Hamfest '81 on Saturday, June 20, 1981, at the Oxford County Fairgrounds, Oxford ME. Features will include computer displays, talks on selected subjects, a ladies' program, a youth program, swap tables, a flea market, manufacturers' booths, a CW contest, many prizes, and a buffet dinner

in the evening. Registration at the door will be $8.00 for dinner and prizes ($7.00 for early registration). Admission at the gate is $2.50 and includes prizes. Camper hookups will be available for Friday and Saturday nights at $2.00 per night. Talk-in on 146.28/.88 and 146.52 by W1BYK. For more information and registration, send an SASE to Edward M. Fahey, Jr., W1OKS, 19 Farwell Street, Lewiston ME 04240.

DUNELLEN NJ
JUN 20

The Raritan Valley Radio Club (W2QW) will hold its 10th annual hamfest and flea market on Saturday, June 20, 1981, from 8:30 am to 4:00 pm, rain or shine, at Columbia Park, Dunellen NJ. There will be door prizes and a snack bar. Admission is $3.00 for sellers and $2.00 for lookers. Talk-in on 146.625/.025 (W2QW) and 146.52. For further information, call KB2EF (201)-369-7038, 9:00 am to 4:00 pm.

SIDNEY MT
JUN 20-21

The Sidney, Montana, ARC will hold the 26th annual Eastern Montana Hamfest on June 20-21, 1981, at the Richard County Fairgrounds in Sidney MT. Activities include overnight parking, flea market, used gear auction, prizes, and contests for all. A potluck lunch will be held on Sunday. Talk-in .52 and 7240 kHz. Contact Ron Martini N7BMR, Box 449, Sidney MT 59270.

TORRINGTON CT
JUN 20-21

The C.Q. Radio Club will hold a two-day ham-radio flea market on June 20-21, 1981, at the Torrington Drop-In Center, East Albert Street, Torrington CT, from 9:00 am to 5:00 pm. There will be indoor tables for sellers, an outdoor tailgater area, bake-sale items, refreshments, prizes, raffles, and plenty of free parking. The entrance fee of $2.00 includes one chance for a door prize. There will be two separate raffles; the winner need not be present for either raffle prize. One raffle prize will be a portable black and white TV set and the other raffle prize will be an Icom IC-2AT synthesized 2-meter hand-held. Raffle tickets for either prize are $1.00 each or a book of 12 for $10.00. Table space will cost $5.00 per table, or $3.00 per half-table; tailgate space will cost $2 per space. Talk-in on 146.25/.85, 147.84/.24, and 146.52. For table or tailgate reservations, raffle tickets, or more information, contact Gil Donovan WB1DVD, 50 Wood Street, Torrington CT 06790; Dave Johnstone WB1COB, 19 Margerie Street, Torrington CT 06790; or The C.Q. Radio Club, PO Box 692, Torrington CT 06790.

CROWN POINT IN
JUN 21

The Lake County Amateur Radio Club will hold its ninth annual hamfest on June 21, 1981, at the Lake County Fairgrounds, Crown Point IN. The gate will open at 8:00 am, and all tickets are $2.00. Talk-in on 147.84/.24 and 146.52. For further information, contact "Mike" Evanson KA9COM, 8037 Monaldi Drive, Munster IN 46321.

LANCASTER OH
JUN 21

The Lancaster and Fairfield County ARC 1981 Family Hamfest will be held on June 21, 1981, from 9:00 am to 5:00 pm at The P&R Party Barn, 4 miles west of Lancaster OH, off Rte. 188. Advance tickets are $2.00 and tickets at the gate are $3.00. Flea market tables are $2.00 and out-of-the-auto selling is $1.00. Features will include prizes, an R/C model aircraft demonstration, and many outdoor activities for everyone. Refreshments and overnight camping will be available. Talk-in on 147.63/.03 or .52. For more information or tickets, write C. Ted Riley WB8VOA, PO Box 3, Lancaster OH 43130, or phone (614)-653-8222.

TERRE HAUTE IN
JUN 21

The 35th annual WVARA Hamfest will be held on June 21, 1981, at the Vigo County Fairgrounds, one mile south of I-70 on US 41, Terre Haute IN. Overnight camping will be available. There will be a free outdoor flea market, a covered flea market at $2.00 for a 12' × 12' space (with some tables and ac available). Other features include XYL bingo, refreshments, valuable prizes, and a giant shopping mall nearby. Advance sale tickets are $2.00 or 3 for $5.00. Tickets at the gate are $3.00, with children under 12 admitted free. Talk-in on .25/.85 and .52. For more information and tickets, send an SASE to WVARA Hamfest, PO Box 81, Terre Haute IN 47808.

FREDERICK MD
JUN 21

The 4th annual Frederick Hamfest will be held on Sunday, June 21, 1981, from 8:00 am to 4:00 pm at the Frederick Fairgrounds, Frederick MD. Admission is $3.00; $2.00 extra for tailgating. YLs and children will be admitted free. Features include prizes, demonstrations, exhibits, flea-market tables, tailgating, and an FM clinic. Food and drink services and free parking will be provided. Talk-in on 146.52. For additional information, contact Rick N3RO or Peg N3AIJ, Hamfest Directors, 9425 Glade Avenue, Walkersville MD 21793, or phone (301)-898-3233.

MAPLE RIDGE BC CAN
JUL 4-5

The Maple Ridge ARC will hold its Hamfest '81 on July 4-5, 1981, at the Maple Ridge Fairgrounds, located 30 miles east of Vancouver, Maple Ridge BC. Registration for hams is $4.50, a program with a ticket for a drawing is $2.50, and the dinner and dance is $10.00. Registration for non-hams over 12 years old is $2.00; non-hams under 12 will be admitted free. There will be food and camper space (without hookups) available. Features will include prizes, a swap and shop, a bunny hunt, a ladies' program, and much more. Talk-in on 146.34/.94 and 146.19/.79. For more information and advanced registration, contact Bob Haughton VE7BZH, Box 292, Maple Ridge BC V2X 7G2.

OAK CREEK WI
JUL 11

The South Milwaukee Amateur Radio Club, Inc., will hold its annual swapfest on Saturday, July 11, 1981, at the American Legion Post #434, 9327 South Shepard Avenue, Oak Creek WI. Admission is $2.00 and includes a happy hour with free beverages. Prizes include a $100 first prize and a $50 second prize. Activities will begin at 7:30 am and continue until 5:00 pm. Parking, a picnic area, hot and cold sandwiches, as well as liquid refreshments, will be available on the grounds. Overnight camping is also available. Talk-in on 146.94. More details, including a map, may be obtained from The South Milwaukee Amateur Radio Club, PO Box 102, South Milwaukee WI 53172.

PITTSFIELD MA
JUL 11-12

The Northern Berkshire Amateur Radio Club will hold its annual hamfest on Saturday and Sunday, July 11-12, 1981, at the Cummington Fairgrounds, Cummington MA (off Rte. 9). General admission is $3.00 in advance, and $4.00 at the gate. Family admission is $5.00 in advance and $6.00 at the gate. Dealers are welcome. Talk-in on 146.31/.91. For further information, contact Herb Blake, PO Box 567, North Adams MA 01247.

MOUNT SINAI LI NY
JUL 12

Radio Central ARC will hold its 3rd annual hamfest on Sunday, July 12, 1981, from 9:00 am to 4:00 pm on the grounds of Mount Sinai Elementary School, Rte. 25A, Mount Sinai LI NY. Admission for buyers is $1.50; XYLs and harmonics will be admitted free. Sellers' spaces are $3.00. There will be door prizes, a grand prize drawing at 3:00 pm, a contest, and refreshments. Talk-in on 145.15 (WA2UEC) and 146.52. For more information, contact Lew Franklin at (516)-265-5614.

INDIANAPOLIS IN
JUL 12

The Indianapolis Amateur Radio State Convention and Hamfest will be held on Sunday, July 12, 1981, at the Marion County Fairgrounds. For further information, write Indianapolis Amateur Radio Association, Box 11086, Indianapolis IN 46201.

CHARLESTON SC
JUL 18-19

The Charleston Amateur Radio Society, Inc., will hold its eighth annual Charleston Hamfest on July 18-19, 1981, at the Omar Shrine Temple, 44E Battery Street, Charleston SC. There will be overnight security guards and refreshments available. For more information, contact the Charleston Hamfest Committee, PO Box 30643, Charleston SC 29407, or phone (803)-747-2324/496-3660.

Robert B. Grove WA4PYQ
Rt. 1, Box 156
Brasstown NC 28902

A Timely New Product

—the MFJ-102 digital clock

While inexpensive digital clocks are plentiful on the marketplace, the new MFJ-102 is a step above the average.

Featuring a low-profile aluminum-accented black cabinet, the clock functions around a brilliant fluorescent display. The 5/8-inch characters are clearly visible across the largest room, even in bright ambient light.

For the ham shack, a simple switch setting selects the 24-hour mode. Hours and minutes are always displayed; seconds may be called up by pressing the top bar.

The 102 also may be switched to display 12-hour time, complete with an AM/PM illuminated indicator, for local nets and routine domestic use.

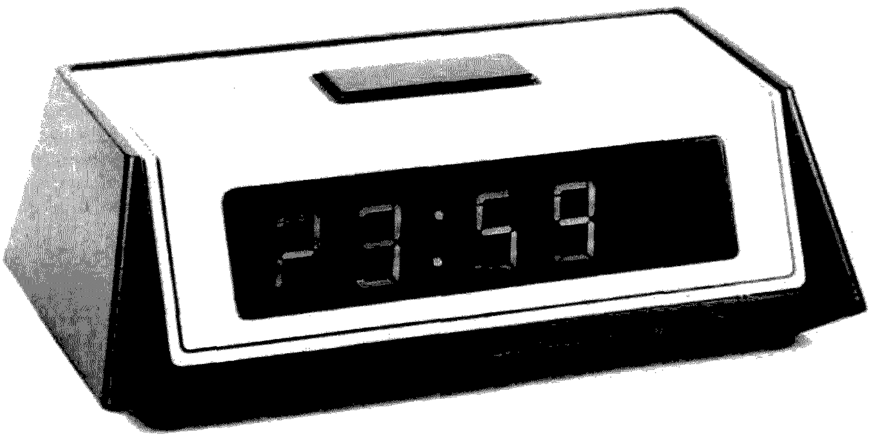
The clock also has an internal alarm complete with snooze button. The alarm doubles as a handy 9-minute ID timer—great for those who conveniently forget those legal IDs!

Time synchronization with WWV is a snap. Fast and slow set buttons allow easy reset, and to prevent accidental bumping of the reset buttons, a lock switch is provided.

Power interruption is always a problem for accurate-time buffs, but the MFJ-102 first-digit display segments will blink repeatedly until reset following a power-line interruption.

Although the clock comes set for American 120 V ac, 60-Hz line power, foreign 50-Hz operation is possible by merely shorting a pair of circuit pads on the PC board. 220- and 240-volt operation may be accommodated with the use of an external voltage-dropping transformer.

We found the MFJ-102 to be flexible, reliable, and easy to read. At $32.95, it represents a good value for the ham shack. For further information, contact *MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762; (601)-323-5869*. Reader Service number 476.■



The MFJ-102 digital clock.

HAM HELP

I need a MITS manual on Altair 8800 BASIC which I can purchase or copy and return.

Carl S. Peterson N6CSI
219 E. Ashland Ave.
Visalia CA 93277

I am writing an expanded history of Wake Island and would like to hear from anyone who has operated from Wake/Peale/Wilkes Islands as a ham, commercial, or military radio op.

I am also interested in converting/repackaging a Gonset 6-meter Communicator for CW/FM/SSB, as well as borrowing the manual/schematics for the rig (I will pay postage).

Frank P. Nollette, SMSGT, USAF
KA0AOJ/KH6
7702C Kikanai Loop
Hickam AFB HI 96818

I am interested in obtaining a schematic or any other information on an old TV Analyzer Scope, model #1076, manufactured by B & K Mfg. Company, Chicago IL. Thanks.

A. B. Wells WA5COH
PO Box 50
Tunica LA 70782

I am looking for an FV-401 external vfo and/or matching speaker to buy at a reasonable price. Also, does anyone know anything about PI2MN or 5N20/HB9BVL?

Todd D. Greenleaf KA1CFQ
108 Edward Ave.
Pittsfield MA 01201

Need wiring diagram package No. WDP-0203 for a 32ASR with Centralized Selective Calling System and SA150 Accessory/Interface Unit. Will pay copy costs and/or mailing.

Terry Simonds WB4FXD/1
PO Box 1558
Edgartown MA 02539

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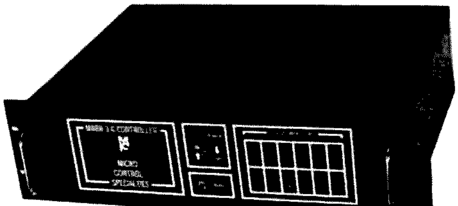

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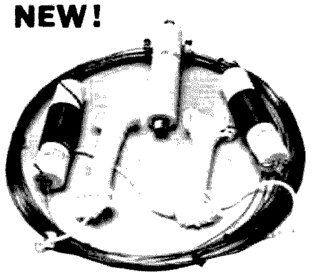

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HAM HELP

I want a circuit and construction article for a 4-250A in grounded-grid for HF. I will pay for copying and postage, or I will copy and return. Thank you.

Gary Kriss VE7CGK
20776 114th Ave.
Maple Ridge B.C.
Canada V2X 1K1

I have an electronic voltmeter model 302C made by Ballantine Laboratories. I would like a schematic or service manual or any information on this.

J. Humphrey KB3T
618 Magee Ave.
Patton PA 16668

I am looking for instruction books for a KAAR Mfg. Co. TR-505N UHF FM base station and a NAVY RBM-4 series HF receiver. I also have available a fairly comprehensive library of GE, Motorola, and RCA FM manuals and will try to help anyone who includes an SASE with information on these makes.

Geoff Fors WB6NVH
PO Box 2946
Carmel CA 93921

I am still searching for a Collins 32S1 transmitter in any condition that is not being used and is cheap. Please state condition and price.

H. F. Schnur
115 Intercept Ave.
North Charleston SC 29405

I need any information, including the schematic, on "Communications Receiver Made for Department of Commerce, Civil Aeronautics Administration, Type RCP, Made by National Co., Malden, Mass. Modified by Schuttig and Co., Washington, DC. Dated 10-30-45."

Bob Hughes KX4A
PO Box 29044
Richmond VA 23233

OSCAR ORBITS

Courtesy of AMSAT

The OSCAR satellites are subject to atmospheric drag, of course, and the present period of intense solar activity has accentuated the problem. During this period, our sun has been expelling huge numbers of charged particles, some of which find their way into the Earth's upper atmosphere, increasing the density (and thus the drag) there. It is through this region that the OSCARs must pass. OSCAR 8, in a lower orbit than OSCAR 7, is the more seriously affected of the two.

If the drag factor is not considered when OSCAR calculations are performed, long-range orbital projections will be in error. For example, by the end of 1979, OSCAR 8 was more than 20 minutes ahead of some published schedules. The nature of orbital mechanics is such that extra drag on a satellite causes it to move into a lower orbit, resulting in a shorter orbital period. Thus, the satellite arrives above a given Earthbound location earlier than predicted.

Using data supplied to us by Dr. Thomas A. Clark W3IWI of AMSAT, the equatorial crossing tables shown here were generated with the aid of a TRS-80™ microcomputer. The tables take into account the effects of atmospheric drag and should be in error by a few seconds at most.

The listed data tells you the time and place that OSCAR 7 and OSCAR 8 cross the equator in an ascending orbit for the first time each day. To calculate successive OSCAR 7 orbits, make a list of the first orbit number and the next twelve orbits for that day. List the time of the first orbit. Each successive orbit is 115 minutes later (two hours less five minutes). The chart gives the longitude of the day's first ascending (northbound) equatorial crossing. Add 29° for each succeeding orbit. When OSCAR is ascending on the other side of the world from you, it will descend over you. To find the equatorial descending longitude, subtract 166° from the ascending longitude. To find the time OSCAR 7 passes the North Pole, add 29 minutes to the time it passes the equator. You should be able to hear OSCAR 7 when it is within 45 degrees of you. The easiest way to determine if OSCAR is above the horizon (and thus within range) at your location is to take a globe and draw a circle with a radius of 2450 miles (4000 kilometers) from your QTH. If OSCAR passes above that circle, you should be able to hear it. If it passes right overhead, you should hear it for about 24 minutes total. OSCAR 7 will pass an imaginary line drawn from San Francisco to Norfolk about 12 minutes after passing the equator. Add about a minute for each 200 miles that you live north of this line. If OSCAR passes 15° east or west of you, add another minute; at 30°, three minutes; at 45°, ten minutes. Mode A: 145.85-.95 MHz uplink, 29.4-29.5 MHz downlink, beacon at 29.502 MHz. Mode B: 432.125-.175 MHz uplink, 145.975-.925 MHz downlink, beacon at 145.972 MHz.

At press time, OSCAR 7 was scheduled to be in Mode A on odd numbered days of the year and in Mode B on even numbered days. Monday is QRP day on OSCAR 7, while Wednesdays are set aside for experiments and are not available for use.

OSCAR 8 calculations are similar to those for OSCAR 7, with some important exceptions. instead of making 13 orbits each day, OSCAR 8 makes 14 orbits during each 24-hour period. The orbital period of OSCAR 8 is therefore somewhat shorter: 103 minutes.

To calculate successive OSCAR 8 orbits, make a list of the first orbit number (from the OSCAR 8 chart) and the next thirteen orbits for that day. List the time of the first orbit. Each successive orbit is then 103 minutes later. The chart gives the longitude of the day's first ascending equatorial crossing. Add 26° for each succeeding orbit. To find the time OSCAR 8 passes the North Pole, add 26 minutes to the time it crosses the equator. OSCAR 8 will cross the imaginary San Francisco-to-Norfolk line about 11 minutes after crossing the equator. Mode A: 145.85-.95 MHz uplink, 29.4-29.50 MHz downlink, beacon at 29.40 MHz. Mode J: 145.90-146.00 MHz uplink, 435.20-435.10 MHz downlink, beacon on 435.090 MHz.

OSCAR 8 is in Mode A on Mondays and Thursdays, Mode J on Saturdays and Sundays, and both modes simultaneously on Tuesdays and Fridays. As with OSCAR 7, Wednesdays are reserved for experiments.

OSCAR 7 ORBITAL INFORMATION FOR JUNE

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
29933	1	0007:01	80.7
29946	2	0101:16	94.3
29958	3	0000:34	79.2
29971	4	0054:48	92.8
29984	5	0149:03	106.3
29996	6	0048:21	91.2
30009	7	0142:35	104.8
30021	8	0041:53	89.6
30034	9	0136:08	103.2
30046	10	0035:26	88.1
30059	11	0129:40	101.6
30071	12	0028:58	86.5
30084	13	0123:13	100.1
30096	14	0022:31	84.9
30109	15	0116:45	98.5
30121	16	0016:03	83.3
30134	17	0110:18	96.9
30146	18	0009:36	81.8
30159	19	0103:50	95.4
30171	20	0003:08	80.2
30184	21	0057:23	93.8
30197	22	0151:37	107.4
30209	23	0050:55	92.2
30222	24	0145:10	105.8
30234	25	0044:20	90.7
30247	26	0138:42	104.2
30259	27	0038:00	89.1
30272	28	0132:14	102.7
30284	29	0031:32	87.5
30297	30	0125:47	101.1

OSCAR 8 ORBITAL INFORMATION FOR JUNE

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
16509	1	0054:24	74.2
16523	2	0059:05	75.4
16537	3	0103:46	76.6
16551	4	0108:26	77.8
16565	5	0113:07	79.0
16579	6	0117:48	80.2
16593	7	0122:28	81.3
16607	8	0127:09	82.5
16621	9	0131:50	83.7
16635	10	0136:30	84.9
16649	11	0141:11	86.1
16662	12	0002:40	61.5
16676	13	0007:20	62.7
16690	14	0012:00	63.9
16704	15	0016:41	65.1
16718	16	0021:21	66.3
16732	17	0026:01	67.5
16746	18	0030:42	68.6
16760	19	0035:22	69.8
16774	20	0040:02	71.0
16788	21	0044:42	72.2
16802	22	0049:22	73.4
16816	23	0054:03	74.6
16830	24	0058:43	75.8
16844	25	0103:23	77.0
16858	26	0108:03	78.2
16872	27	0112:43	79.3
16886	28	0117:23	80.5
16900	29	0122:03	81.7
16914	30	0126:43	82.9

OSCAR 7 ORBITAL INFORMATION FOR JULY

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
30309	1	0025:05	86.0
30322	2	0119:19	99.5
30334	3	0018:37	84.4
30347	4	0112:52	98.0
30359	5	0012:10	82.8
30372	6	0106:24	96.4
30384	7	0005:42	81.2
30397	8	0059:56	94.8
30410	9	0154:11	108.4
30422	10	0053:29	93.3
30435	11	0147:43	106.8
30447	12	0047:01	91.7
30460	13	0141:15	105.3
30472	14	0040:33	90.1
30485	15	0134:48	103.7
30497	16	0034:06	88.6
30510	17	0128:20	102.1
30522	18	0027:38	87.0
30535	19	0121:52	100.6
30547	20	0021:10	85.4
30560	21	0115:25	99.0
30572	22	0014:43	83.8
30585	23	0108:57	97.4
30597	24	0008:15	82.3
30610	25	0102:29	95.9
30622	26	0001:47	80.7
30635	27	0056:02	94.3
30648	28	0150:16	107.9
30660	29	0049:34	92.7
30673	30	0143:48	106.3
30685	31	0043:06	91.2

OSCAR 8 ORBITAL INFORMATION FOR JULY

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
16928	1	0131:23	84.1
16942	2	0136:03	85.3
16956	3	0140:42	86.5
16969	4	0002:11	61.9
16983	5	0006:51	63.1
16997	6	0011:30	64.2
17011	7	0016:10	65.4
17025	8	0020:50	66.6
17039	9	0025:29	67.8
17053	10	0030:09	69.0
17067	11	0034:49	70.2
17081	12	0039:28	71.4
17095	13	0044:08	72.5
17109	14	0048:47	73.7
17123	15	0053:27	74.9
17137	16	0058:06	76.1
17151	17	0102:46	77.3
17165	18	0107:25	78.5
17179	19	0112:04	79.7
17193	20	0116:44	80.9
17207	21	0121:23	82.0
17221	22	0126:02	83.2
17235	23	0130:42	84.4
17249	24	0135:21	85.6
17263	25	0140:00	86.8
17276	26	0001:20	62.2
17290	27	0006:07	63.3
17304	28	0010:46	64.5
17318	29	0015:25	65.7
17332	30	0020:04	66.9
17346	31	0024:43	68.1

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Waveguide & coaxial microwave components & equipment. Laboratory grade test instruments, power supplies. Buy, sell & trade all popular makes, HP, GR, FXR, ESI, Sorensen, Singer, etc. **Lectronic Research Labs., 1423 Ferry Ave., Camden NJ 08104, 541-4200.**

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Professional service, reasonable rates, all brands, USA KDK repair center. **Amateur Radio Repair Center, 1020 Brookstown Ave., Winston-Salem, NC 27101, 725-7500.**

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All major brands featured in the biggest and best ham store for miles around. Come in and twist the knobs before you buy. **Universal Amateur Radio, Inc., 1280 Aida Dr., Reynoldsburg (Columbus) OH 43068, 866-4267.**

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DEALERS

Your company name and message can contain up to 25 words for as little as $150 yearly (prepaid), or $15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the August issue must be in our hands by June 1st. Mail to 73 Magazine, Peterborough NH 03458. ATTN: Nancy Ciampa.

PROPAGATION

J. H. Nelson
4 Plymouth Dr.
Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7	7A	14	14	14
ARGENTINA	21	14A	14	7	7	7	7A	14	21	21A	21A	21
AUSTRALIA	14A	14	14	7B	7B	7B	7	7	7B	7B	14	21
CANAL ZONE	21	14	14	14	7	7	14	14	21	21	21A	21A
ENGLAND	14	7A	7	7	7	7A	14	21	21	21	14	14
HAWAII	21	14	7A	7	7	7	7	7A	14	14	14	14A
INDIA	14	7A	7B	7B	7B	7B	7A	14	14	14	14	14
JAPAN	14	14	7A	7B	7B	7B	7B	7B	14	14	14	14
MEXICO	14A	14	14	7	7	7	7A	14	14	14	21A	21
PHILIPPINES	14	14	7A	7B	7B	7B	7B	7B	14	14	14	14
PUERTO RICO	14	14	7	7	7	7	7A	14	14	14	21	14A
SOUTH AFRICA	14	7B	7B	7	7	14	14	21	21A	21A	21	14
U. S. S. R.	14	7A	7	7	7	7	14	14	14A	14A	14	14
WEST COAST	21	14	14	7	7	7	7A	14	14	14A	21	21

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	14	14	14	14
ARGENTINA	21	21	14	14	7	7	7	14	21	21A	21A	21
AUSTRALIA	21	21	14	14	7	7B	7	7	7B	7B	14	14A
CANAL ZONE	21	14	14	7	7	7	14	14	21	21	21A	21A
ENGLAND	14	7	7	7	7	7	7A	14	14	21	14	14
HAWAII	21	14A	14	7A	7	7	7	7A	14	14	21	21A
INDIA	14	14	7A	7B	7B	7B	7B	7B	14	14	14	14
JAPAN	14	14	14	7	7	7B	7B	7B	14	14	14	14
MEXICO	14	14	7	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14	14	14	7B	7B	7B	7B	7B	14	14	14	14
PUERTO RICO	21	14	14	7	7	7	7A	14	14	14A	21	21
SOUTH AFRICA	14	7B	7B	7B	7B	7B	14	14	21	21A	21	14
U. S. S. R.	14	7A	7	7	7	7	7	14	14	14A	14	14

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	14	14	14	14
ARGENTINA	21A	21	14	14	7	7	7A	14	21	21	21A	21A
AUSTRALIA	21A	21	14A	14	7	7	7	7	7B	7B	14	21
CANAL ZONE	21	14	14	7	7	7	14	14	21	21	21A	21A
ENGLAND	14	7B	7	7	7	7	7	7	14	14A	14	14
HAWAII	21A	21A	14A	14	14	7	7	14	14	21	21	21
INDIA	14	14	14	7A	7B	7B	7B	7B	14	14	14	14
JAPAN	14	14	14	14	7	7	7B	7B	14	14	14	14
MEXICO	14A	14	14	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14	14	14	14	7B	7B	7B	7B	14	14	14	14
PUERTO RICO	21	14	14	7	7	7	7	14	14A	21	21A	21
SOUTH AFRICA	14	7B	7B	7B	7B	7B	7B	14	14	14	21	14
U. S. S. R.	14	7	7	7	7	7	7B	7A	14	14	14	14
EAST COAST	21	14	14	7	7	7	7A	14	14	14A	21	21

First letter = day waves   Second = night waves
A = Next higher frequency may also be useful
B = Difficult circuit this period   F = Fair
G = Good   P = Poor   * = Chance of solar flares

JUNE

SUN	MON	TUE	WED	THU	FRI	SAT
	1 G/G	2 G/G	3 G/G	4 G/G	5 G/G	6 G/F
7 G/G	8 G/G	9 G/F	10 G/G	11 G/G	12 G/G	13 G/G
14 G/G	15 G/F	16 G/F	17 G/G	18 G/G	19 G/G	20 G/G
21 G/G	22 G/F	23 G/G	24 G/G	25 F/F*	26 F/F*	27 F/F
28 G/G	29 G/G	30 G/G				

July 1981 $2.95

73 MAGAZINE

FOR RADIO AMATEURS

Are *You* Ready for the Fun-Ceiver?

CQ de Turks & Caicos!

Dayton's Dilemma

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73 MAGAZINE july 81


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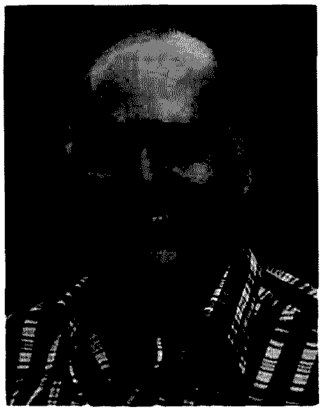
Dayton—22


Grandma—102

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green



DAYTON!

No matter what any hamfest claims, there is no question but that Dayton is the biggest of 'em all. Indeed, if you want to get your car or van into the flea market on Saturday, you'd better get up mighty early. Even parking within walking distance of the show calls for an early start.

Thousands of happy hams were seen carrying or dragging home trophies from the flea market. Others were haggling with the few dealers who attended this year, trying to get the price down another dollar on a new rig. One chap had a price on his heart's desire from every dealer in the place. I know he had to have spent the better part of a day doing nothing else. If anyone offered to pay him at the rate he was using his time to save a buck, he would have been furious.

There were some new items . . . lots of them. Probably the most popular new development is the Morse code keyer/reader, with RTTY and ASCII provisions. A couple of years ago we saw one or two of these . . . this year they were all over the place. If the number of these gadgets being designed and made has any effect on amateur radio, we're in for a lot of high-speed CW and RTTY in the next few years.

Another mushrooming interest which was represented in force was the satellite TV makers. Several well-known ham firms have gotten into this field . . . and more are coming. I've just been waiting for the ground around our ham shack to thaw so we could plant a couple of small dishes and see what they grow into.

QST EVENTS

With the announced retirement of Baldwin, rumors have been flying about Harry Dannals taking over the spot upon *his* retirement, which surprisingly just precedes Baldwin's. While the move may not be all that beneficial to loyal *QST* subscribers, frankly *I'm* delighted.

The *QST* people stayed away from Dayton this year, almost totally. I don't know whether that had to do with the awful mess over Don Miller or whether *QST* is on the outs with the Hamvention. Miller was certainly there, as were thousands of furious Indiana hams, so perhaps it was a good time to avoid that heat. Did I smell some tar being boiled?

Dannals, who is a company man through and through, has been working at Sperry, if my memory serves. I thought it was really nice of the HQ gang to sort of look the other way as far as that stupid restriction they have about letting people who work for firms making radios not be eligible as directors. I think Dannals has been working as a union organizer or shop steward at Sperry.

In looking over the roster of HQ people who might be tapped for the top spot, I really can't think of anyone I'd rather see running things. Be sure to do all you can to get your director to see that Dannals is properly honored for all of the fine work he has done for *QST* . . . and its subscribers.

One of the *73* spies was able to sneak into the *QST* Forum at Dayton (using a wig). He reported that much of the time during this meeting was spent in the airing of complaints about the inadequacies of the latest *QST* repeater list.

CHARLOTTE

One of the things I really enjoy about Dayton is that just about everyone in amateur radio is there. Unfortunately, there is such a mass of people that it is possible to go for three days and still miss seeing a number of good friends. I would like to personally thank the several thousand people who recognized me wandering around and who took the time to say hello and say nice things about the magazine. And, yes, I know you enjoy the editorial "but don't always agree with what I write." I could be smart about that and point out that we don't have an IQ test as part of the subscription acceptance, but on the other hand, I reserve the right to change my mind about things. Also, there may be cases where I have not been able to get all of the facts . . . or, forbid!, where *you* may not have all of the facts.

Which brings me to Charlotte. Out of the whole weekend I got one single hard time. I was told that I had at sometime said something bad about the Charlotte ham club. Boy, if I did, I have absolutely no recollection of it. I can't even imagine what would occasion anything like that. Heck, I used to live in North Carolina . . . got my W4NSD call while I was there. And I *loved* the place. I was in Southern Pines and I made more friends there in a week than I find possible in most places around the country in a year. North Carolinians are the most friendly people in the whole country and I have nothing but good feelings about 'em. I am very dismayed that anyone thinks otherwise.

I have to admit that the chap I talked with seemed to have no sense of humor at all. I do have a

TOOTING OUR OWN HORN

We're extremely pleased to report that two long-time *73* authors walked away with the top awards at this year's Dayton Hamvention. It's the first time these prestigious awards have gone to journalists.

The Ham of the Year Award went to Eric Shalkhauser W9CI. "Shaw" is the author of the "History of Ham Radio" series which appears in *73* and in *QCC News*. He was honored ". . . for his very long dedication to amateur radio and its history."

Bill Pasternak WA6ITF is familiar to *73* readers as the author of our "Looking West" column. Pasternak and Bill Orenstein KH6IAF received the Hamvention's Specific Achievement Award ". . . for their contribution of time and effort to the operation of the Westlink Amateur Radio Network." Westlink is a weekly, prerecorded summary of amateur radio news distributed on cassette to many ham clubs and repeater groups.

Congratulations to the winners. It's great to have you as a part of the *73* team!

W2NSD ON-THE-AIR SCHEDULE JULY, 1981

7	40m-80m CW (Novice)
14	20m-40m Phone
21	15m-20m Phone
28	15m-20m CW

Look for us in the first 25 kHz of the General portion of each band. We'll be on the higher frequency band first.

problem with this in that I am serious only a small part of the time. Thus, when people start taking everything I say or write seriously *they* have a problem. I tend to take advantage of this at times, I'm afraid.

I mentioned Dannals earlier . . . and one of his great charms for me is his total lack of humor. He takes everything I write or say seriously, so we get along superbly . . . hi.

ST. LUCIA DELAY

In the May issue of *73* I mentioned that I was planning to get on the air from St. Lucia around the 16th and 17th of the month. Well, I got into trouble over commitments made for the TRS-80 Expo in New York the following weekend. My magazine, *80 Microcomputing*, is the sponsor of the show, so I suddenly found myself with a bunch of television and radio appearances in New York starting the 18th to hype the computer show. Rather than cut my trip to St. Lucia to a couple of days, I decided to move it to the middle of June.

Even that date is going to be a bit tight for me since I will probably have to get over to Ireland to attend the opening of our Instant Software plant in Dublin sometime in June . . . and I was hoping to attend the yearly reunion of the crew of my old submarine, *USS Drum*, which is at Mobile, Alabama . . . tied up next to the battleship *Alabama*.

And, with a new computer magazine being readied for a fall start, I will be needed more than a little at home. The new magazine, in case I haven't mentioned it before, will be aimed directly at businessmen and will be the first computer magazine to be published in English . . . rather than a subset of English known as computerese.

The new magazine has generated a good many problems . . . such as the need for about 50 people plus the space to put them. If you are ever up this way, stop in and marvel at how many people we are able to pack into a 230-year-old home . . . plus six other local buildings. The staff is up to 175 right now, with no end in sight.

At any rate, my plans are to get down to St. Lucia, rig in hand, and get on the air for a few

Well . . . I Can Dream, Can't I? by Bandel Linn K4PP

"You will create a magazine called *73* . . . In July, 1981, you will publish your 250th issue . . ."

days to say hello to as many friends as possible. I'll QSL all contacts. Tim Daniel N8RK of the *73* staff will be along, as will Chuck Martin WA1KPS of Tufts Electronics. Since stopping his ads in *73*, his business has slowed way down, so he figures he might as well take a vacation before running more ads and getting so busy he won't be able to leave.

I'll probably spend half of my time under water, scuba diving and taking pictures, and the other half hamming and adding a pound or two to my already substantial waist. I'll be looking for as many of you as I can contact on 20m, 15m, and possibly a bit on 10m and 75m. I like 20 the best.

TURKS AND CAICOS

Unless you're a ham, it is unlikely that you've ever even heard of these islands. After operating from there for a few days, I can assure you that about 75% of the hams don't know where they are either.

It all started out during the winter. Jeff DeTray, my Assistant Publisher/Editor, got struck with wanderlust and had cooked up a scheme to go to the Turks and Caicos Islands for the March DX contest. Tim Daniel N8RK, also of the *73* staff, was going, too, so they could operate around the clock as a multi-operator, single-rig station.

Having recently read a review in *Undercurrent* of the skin diving at Provo, the island to which they were heading, I invited myself along. What can you say when the boss invites himself on *your* DXpedition? The news was received with strained grace by Jeff and Tim. Jeff even offered to send and get my license for me.

Tim and Jeff headed out a couple days early to get their contest station and antennas hooked up. I ran schedules with them on 15m to see how they were doing. They'd gotten VP5TDX for Tim and VP5JDT for Jeff. They were not tickled with these calls, perhaps having hoped for something simpler for the contest, like VP5A. My ticket hadn't come through yet. Hmm.

Sherry, Chuck Martin, and I took off from Boston on March 5th, landing first in Miami... where I made a few contacts on

This is South Caicos Island... and fairly typical of the relatively uninhabited islands making up the group. There's an airport at the lower right.

One of the cab drivers at Grand Turk is Art VP5AQ. We lucked onto Art when we zipped downtown between flights to check into our ham tickets. Chuck got his ticket (VP5KPS) and I'm still waiting for mine.

With hotel space for only a few dozen guests, the Turks and Caicos Islands are not yet a full-fledged mecca. With service by Air Florida, hotels are abuilding. Reciprocal ham tickets are relatively simple to get... if you do your homework ahead of time. The Grand Turk airport is a short flight out of Miami. They're just building the new terminal building.

This is the cottage where our contest station mowed 'em down. It's part of the Third Turtle Inn. I was lucky enough to have the room next to the contest station, thus not missing hearing a contact, even in the wee hours of the morning. After a couple of nights of that, I moved.

2m. Next we went via Air Florida to Grand Turk Island.

There was just a bit less than an hour between the time our plane arrived and when the TCNA (Turks and Caicos National Airlines) plane was due to leave for Provo, so Chuck and I grabbed a cab and headed for town to see about our missing ham tickets. It was one of those amazing coincidences when we found that our taxi driver was VP5AQ! He took us to the licensing office and we eventually got a gal to check through the license applications. Though Jeff had sent mine in a week before Chuck had sent his, they had absolutely no record of mine! The magistrate was out at the moment, but they said our licenses would be issued that day and mailed over to Provo for us.

We dashed back to the airport to catch the plane to Provo. We needn't have rushed so much. Despite confirmed reservations, when the plane was ready to load we were told that they had just two seats left. . . which of us would volunteer to wait until the next day? We looked at each other, but were unable to discover any volunteers.

A fellow named Harold came up and said he had a plane and would be glad to take us to Provo on a charter. His price was more than TCNA, but it seemed to be the only transportation, so we agreed. We began to have second thoughts when he told us that his was a small plane and that we would have to go without our bags. . . which he would pick up the first thing in the morning and bring over for us at six o'clock.

Oh well. . . if we don't go this way we'll have to find a place to stay on Grand Turk and be delayed a whole day in getting to Provo. We were not all that encouraged about this part of the adventure when Harold rolled his plane out of the hangar and backed a car up to it for a jump start. We piled into the Piper and were off, heading about 50 miles across the water to Providentiales Island at the far end of the Turks and Caicos group. . . and the Third Turtle Inn.

Tim Daniel VP5TDX (N8RK/1) of the 73 staff, happily DXing away, racking up CW contacts. . . which are a lot of fun until QSL time arrives.

It doesn't take much of a setup to work a lot of DX. This simple station, operated in between scuba diving trips, leisurely meals, exploration, and a lot of local rag-chewing, still managed over 2,000 QSOs in a couple of days. That's Chuck sitting back in his "Whereinthehell's Providentiales?" tee shirt. My W2NSD hat is on the couch.

This is the Latitude 22 hotel, right next to the Third Turtle Inn. Chuck set up his VP5KPS station there. . . in the end cottage. Even with a simple traveling dipole, he got out on all bands. Next time. . . an amplifier and a beam!

Here I go, over the side, with my scuba gear, down to take some pictures. The GREEN TEAM tee shirt comes from the company volleyball team, the Peterborough winners this year, coming from behind to wipe out Byte *and all of the other volleyball teams.*

The scenery underwater is even more magnificent than that above. We went diving down the sea wall of coral which started from a bottom of about 50 feet and went down far beyond the depth of my new Casio 100m watch. . . which flooded out at 85 feet. Tsk.

I'm game for anything, so I didn't worry. That's one of the main reasons I got rid of my own plane when I first was starting *73 Magazine*. I knew that if I continued to fly I would sooner or later finish myself off. I had a lot of adventures during the two years or so I was flying. I'm just not careful enough to survive indefinitely at that sport.

When we arrived at Provo, Harold bounced the plane down the runway and we piled out. It was too dark for him to take off again. We arrived with perhaps two gallons of gas left, just enough to get to South Caicos . . . perhaps. Oh well, Harold would take care of everything the next morning bright and early. Sure he would.

A short taxi ride to the Inn . . . a taxi ride in these islands seems to cost $10 minimum if you haggle, $25 if you don't. Jeff and Tim were moderately delighted to see us. They, too, had had to charter a flight to Provo, though they managed to get a more professional pilot. We found out later, from a TCNA pilot, that Harold had no license, his plane was not certified . . . and he had no insurance. Ooops!

The Inn and Provo are absolutely gorgeous. The weather is gorgeous. The ocean and beaches are gorgeous. Flowers are everywhere. It soon became obvious that Jeff had no intention of letting loose of his mike for anyone . . . he was in ham heaven . . . in a rare country with the bands piled high with stations calling. I mumbled about one of the rigs being from my ham shack . . . he didn't hear me. Luckily Chuck had packed an extra rig, which we eventually got on the air . . . otherwise I might have had to do Jeff serious bodily damage.

The dish and studio building of WIV. The antennas pick up TV from Miami during openings. They also send the satellite signals via channel 7 to a hilltop, where a solar-powered transmitter rebroadcasts on channel 4 for the whole island. It's free for now, but Bob intends to encode the signals and charge . . . much like cable TV.

Here are some of the monitors, switching, and other paraphernalia needed to put on a professional television broadcasting service.

The TV studio is, for the time being, the kids' playroom and living room for Bob and his family. Once the house is built next door, they will move there and be able to put on live TV from this studio. Talk about living in a goldfish bowl!

This 20' dish is outside the new WIV television studios. Yes, I know they can't use a "W" prefix in Turks and Caicos. Their answer: "Who says so?" We arrived on a very unusual day . . . when the sun was exactly behind the satellite, thus creating a good deal of sun noise on the signal. Notice shadow of the LNA (low-noise amplifier) in the exact center of the dish. It happens about once a year. That's me, Coop, and Chuck, with Sherry carrying my camera bags.

The video recorders can furnish programs when the satellite channels are barren, which is seldom. They do allow television programs run at weird times to be sent during prime time. The station receives the satellite signals, converts them to channel 4, and rebroadcasts them for the island populace. When the station is complete, they will be able to put on locally-done programs as well as satellite and video tape programs.

We settled down to dinner...which was fine. The prices were scary, particularly for a registered skinflint like me. I never really was able to relax and forget the money those damned meals cost. Hoot mon! But then nothing is cheap in these islands. Power runs 35¢ a kWh, to give you an example. And I mentioned the two-mile $10 taxi rides.

The next morning, dressed in my suit since my island clothes and bathing suit were still over on Grand Turk, we sat around and talked ham radio, ate a very expensive breakfast, and leisured. Along about 10 am I talked Chuck into going to the airport to see if our bags were in yet...six o'clock, you remember? That's the last we saw of Chuck until dinner time.

It turned out that Harold was still hanging around. Chuck got him going and went with him in the death ship to South Calcos for gas...and then on to Grand Turk for the bags. While he was there he pooped downtown again and got *his* ham ticket. There was nothing there for me...thanks, Jeff. So eventually VP5KPS and our bags were back in the air, heading again to Provo. They made it, against rather stiff odds. Chuck mentioned having to fix the compass in the plane and that the radio went out during the trip. Lot of water down there.

The next morning Chuck had his rig set up, but the scuba trip was about to leave, so Chuck, Sherry, some other guests, and I headed out to the reefs in a small power boat. I had my diving gear and a Nikonos IV camera along. It was very rough going...and the trip took over a half hour. The nervous part was when we had to go over the reef. We had to wait for just the right wave and go with it over the reef so we wouldn't get stuck on it and perhaps lose the boat. This drama did not help Sherry, whose complexion was beginning to match her GREEN TEAM tee shirt.

Nothing bothers me, so I

Continued on page 120

This is the view out of the front of the Cooper establishment. Miles of perfect beach. Oh well, it probably won't be long until there are hotels from one end of the beach to the other. The government owns the beach and it will always be kept public, which is a good move.

Providentiales (Provo) looks weird from the air. There are access roads all over the place. The idea is to sell vacation home sites, so they have already put in the roads. It's a little difficult to get to... but not impossible. You have a fantastic climate year 'round... some of the best swimming you can ask for... remoteness. You get your water from catchments on your roof or in the yard and keep your water in a cistern under your house.

Bob Cooper VP5D. Bob is one of the pioneers of the home reception of satellite television. His monthly publication, Coop's Notes, is the main source of information for the field. Bob's been at this longer than anyone else and is the guru of satellite TV.

This is Tim, resting up a bit during lunch. I never did get pictures of Jeff, who just wouldn't leave the rig, even for meals. Note the ever-present HT.

Chuck Martin VP5KPS/WA1KPS, the owner of Tufts Electronics, the largest ham store in New England and, if ham sales continue to drop and force others out of business, perhaps the largest in the east.

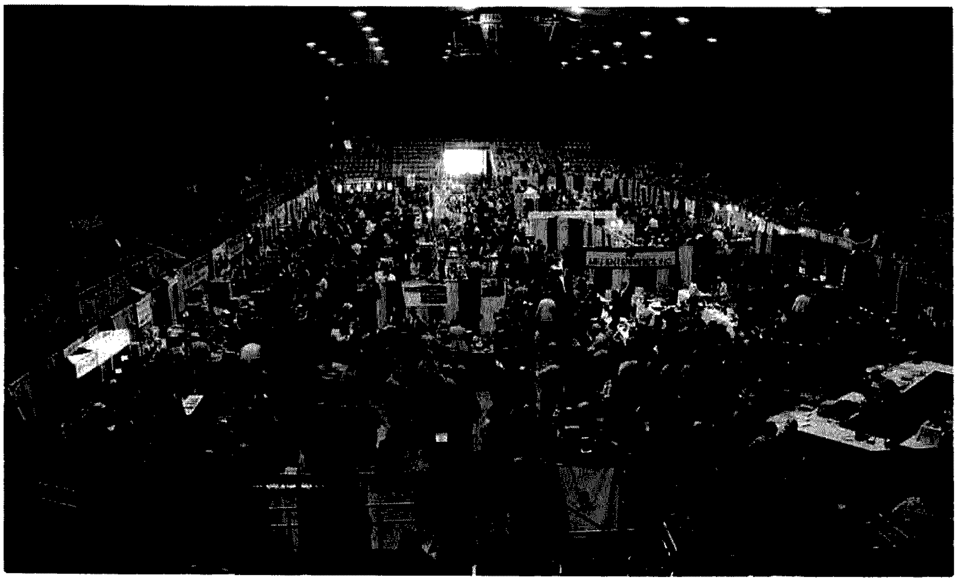
Paul Grupp KA1LR
73 Magazine Staff

Dayton Dilemma '81

—which new gear do you buy?

If you're a ham, chances are good that you'll find something of special interest to you going on at the annual Dayton Hamvention. Part of the fun for almost everyone who goes is nosing around to see what new equipment is available. I went to Dayton this year specifically to look at new products, and there were plenty there to see! If there is any trend to spot, it is unquestionably the growth of interest in RTTY communication. The most interesting and innovative products shown this year were designed for that mode, and RTTY equipment seemed to be everywhere. Folks looking for other types of gear weren't dissappointed either—there were new transceivers, tuners, amplifiers, and other hardware much in evidence. In this article, you'll find gear listed by category, and in alphabetical order for fairness. Be sure to take a close look at the last category of equipment (RTTY). If you're not interested in RTTY yet, there are a lot of manufacturers out there who are after your attention.

Of course, deciding what is new and what isn't can be a formidable task. We decided to include only those products that were first announced at Dayton or announced just a few weeks previously. If you know of something that should have been included but wasn't, please accept our apologies—the decision of the *73* judges is final. Enjoy!

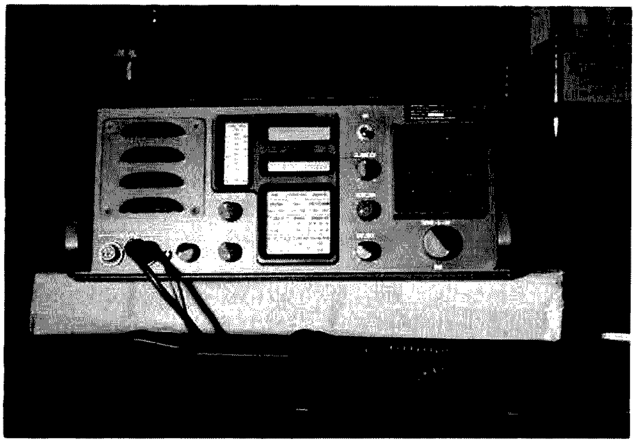


Dayton '81!

New Rigs

Starting with the most esoteric, Advanced Receiver Research of Burlington CT was showing the TR10GA, a 10-GHz full-duplex FM/CW transceiver with provisions for an internal or external gunnplexer. The transceiver requires 13 V dc at 0.5 Amps, and is equipped with a tripod mounting ring.

Cubic Communications was showing a rig to cause the most jaded DXpeditioner's heart to flutter—the Astro-C HF SSB transceiver designed for commercial and military use. At $8000 it's not for everyone, but in all seriousness, it may have a few things going for it. The thing is built to take abuse and, in the words of the manufacturer, is designed for "...continuous operation in the severest of environmental conditions." The front panel offers a waterproof and blast-protected speaker, a few knobs, a key pad for function selection, and an LCD readout to keep you informed of what the transceiver's microprocessor controller is up to. 10 memories are maintained by a lithium battery with a



Cubic's Astro-C.

The new Icom 730.

projected life of ten years! No need to carry a remote vfo either—split operation is a snap. Frequency coverage is from 1.6 to 30 MHz, in 100-Hz steps, in your choice of SSB, CW, AM, and RTTY. Power output is 100 Watts SSB/CW and 25 Watts AM. In case you are wondering, the Astro-C is not just a 102BX in olive drab—the 7" × 17" × 17" 42-pound beast is designed to bring high performance to the battlefield. Planning a DXpedition to Spratley Island? This has got to be the ideal rig!

A little more conventional is the DenTron HF-200D HF transceiver, shown in prototype form and slated for release sometime this summer. Hopefully the new digital readout will help this rig fare better than DenTron's previous efforts in the field.

For a lot of us, the Icom IC-730 stole the show. By now you've seen the pictures. I spent about half an hour experimenting with the controls, using the minimal antenna that Icom had plugged into it at the show. I was very impressed. I'm a confirmed audio nut and the receiver audio quality seemed to be better than what the IC-701 provides. Whatever you think of the novel configuration of the i-f shift, you'll have to admit that it functions beautiful-

Santec's 440-MHz HT.

ly; it should be love at first sight for CW addicts! The 730 continues the Icom tradition of packing the maximum number of useful features into a small package. The layout is one of the most functional I have seen and should be equally at home as a main rig or in a vehicle.

The Icom 22S is seeing yet another re-release, this time as the IC-22U. Banished is the diode programming and rotary channel selector—they've been replaced with push-button channel selection of 800 channels. The rig has got to win some kind of an award for longevity!

Japan Radio Company, still looking for a US distributor, was showing a fascinating (and expensive!) set of HF twins that have been on the Japanese market for a while but haven't had wide-spread distribution in the US yet. The NRD-515 receiver offers continuous coverage from 100 kHz to 30 MHz, in PLL-synthesized 100-Hz steps. Design is of the up-conversion dual-conversion variety, with a first i-f at 70.455 MHz. Features include passband tuning, digital readout, bfo pitch control, four i-f filters, and completely modular design. The NRD-515 is one of the few receivers that could do a first-class no-compromise job as both an SWL rig and a ham receiver. The NSD-515 transmitter is equally versatile, covering 160-10 meters (including the new WARC bands). Features of the transmitter include speech processor, VOX, FSK input terminal, and 100 Watts output. Used with the NRD-515, the transmit and receive frequencies can be set from either vfo, and split operation should be a breeze. All things considered, this pair of rigs could become quite popular in the US—I hope Japan Radio finds a distributor!

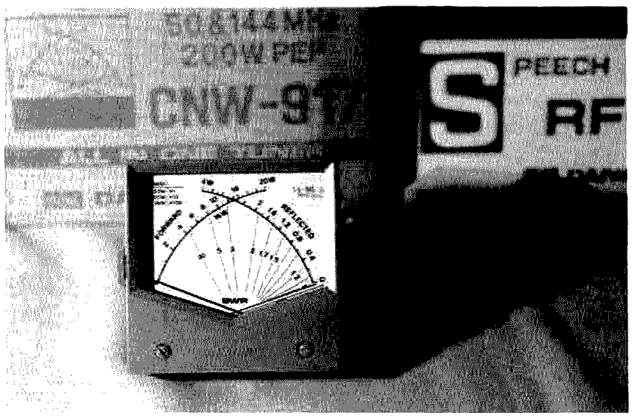
Kenwood was showing the TS-530S, a new rig that took many of us by surprise. The 530 offers many of the features of the venerable TS-820S, in a package that matches the TS-830S flagship. If sales of the 520S that this rig replaces are any indication, this rig will be very, very popular.

Moving abruptly to the UHF spectrum, Santec was pleased with the interest shown in their ST-7T 440-MHz synthesized handheld. The unit tunes 2000 channels in 5-kHz steps, with thumbwheel-switch frequency selection. Control operators for repeaters should be happy about the standard 16-tone DTMF pad and the optional synthesized CTCSS encoder. High power output is rated at 3 Watts, medium at 1 Watt, and low at .05 Watt.

Ten-Tec displayed a new compact HF rig, the Argosy, offering a lot of features at an inexpensive price. The solid-state finals provide 40-50 Watts output rather than the usual 100, and the readout is analog only. On the positive side, features include RIT, notch filter, and a built-in swr meter. At $549 list, they'll no doubt be getting a lot of orders!

Yaesu's new FT-290R multi-mode portable 2m transceiver should be of special interest to types who want to get a lot of mileage out of their equipment. Built-in batteries allow mountaintopping fun with two Watts out on FM and SSB. Put the rig indoors with an amplifier brick and

FT-290R from Yaesu.



Daiwa's 1.8-to-60-MHz swr meter.

The DenTron Clipperton T.

Heath's SA-2000 tuner.

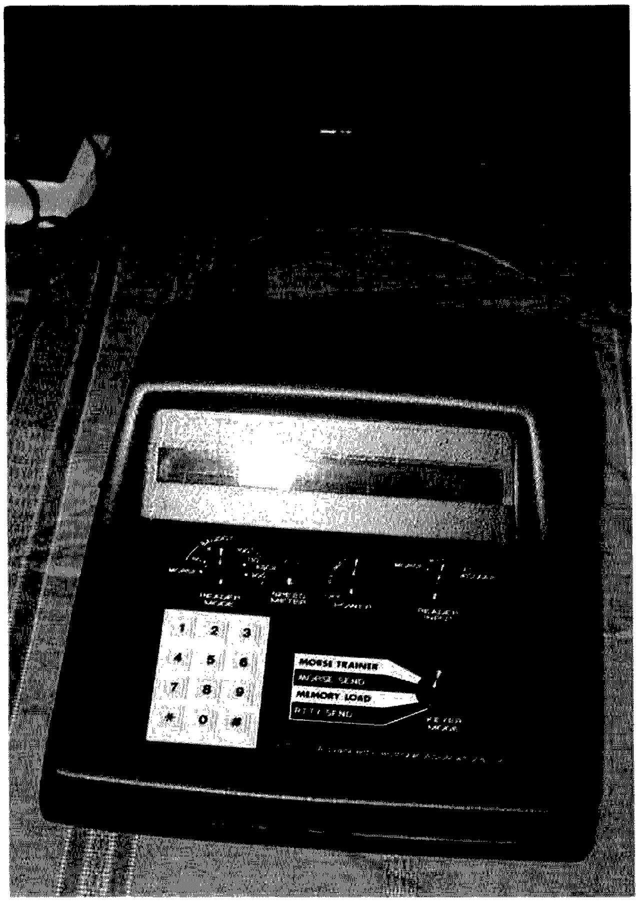
the LSB/USB capabilities will let you into the world of OSCAR. Wherever you use it, the five memories should add to the fun.

Amplifiers

A good handful of new amplifiers was shown. As with the transceivers above, the emphasis was on evolution, rather than revolution.

2-meter DX and EME addicts will no doubt be interested in DenTron Radio's Clipperton-V 500-Watt two-meter linear. Drake introduced a relatively inexpensive 1.5-kW unit for the HF bands—the L-75 160-15 amplifier.

Heath was showing two new linear amplifiers for 2 meters—the VL-2280 and VL-1180. Both offer 75 Watts out for 10 Watts of drive. The 2280 sports a built-in ac power supply that will power both the amplifier and a transceiver; it should be an ideal companion to one of the multi-mode 2-meter rigs. The 1180 operates on 12 V dc and is designed for mobile use.



The MBA-1 from AEA.

Icom showed a compact 10-Watt amplifier for the 2-meter band. Designed to mate with the IC-2AT, it should be right at home with any of the other popular hand-helds,

Last but certainly not least, Lou Anciaux of Lunar Electronics was showing the 4-40P linear 2-meter amplifier, which also features a receive preamp with a better than 2-dB noise figure. One-to-four-Watts input yields 10-40 Watts out. Should be the ideal companion for Yaesu's new FT-290R multi-mode portable!

Antennas

There were plenty of new antennas in evidence. Daiwa showed a very interesting line of mobile antennas, including a duoband 2-meter and 450-MHz model with 2.5-dB gain on 2 and 5.5-dB gain on 450.

Hy-Gain introduced the V2 3-dBd-gain vertical antenna for 2 meters. Claiming a low angle of radiation and effective decoupling of the feedline, Hy-Gain is competing with the Cushcraft ARX-28 and the AEA Isopole in the high-technology gain antenna race.

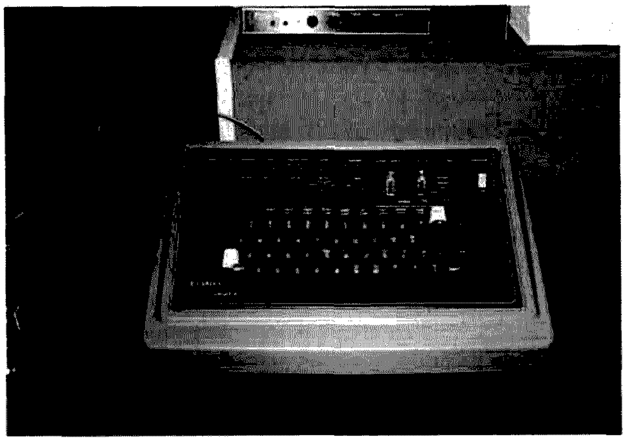
KLM had a variety of new antennas to announce, from 40 meters on up to two. There are two new shortened beams for 40 meters, one with three elements and one with two. For two meters there was the JV2 2-meter vertical with 5 dB of omnidirectional gain. Also shown was the 144-148-4X four-element beam, with a folded-dipole driven element. The antenna is supplied with an RG-142 balun, rated to 2 kW. The rear-mounted antenna has a claimed gain of 8.5 dBd.

Lunar introduced a pair of beams for 430 MHz and 2 meters, with 19 and 11 elements, respectively.

Miscellaneous Items

AEA is entering the FM direction-finding sweepstakes with the PFDF radio direction indicator, operating on the Doppler principle. The unit offers several sophisticated features, including an automatically-triggered sample and hold circuit for instant pinpointing of the kerchunker variety of wild turkey.

Daiwa introduced more new products than any oth-



Drake RTTY/CW keyboard.

er manufacturer and with good reason. Daiwa markets an extensive line of high-quality products in Japan and their new distributor in the US plans to import a good many of those items. Included in the lineup is a very compact audio CW filter with built-in amplifier and speaker, a speech processor, two world map rotators, an incredible variety of compact cross-needle swr meters, and a cordless mobile microphone, complete with speech processor!

DenTron Radio was showing the prototype model of the Clipperton-T 3-kW antenna tuner, which should be available later this summer. The tuner offers full metering and lots of other nice features, and is of course an ideal companion to the Clipperton-L linear amp.

HAL's CT-2100/KB-2100.

For proud owners of the Drake 7-line with a taste for matching equipment, there was the Drake CW keyer. Front-panel controls are limited to speed and volume, so this unit appears to be designed for the casual CW op.

Elkhart Industries is cashing in on the current keyboard craze in ham radio with two new enclosures for keyboards and computers.

Heathkit had a new antenna tuner that adds an swr meter to their previously-available tuner. Of special interest to Field-Day ops is the surprisingly compact gas-in, ac-out generator. By the time you read this, the *73* gang will have put one through the wringer during this year's Field-Day festivities!

Last on our list of miscellaneous introductions was Radiokit, offering the K9CW contest keyer in kit form—contest season is just around the corner!

RTTY/CW Gear

As promised, I've saved the best for last. The big news at Dayton was unquestionably computerized RTTY/CW gear. New keyboards, readers, and computer interfaces were available everywhere I looked, and could very well represent the ham trend of the eighties.

I had a very difficult time tearing myself away from the AEA booth, where all concerned were justifiably proud of their MBA-1 Morse, Baudot, and ASCII reader. Kept as a deep dark secret until the first day of the show, the MBA might be an ideal way for hams to get into RTTY. It sports a 32-character vacuum display designed to give the user plenty of time to read high-speed messages and especially to help copy weak signals in high-QRM situations. The MBA seemed able to track speed changes extremely well, suggesting that it might do an excellent job of copying sloppy CW. The most innovative aspect of the MBA is its MBA-01 code converter option, which allows you to join the RTTY crowd and transmit in ASCII or Baudot with a Morse keyer! This is such a great idea that I can't imagine why it hasn't been done before, but in any case it's available now and provides an interesting and practical alternative to a keyboard.

Commsoft showed their new software package for the Heath H-89 computer. The system uses almost any demodulator and provides a three-level split-screen display, pretype buffer, disk-based autostart/mailbox system, automatic CW ID, and excellent user's manual. I was pleased to note that the manual provided lots of information about operating on RTTY for the first time, what to look for in transmitters and receivers for RTTY, and an extensive list of RTTY books and publications.

Crown Microproducts had the ROM-113 computer interface up and running with the TRS-80 Model III computer, and software for both the Model I and III has been improved, offering more buffer memories and a host of new features. Hams contemplating purchasing a computer and RTTY interface will be interested to know that the new TRS-80 Model III reportedly causes virtually no interference to ham gear, unlike its noisy predecessor.

Drake is making the Tono Theta 7000E CW/RTTY terminal available in the US sometime this summer. Fea-

tures include seven 64-character memories with battery backup to retain memory when power is off, 53-character keyboard buffer, auto word-wrap, scope outputs, automatic T/R switch, two-page display memory, split-screen video, and a well-shielded cabinet for RFI protection. Interestingly, the 7000E will operate on 13 V dc at one Amp, which opens the way for some interesting mobile or portable work!

HAL no doubt is feeling pretty smug about the new interest in RTTY, and they were showing two new RTTY/CW terminals: the DS-2050 KSR and the CT-2100/KB-2100. The 2050 is essentially a DS-2000 terminal and an ST-5000 demodulator combined in one compact package. The system is loaded with the usual pretype buffers, status indicators, and pretype-while-receiving features. Considering its relatively low price, the DS-2050 KSR might be an ideal way to get into RTTY communications.

The CT-2100/KB-2100 combination is HAL's upmarket terminal and offers virtually every feature the dedicated RTTY fanatic could desire. The CT-2100 receive terminal can be used alone, but the KB-2100 is needed to transmit. HAL has obviously been listening carefully to RTTY enthusiasts, and this new combination is the result of that research.

TRS-80 owners might be interested in the Macrotronics, Inc., terminal which is offered in two models—one for the 16K Level II TRS-80 and one for the 16K Model III. Macrotronics deserves some kind of an award for the most number of features available in a computer/interface RTTY system. There are 16 soft-sectored buffer memories, a four-word user-defined WRU, a complete terminal-status display line, word-wrapping, pretype buffers, and more. The hardware side includes a six-stage active-filter CW demodulator, a hardware clock, and a multi-stage active-filter RTTY demodulator. By terminating the data and address busses at the computer end of an active buffered cable, Macrotronics has effectively reduced RFI caused and suffered by the computer. Sounds interesting!

Microlog got into the act with the new ACT-1 stand-alone terminal (sorry about that pun!). Like the HAL DS-2050 KSR, demodulator, AFSK generator, and terminal are all included in a single cabinet. The ACT-1 includes all the usual features as well as a few unusual ones. A random-code generator and a hand-key input are provided for Morse practice, and the unit can be used as an SSTV generator. Also included are several test messages, SELCAL, autostart, and a real-time clock.

For the do-it-yourself CW-only operator, AJR Electronics of Evansville IN is offering PC boards and manual for their Skipjack keyboard. The estimated final cost is about $200, depending on how careful a parts shopper you are. Special Morse characters are available (AR, KN, etc.) and speed is adjustable from 7-104 wpm. A 64-character buffer is provided with LED indicators to let you know how full it is.

Well, that about wraps it up! There was something for everybody at Dayton this year, and you'll be reading extensive reviews on many of these new products in *73* in upcoming months. Got something you'd particularly like to see reviewed? Drop us a line and let us know—we appreciate your input! ■

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The Fun-Ceiver

—easy-to-build companion to February's QRP Fun-Mitter

The Fun-Mitter 5-Watt transmitter ("The Fun-Mitter—A Goof-Proof Rf Project," *73 Magazine*, February, 1981) confirmed my ideas about hams and home-brew. Hams are, indeed, anxious to build their gear if they can be sure of success once they have done the building! Judging from the response, the Fun-Mitter provides the amateur with the kind of gear that interests the first-time and the short-of-time home-brew enthusiasts.

Goof-proof projects also will appeal to hams with a limited amount of test equipment. Many times a project is bogged down when, upon completion, the device doesn't work correctly and a great deal of time must be used to debug and/or redesign it.

Photos by Dave Jehu

View of Fun-Mitter, companion receiver, and audio amp.

This project follows the same ideas as for the Fun-Mitter—to provide a simple companion receiver that also is goof-proof. It can be built for either 80 meters or 40 meters and provides an ideal receiver to further your all-home-brew station. It can also be used with other transmitters or can be used by itself as a standby or portable receiver. As with the transmitter, the receiver uses a minimum of parts and can be assembled easily in an afternoon.

The design criteria and design goals for the receiver are similar to those for the transmitter. There basically are six goals for the design:

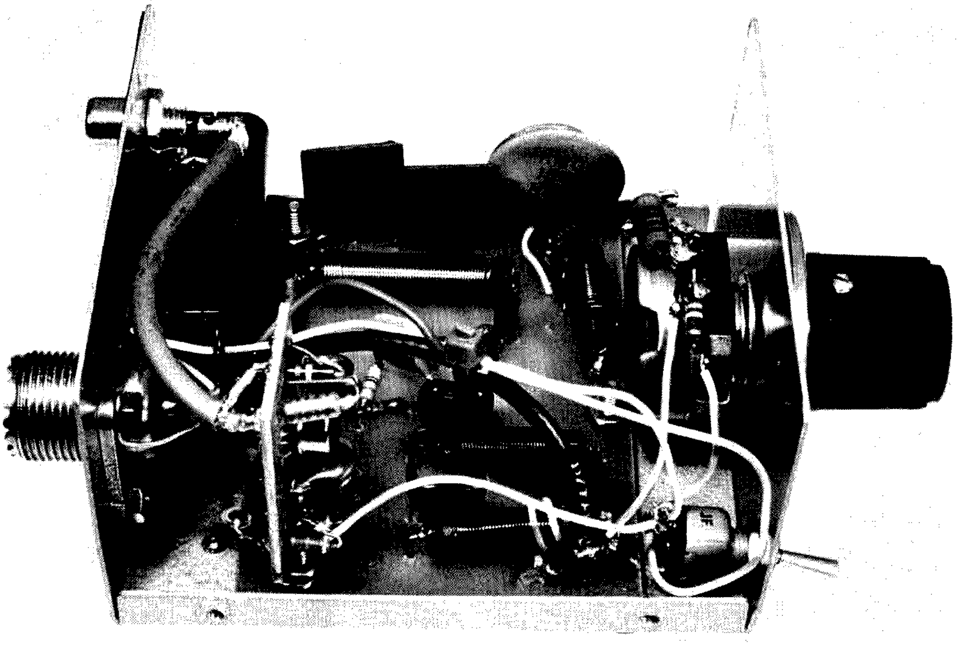
- Compatible with Fun-Mitter.
- Same size as Fun-Mitter.
- Costs less than $30 with new parts.
- All parts available from Radio Shack.
- No variable capacitors or tuning adjustments.
- As simple as possible.

The finished receiver meets the six goals. It will tune any 70-kHz segment of the 40-meter band or any 50-kHz segment of the 80-meter band. Sensitivity is very good. The selectivity is adequate in the basic receiver and can be improved with the optional audio filter. As can be seen in Fig. 1, the receiver is very simple. Only a tuning knob and an on-off switch are used. This makes construction and operation easier but does not compromise performance.

Designing the receiver (as with all home-brew rigs) was a great deal of fun. Setting goals in advance provided a challenge that took me through four revisions of the receiver board. Originally, the receiver utilized a JFET detector and op-amp audio stage but it evolved slowly to its current form. Fortunately, Radio Shack introduced dual-gate MOSFETs in the 1981 catalog and that provided the impetus to continue. The dual-gate MOSFET provides a more sensitive, easier-to-match-impedance detector than does the JFET. Although it has drawbacks, such as AM detection and hum, it makes for a good direct-conversion detector. These drawbacks are reduced considerably by utilizing a double-tuned input network and by using an enclosed case with a battery supply.

Radio Shack rf chokes were again used as resonant-circuit inductors and, again, perform quite well. They are modified as described later to provide the necessary inductances for the circuit. The physical size of the chokes, however, necessitated a larger PC board than might otherwise have been used.

Variable-frequency tuning is provided by using general-purpose diodes as voltage-variable capacitors. The voltage to the diodes is varied by a front-panel potentiometer which in turn changes the capacitance of the diodes to vary the frequency of the oscillator.



View of inside of companion receiver.

Circuit Description

The receiver is the ultimate in simplicity but still performs quite well. It is shown in schematic form in Fig. 1. As can be seen, it is a direct-conversion receiver utilizing a product detector, Q1, and a variable-frequency oscillator, Q2, which operates at the same frequency as the incoming signal.

L2, C1 and L3, C3 comprise a double-tuned input network which provides good out-of-band signal attenuation. L1 matches the 50-Ohm antenna impedance to the high impedance of gate 1 of the MOSFET. To construct L2 and L3, the same procedure is used as was used for the Fun-Mitter. For 80 meters 8 turns should be removed, and for 40 meters the choke should be left intact. Small-gauge hookup wire or magnet wire can be used for L1.

Audio output is taken from Q1 through a .1-uF capacitor (C7). C6 is used to bypass the detector drain at high frequencies. The audio output is routed to J2. From there the audio is routed to a 200-mW Radio Shack audio amplifier through a

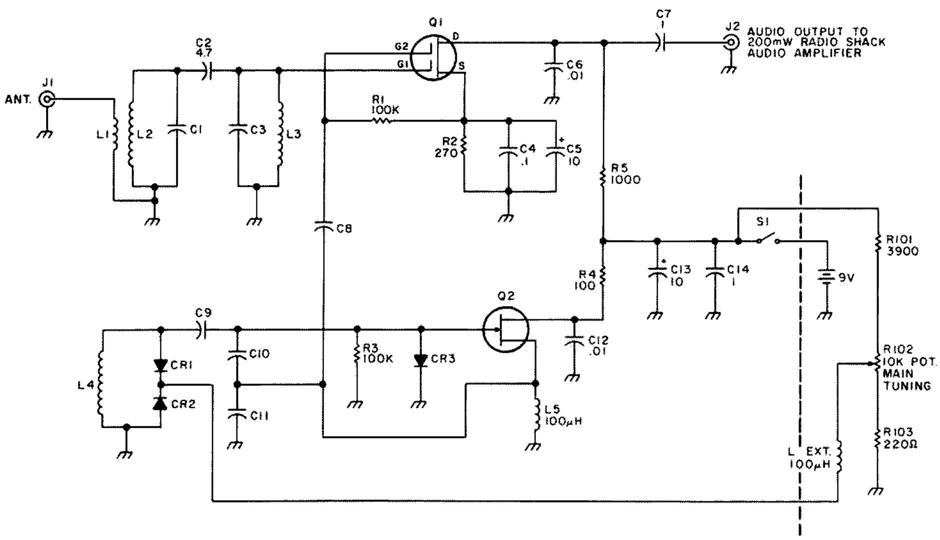
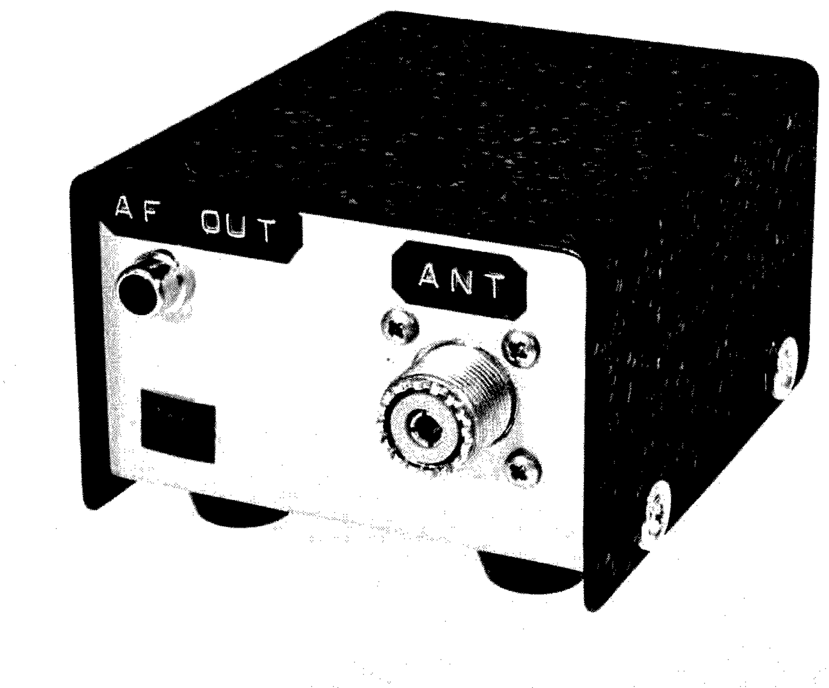


Fig. 1. Schematic of companion receiver.



View of back of companion receiver.

shielded cable. This is a significant departure from normal design procedures but it was done for several reasons. Not including any audio amplification on the receiver board made the receiver much simpler. This, in turn, makes the receiver easier and faster to assemble.

There are no layout problems with the external amplifier due to the high gain needed for direct-conversion audio chains. Also, no audio gain control (or associated wiring) is needed on the front panel. The only drawback to the external Radio Shack amplifier is its $12 price tag. I feel the advantages more than outweigh this cost, however, and the amplifier can be used for other projects. Once the decision was made to use the external amplifier, the project really began to take shape. The simplicity of the rig was finally realized! (Only two transistors and no audio control!)

Other than the product detector, the only other section of the receiver is the vfo. Designing a stable, simple vfo from Radio Shack parts was definitely a challenge. However, the design of Fig. 1 provides one. The circuit is configured as a parallel-tuned Colpitts oscillator. The frequency-determining components are L4, CR1, CR2, C9, C10, and C11. Stable capacitors must be used for C9 through C11. Ordinary disc ceramic capacitors will tend to cause the receiver to drift over time. In order to meet the design goal of using all Radio Shack parts, some ingenuity must be used with these capacitors. Radio Shack does sell a packet of 100 capacitors (part number 272-801) that contains a large number of capacitors marked NPO. This denotes a capacitor that doesn't change value with temperature.

I found in several packs that the values needed existed with the NPO designation. If the values given in the parts list do not exist in the packet you purchase, use the parallel- and serial-capacitance formulas to obtain the needed capacitance: For parallel capacitors: $C_T = C_1 + C_2 + \ldots$ For series capacitors: $C_T = 1/(1/C_1 + 1/C_2 + \ldots)$. These NPO capacitors will yield very acceptable drift characteristics. After a five-minute warm-up the receiver has no noticeable frequency change. If you have silver mica capacitors available, they will perform even better.

L4 consists of a single modified inductor for 40 meters. For 80 meters, the same size inductor is placed in series with an unmodified inductor to provide the needed inductance. As mentioned in the Parts List, the last three turns of the modified inductor should be spread out over the rest of the inductor body to provide a method of setting the operating frequency.

The receiver is powered from an internal 9-V battery. Current drain is approximately 5 mA, so the battery life should be long. The use of the internal battery eliminates the problem of a separate supply or reg-

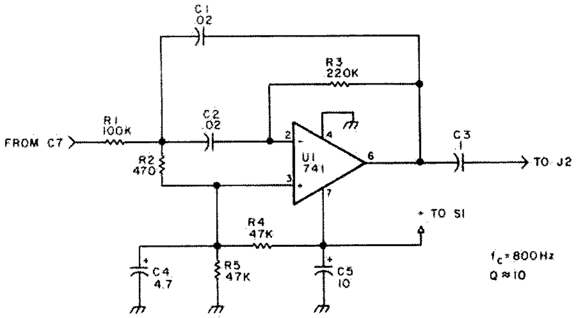


Fig. 2. Optional audio filter.

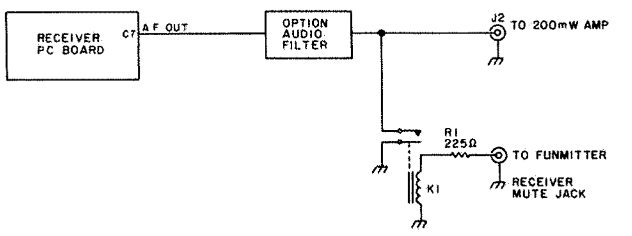
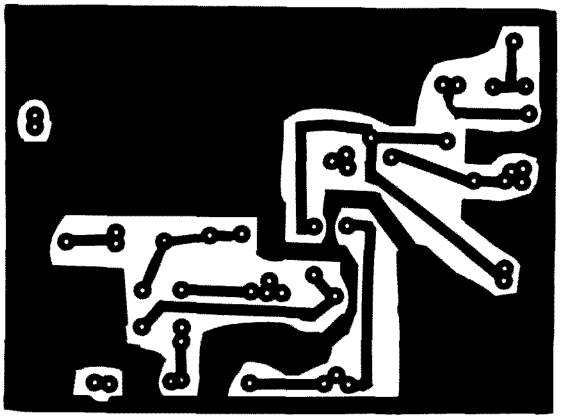
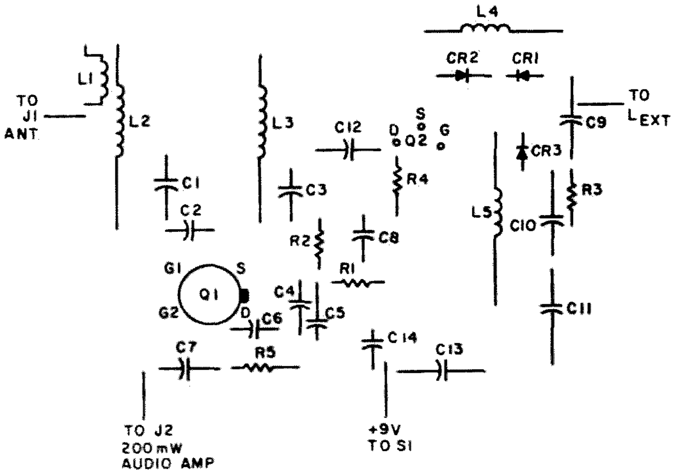


Fig. 3. Wiring of filter and receiver mute options. K1—SPDT miniature relay (275-216); R1—three 680Ω, ½-W resistors wired in parallel.



Foil side, receiver PC board.



Component layout, receiver PC board (foil side shown).

ulator for the receiver. It also aids in reduction of hum caused by the 60-Hz power-line frequency that is common with ac-operated, direct-conversion receivers. Again, simplicity is the key word!

Options

Two options have been designed for use with the receiver to make operation more enjoyable. An audio filter, shown in Fig. 2, can be added before the audio amplifier to provide good audio selectivity. The filter is a bandpass type with a center frequency of 800 Hz. The filter will cause signals to peak at 800 Hz.

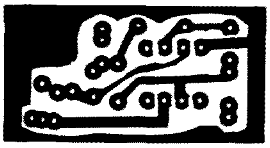
The filter is inserted at the af output (after C7). The PC board can easily be mounted inside the receiver box. Ideally, a front-panel switch should be added which will either bypass or include the audio filter. This will make tuning much easier. If the switch is not included, tune very slowly across the signals or the band will appear dead! For best results with the filter, headphones should be used. This is because the high-Q filter will cause an unpleasant ringing at the higher audio levels needed for speaker use.

The second option allows the receiver to be silenced during transmit. If this is not done, the audio level from the receiver can become quite uncomfortable during transmit. Most designs use a transistor switch to short the audio to ground, but for simplicity sake I chose to use a relay—as shown in Fig. 3. This provides a very easy method to mute the receiver audio and can be added to the receiver at any time. Control voltage comes from the transmitter. A phono jack can be added to the FunMitter and wired to the receive side of the transmit/receive switch, as shown in Fig. 4.

Construction

The receiver is constructed on a 2¼" × 3" single-sided PC board. Although the layout of the board can be changed, it should be emphasized that the receiver needs to be built on a PC board. Point-to-point wiring or breadboard wiring can lead to wiring errors and also can create unwanted ground loops in the receiver. Loading time of the parts on the PC board should be less than one hour.

For best operation, the board should be mounted in an enclosure. A very suitable one is mentioned in the Parts List. Front- and rear-panel controls and jacks should be mounted for best use and looks. If the Radio Shack cabinets are used, the metalwork becomes an easy task. The

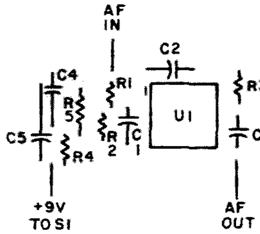


Foil side, filter PC board.

light-gauge aluminum can be drilled easily with a hand drill, and the holes enlarged with a file or knife.

The tuning potentiometer and its associated resistors and inductor should be mounted on the front panel. Small-gauge wire can be used between 9-V and R101 and between one side of L (external) and the PC board. Coax should be used between the antenna connector and the PC board. Audio cable should be used for the connection from C7 on the PC board and the phono connector, J2. Audio cable should also be used between the receiver and the audio-amp input.

Mount the board at least ¼" above the cabinet base



Component layout, filter PC board (foil side shown).

so that the PC traces will not short to ground. The PC board should be mounted in such a way that both the front-panel controls and the battery will fit easily. The battery can be tucked neatly between the board and the rear panel and a 9-V battery clip used to connect it to the circuitry. Dress the battery wires neatly along the side, away from the components, and attach them to the on-off switch.

Operation

Before the receiver is turned on, a few simple checks should be made. Vi-

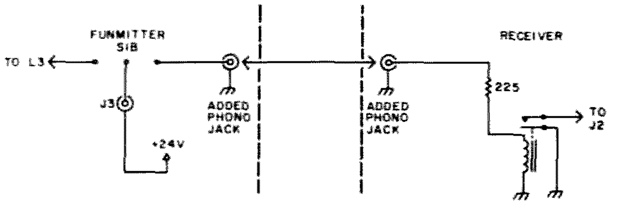


Fig. 4. Needed modifications to transmitter and receiver to include receiver mute option.

Parts List

C1, C3	80m: 220 pF	272-124
	40m: 47 pF	272-121
C2	4.7 pF	272-120
C4, C7, C14	0.1 uF	272-135
C5, C13	10 uF	272-1025
C6, C12	0.01 uF	272-131
C8	approx. 47 pF	272-801 (see text)
C9	approx. 200 pF	272-801 (see text)
C10, C11	approx. 470 pF	272-801 (see text)
CR1, CR2, CR3	1N914 diode	276-1122*
J1	SO-239 ant. conn.	278-201
J2	Phono conn.	274-346
L1	2-turn link over L2 (hookup wire)	
L2, L3	80m: 8 turns removed from 273-101 inductor	273-101
	40m: no turns removed from 273-101 inductor	273-101
L4	80m: Two 273-101 inductors in series; one with no turns removed; one with 10 turns removed	273-101
	40m: 10 turns removed from 273-101 inductor (For both 80 and 40m, the modified inductor should have last 3 turns spread out over rest of form.)	273-101
L5	100-Uh choke	273-102
Q1	Dual-gate MOSFET	276-2045
Q2	FET	276-2035
R1, R3	100k, 1/4 W	271-1347
R2	270, 1/4 W	271-1314
R4	100, 1/4 W	271-1311
R5	1000, 1/4 W	271-1321
S1	SPST min. switch	275-612
Misc.	200-mW audio amp	277-1008
	metal cabinet	270-251
	knob	274-392
	9-V battery clip	270-325
	9-V battery	
	Misc. Hardware	
Not on PC board:		
R101	3900, 1/4 W	271-1329
R102	10k linear pot	271-1721
R103	220 1/4 W	271-1313
L (external)	100 uH	273-102

Filter Option

C1, C2	0.02 uF (two 0.01 in parallel	272-131
C3	0.1 uF	272-135
C4	4.7 uF	272-1024
C5	10 uF	272-1025
R1	100k, 1/4 W	271-1347
R2	470, 1/4 W	271-1317
R3	220k, 1/4 W	271-1350
R4, R5	47k, 1/4 W	271-1342

*For 80 meters, for CR1, CR2 use two 1N914 in parallel (piggyback).

sually inspect all the traces on the PC board to make sure that there are no solder or etching shorts between pads. Also check all soldered connections to make sure that there are no cold solder joints. Components should also be checked for loading accuracy.

If an ohmmeter is available, a reading of approximately 200Ω should exist between the hot side of S1 and ground (with S1 off!). If the ohmmeter reads near zero Ohms, then a short exists somewhere and the PC board and all wiring should be reinspected.

After these checks have been made, the receiver is ready for frequency adjustment. All of the receivers I have constructed have worked the first time, and yours should not be an exception. The only adjustment to be made is that of adjusting L4 for the correct frequency. For either 80 or 40 meters the procedure is the same.

Using another receiver, listen for the vfo signal. To do this, hook a length of wire to the antenna connector of the listening receiver. Drape the other end of this wire near the companion receiver's PC board. Tune the listening receiver to the bottom of the segment to which you desire to set your tuning range (for instance, 3700 kHz on 80 meters). Using a non-metallic tool, compress or widen the 3 adjusting turns of L4 until the vfo signal is heard on the frequency you are tuned to. This adjustment will need to be done slowly and may need to be repeated once or twice until you are right on frequency.

That is the only adjustment necessary. For best results, the receiver should be operated initially without the 800-Hz filter (or with it bypassed). This will allow you to familiarize yourself with the receiver. You may find you don't even need it. I prefer headphones because the brain seems to do a great deal of filtering for you when using them. Any 8-Ohm phones can be used provided an adapter is made to connect the amplifier output to them. (The amplifier output is a mini-jack, whereas most 8-Ohm headphones have ¼" standard plugs.)

A 50-Ohm resonant antenna will provide best results. If the receiver is to be used with the Fun-Mitter, a short coax jumper can be used between the two. If the receiver mute option is used, a short wire should be connected between the two and it should be verified that the audio disappears when the transmit-receive switch is switched to transmit.

The receiver provides surprisingly good results. Because of the simplicity and low cost, several receivers can be built for different frequencies. I have even built one for a 75-meter SSB net for use as a monitor receiver.

Conclusion

All home-brew contacts can now be completed with the construction of the receiver. The companion receiver provides the simplest method, without compromising performance, to complete your station. In the months to come, a vfo, amplifier, and other projects will be presented which will further enhance your station. ■

PC boards are available from the author: Receiver PC board —$7.00 ppd; Filter PC board—$3.50 ppd. PC boards for the Fun-Mitter transmitter (*73 Magazine*, February, 1981) are also available from the author—$7.00 ppd.

Paul Grupp KA1LR
73 Magazine Staff

The Kenwood TS-130S
—a good rig done better

When Kenwood introduced the TS-120S some time ago, it was an instant success. There weren't many rigs like it available at the time and Kenwood's engineers managed to cram an incredible number of useful features into a very small box.

After WARC, Kenwood decided to upgrade their HF transceivers to include the new amateur frequency allocations, and the TS-130S was one of the first of the improved rigs to appear on the dealers' shelves. Not content to merely add a few new positions to the bandswitch, Kenwood listened carefully to TS-120S owners and included some useful new features in the package. For example, when mobiling an HF rig, every Watt of transmit power counts, and the lamentable omission of a speech processor from the 120S has been corrected in the 130S. Many CW operators like to be able to choose between wide and narrow CW filtering, depending on band conditions. With the 120S, once the narrow filter is installed, it is automatically selected whenever the mode switch is in the CW position. CW operators have been placated by the addition of a wide/narrow filter switch on the front panel of the 130S. Small changes? Maybe, but they can make a big difference if they happen to be important to you!

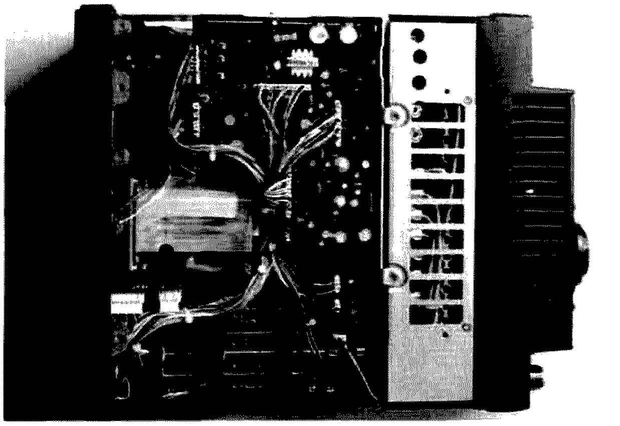
After owning an Icom IC-701 for over a year and using a Yaesu FT-707 for the last several months, I thought I would round out my experience with small HF rigs and get a Kenwood TS-130S. Here is what I discovered.


Kenwood's TS-130S HF transceiver.

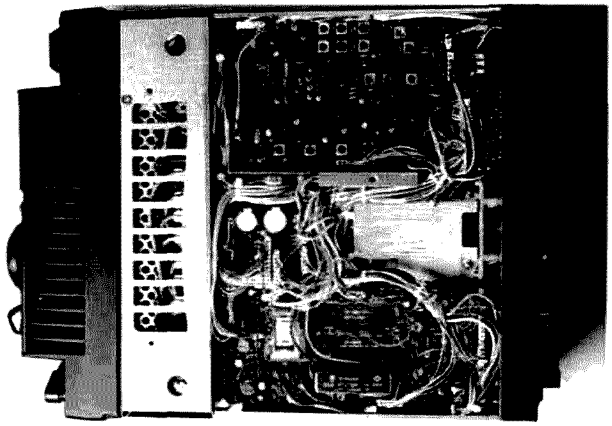
The Features

When you sit down in front of a 130S for the first time, it doesn't take long to discover that while it is small, it *is* a complete rig. In fact, it incorporates almost all the features of much larger transceivers like the TS-820S. Here are a few of the facilities available to the operator of the 130S: full filtering available for both CW and SSB, i-f shift, RIT, speech processor, complete VOX facilities, built-in relay for linear-amplifier switching, digital and analog readout, 25-kHz calibrator, noise blanker, and 80-10 meter coverage, including the new WARC bands. Not bad for a rig of any size!

The good stuff isn't just inside the rig. There is an extensive line of matching accessories for the 130S, including several different types of remote vfo's, an external speaker for hi-fi audio fanatics, several microphones, an antenna tuner, a mobile mounting bracket, a monitor scope, and a phone patch. Kenwood has understood for years that hams like to have



Top view of the 130S.



Bottom view of the 130S.

a lot of accessories to choose from for their stations (are you listening, Icom?) and they are doing their best to provide them.

When the 130S arrived, it saw a couple of months' service in the *73* ham shack, where it performed well. Its microphone, remote vfo, and linear amplifier connectors are compatible with those on the TS-830S, allowing fast changeover for both rigs. In side-by-side comparison with the 830S, the 130S fared remarkably well. Any differences in sensitivity were deemed inconsequential, but the 830S was a slightly better performer in the selectivity department. Our admittedly subjective tests indicated that when both rigs were tuned to the same frequency, under certain conditions adjacent frequency "garbage" caused slightly more interference to the 130S than it did to the 830S. Otherwise, the 130S kept right up with its bigger brother. The i-f shift is several orders of magnitude more useful than similar controls on some other transceivers. It really works! The internal speaker provides better than average audio quality, although it occasionally rattles when driven to the high levels favored by some staff members. When the rig is plugged into an external speaker, it provides typical Kenwood hi-fi audio at any practical level. The headphone jack on the front panel is wired to ac-

Continued on page 109

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73 Magazine Staff

The NCG-15 SSB/CW Monoband Transceiver

—a moving tale of mobile hamming

Ever been curious about that NCG-15 15-meter SSB/CW QRP transceiver that's been advertised in *73* lately? I have. In fact, I've been seeing tantalizing ads for it since 1978 in *CQ HAM RADIO*, Japan's premier ham radio magazine. When the rig finally appeared on Columbia's shore, I knew I had to have one. At $235, it seemed almost impossible to go wrong, so I promptly fired off an order.

By the time the rig arrived, I was more than a little curious and excited. Careful unpacking yielded the rig itself, a U-bracket mobile bracket, a package of hardware, a Hi-Z handheld microphone, and a perfectly atrocious operating manual. Whoever is responsible for that manual couldn't have more than a nodding acquaintance with the English language! Fortunately, schematics are a universal language, and that essential document appears to be adequate for any service or modifications that a ham might contemplate.

The manual may be less than useful, but the rig is so straightforward that no manual is needed. Within three minutes of connecting the rig to a small 12-volt supply and a fifty-foot random wire, I was exchanging signal reports with F6EXL, near Paris! After signing with him, I had a pleasant QSO with a ham in Florida, and then with another in Arizona.

For the next couple of months, though, the rig languished unused on the shelf. I am inflicted with an incurable case of DXitis, and with my marginal antenna system, when I heard someone I wanted to talk with I always reached for one of the more powerful transceivers in my arsenal. I could see that the QRP rig wasn't going to see much action until I installed my tower, an operation scheduled some two months in the future.

One day as I sat in my shack lost to the world, idly spinning the knob on my IC-701, my gaze came to rest on the NCG-15, and a lightning bolt of inspiration struck. Why not mobile the NCG! At this point some explanation is necessary. When I bought my IC-701 two years ago, I had great plans for mobile operations with it. I bought a mobile mount for it, and a Hustler mobile antenna with resonators for 40, 15, and 10 meters.

I soon discovered that the Icom's chances of seeing mobile operation were slim. Once it was wired into the home station with ground, linear control, antenna, keyer, speaker, and other accessory cables, pulling it out to use it in the car threatened to be a for-

The NCG-15 15-meter monoband transceiver.

Continued on page 111

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The Incredible Shrinking Antenna

—give your vertical a top hat

You might not believe it if I told you that you can build a vertical antenna for 40 meters that has a 2:1 swr bandwidth of over 1 MHz, is highly efficient, is only 12′ high, and will withstand wind velocities to an extent that it will probably never blow down.

It probably sounds too good to be possible. And yet, it can be done easily using a technique that I have seen very little of at amateur frequencies: oversized capacity hats. The antenna described here was built from the remnants of an old 14AVQ 4-band trap vertical, a few feet of wire, and three ordinary porcelain insulators.

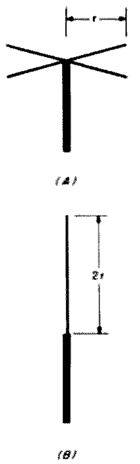


Fig. 1. A Capacity hat of radius r increases effective antenna height by twice its radius, or 2r. That is, the antenna at A and the antenna at B will have about the same resonant frequency if the lower section (thick line) is identical in both cases.

Capacitive Loading

Take a drive around your local ham neighborhood and observe the trap vertical antennas being used. Most of them have a little top hat consisting of three or four prongs about a foot long. What is the purpose of this little thing? Basically, it increases the capacitance of the high-voltage end of the antenna. Capacitive loading brings down the impedance value at the top of a vertical antenna, reducing chances for "corona" effects. It also increases the bandwidth somewhat on the lowest band; not much, but a little is better than nothing. The capacity hat also makes the antenna look much more sophisticated and *increases* the wind loading. (Isn't that great?)

Actually, capacitive loading is under-utilized on the 40-, 80-, and 160-meter amateur bands. While the radius of the capacity hat on a commercially manufactured trap vertical is about 12″, which translates to an electrical length of 0.008 wavelength on 40 meters or 0.004 wavelength on 80 meters, it is possible to have a capacity hat radius of up to about 0.1 wavelength without producing detrimental effects on antenna efficiency. This is true because most of the radiation from an antenna occurs where the current is highest, and that's near the bottom of a quarter-wave vertical.

In general, a capacity hat of radius r, consisting of three or four elements, increases the effective height of a quarter-wave vertical by about 2r. This is illustrated in Fig. 1. The physical size of 0.1 wavelength is about 12′ at 40 meters, 24′ at 80 meters, and 48′ at 160 meters.

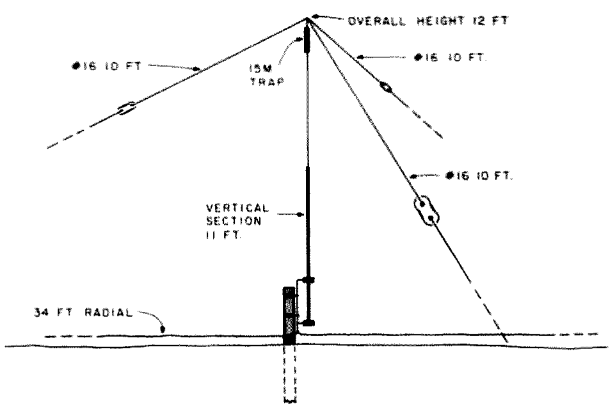


Fig. 2. The basic design of the 12′ 40/15-meter vertical. The trap and base mount are from the original 14AVQ. The capacity hat wires were attached to the top of the trap via an ordinary hose clamp. The fine details of construction are not critical, and the builder may use whatever methods suit his situation.

The 40/15-Meter Vertical

Fig. 2 shows the design of the 40- and 15-meter antenna I constructed. Actually, I

designed the antenna with only 40 meters in mind, but it turned out that the lengths and inductance values required were close enough to allow the inclusion of 15-meter capability. The entire antenna system is resonant as a quarter-wave vertical on 40, and the 11′ section underneath the 15-meter trap operates as a quarter-wave system on 15.

I installed six radials, each 34′ long, simply by laying them on the grass (after warning the landlord to have me remove them before he cut the lawn!). This is admittedly a marginal system; actually it takes dozens of radials to make a ground-mounted vertical optimum. But, being basically lazy (and frugal), I felt quite content with only six. This proved to be entirely adequate on the air.

Using the formula that the 10′ radius of the capacity hat translates to about 20′ of additional height for the antenna, you can see that the effective height of this vertical is pretty close to a full quarter wave on 40 meters. Actually, the swr bandwidth is astonishing. Fig. 3 shows the swr measurements across the 40-meter band.

Of course, you may say that Fig. 3 doesn't tell us much about the antenna; after all, a dummy load would have a swr curve every bit as flat, and even lower! And, if this antenna were radiating almost nothing but happened to have a ground resistance close to 50 Ohms, you might get a curve similar to that shown in Fig. 3. This is a valid point. So, I checked out the swr on 20 and 80 meters; it should be very high if the antenna is working properly—it is. The broad resonant response of this antenna is, no doubt, attributable to the effects of the gigantic capacity hat.

One note if you happen to have a 4-band trap vertical and are thinking about trying this idea: The radius of the capacity hat may vary a little bit, depending on the ground characteristics in your vicinity and the Q of your 15-meter trap. However, the radius should be between 8′ and 12′ in almost any situation.

On the Air

Then came the ultimate test, the real checkout. There's only one way to see whether an antenna works after all the engineering and swr checking is done. The question was, of course: Will this antenna "get out"?

On the air, the antenna performed as expected for a vertical. Nearby stations (within a radius of about 300 miles) were relatively weak, and stations further away were strong. A lot of DX was heard and worked, especially from Europe in the evening and Japan and New Zealand in the morning. Many of these DX stations were as strong as stateside W2 stations.

I'm not about to make any extraordinary claims for this antenna. In operation, it seemed to outperform the original 14AVQ with respect to DX; it proved essentially the equivalent of a full-size, 33′ structure which I subsequently built and tested. This little antenna certainly is more physically rugged than the full-size job. The latter strained perilously against mere 20-mph winds, while the little 12′ antenna was indifferent to gusts in excess of 40 mph. By indifferent, I mean that it hardly moved. And, of course, during a heavy thunderstorm, I would much rather have a 12′ metal structure in my yard than a 33′ metal structure!

Considerations for 80 and 160

Since 40 meters is my favorite band by far, I did not consider applying this technique to 80 or 160. However, these low bands are even better candidates for the idea than 40 meters.

If you are interested in building an antenna of this kind for 80 or 160 meters, remember that the maximum radius of the capacity hat is 0.1 wavelength, or 24′ on 80 and 48′ on 160. These values are probably best. Why go for anything shorter? As for height, choose the maximum height you feel comfortable with. On 80 meters, 16′ would be a good choice, since the coil or trap would allow resonance on 20 meters also.

In place of the trap, it is recommended that an air-core coil be used, which can be tapped until the proper value of inductance is obtained. The trial-and-error process may take a while, but resonance should be very broad, so the task should not be that difficult. ■

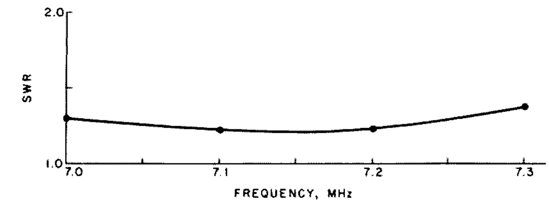


Fig. 3. The swr curve for this antenna is almost flat. The exact value will depend on the number of radials used and the conductivity of the ground. Anything less than 2:1 is generally regarded as acceptable. The important characteristic here is the flatness of the curve, indicating a very low Q attributable to the large size of the capacity hat.

Paul Grupp KA1LR
73 Magazine Staff

The Micro Control Specialties Mark 3CR

—a hassle-free repeater that does it all

Not so very long ago, if you wanted to put a repeater on the air, you had two choices. You could buy a commercial repeater from Motorola, GE, or RCA at a breathtaking price, or you could kludge-together something on your own, producing a unique blend of home-brew, amateur market, and commercial equipment. Over the last few years, several firms have been marketing repeaters specifically designed for the amateur market, without the hefty price tags of commercial equipment. At first, these "amateur-grade" repeaters were sneered at by the old stalwarts of the VHF bands. Recently, the performance and capabilities of these repeaters have improved to the point where they can no longer be ignored.

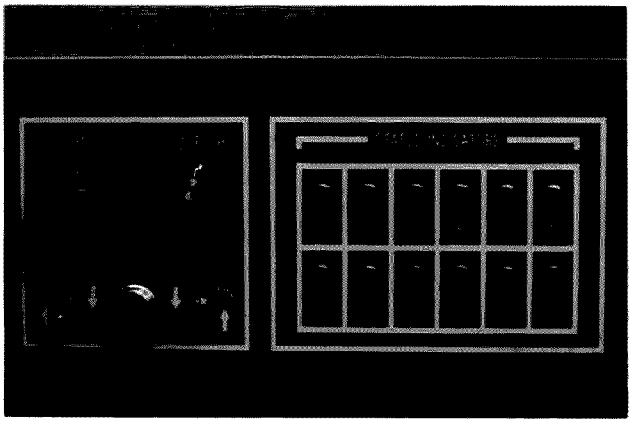
The Micro Control Specialties Mark 3CR repeater is an excellent example of what can be done by an enterprising company that sets out to meet the unique needs of the amateur community. Its microprocessor controller is the most versatile and practical I have ever seen—it would take a book to describe all its capabilities! In this review, I'll try to give you a general idea of what the repeater is capable of, and how it performs in day-to-day use.

Physical Characteristics

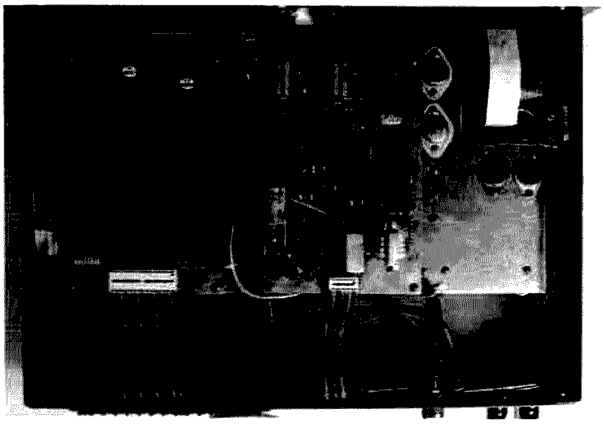
Physically, the repeater is rather unassuming—it is mounted in a box on a standard 19" rack panel, 5-1/4" high and 12-1/2" deep. On the front panel are two knobs, two switches, a mike jack, and a cluster of 12 LEDs. Period. One of the knobs is the squelch control for the main receiver; the other is the volume control for the local speaker. The switch on the left of the mike jack is the power switch, and on the right is the "command" switch. More on the command switch later. The LEDs on the right-hand side of the front panel are status indicators. Some are assigned at the factory, others are free to be assigned to specific tasks by the end user.

If the front panel fails to indicate the vast range of functions available to the owner of a Mark 3CR, comprehension will surely dawn after even the most cursory examination of the rear panel. It sports two terminal strips with a total of 30 connection points for control of external devices, and six phono jacks for various audio inputs and outputs. An octal socket allows access to various voltages for metering purposes, and a pair of banana connectors is provided for a 12-volt backup power supply, such as a deep-cycle marine battery. Three SO-239 connectors are provided for antenna connection to the receiver, transmitter, and an onboard control receiver.

Continued on page 109



Front view of the Mark 3CR.



Top view of the Mark 3CR.

Tim Daniel N8RK
73 Magazine Staff

Radio Amateur's License Manual

—don't memorize, learn!

Radio Amateur's License Manual, *American Radio Relay League, 225 Main St., Newington CT 06111.*

Any book that gets as far as a 78th edition has to be doing something right. The American Radio Relay League's *Radio Amateur's License Manual* is a classic. It has nurtured thousands of hams from Novice to Extra. Over the years, the *License Manual* has tried to keep pace with changes in the rules and exam content. With "memorize-the-answers" publications gaining in popularity, I was interested to see how the League's tried and true "Publication #9" kept up.

The *Radio Amateur's License Manual* has always offered something for everybody. In the space of 175 pages it includes coverage of the Technician/General, Advanced, and Extra class exam subjects, plus a copy of the FCC's Part 97 rules and regulations. Among the other useful bits of information are details about international regulations, reciprocal licenses, and third-party agreements. Rounding out the broad range of topics is a list of addresses for the FCC field offices and a frequency allocation chart. All this in one 8½"×11" softbound book that costs $4.00.

The ARRL editorial staff has done a good job of presenting a tremendous amount of material in a limited space. If you are very dedicated and have a solid background in amateur radio practices and theory, the *License Manual* will probably get you through the exams on the first try. Less experienced readers will want to use other materials to supplement the contents of the ARRL book.

As a firm believer in learning rather than just memorizing, I like the "new" *License Manual*'s style. The large format lends itself to a lot of figures and diagrams that help clarify technical topics. There are multiple-choice questions at the end of each section. No, they are not pirated from the FCC exams, but they do make a nice way to review.

For the majority of the hams contemplating the purchase of this book, all the lists, rules, and other extras are not as important as a pertinent, well-explained discussion of the topics on the exams. Each of the exam topics is covered, but not always in the depth required to be confident in answering the test questions. The approach used in this guide resembles shooting in the dark at a very small target, with a limited amount of ammunition. While the 78th edition of the *Radio Amateur's License Manual* is not a bull's-eye, it is better than completely missing the target.■

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The CCD Antenna—Another Look

—theoretical justification and answers to some frequently asked questions

Response to our first article (*73* for October, 1978) describing the high-gain Controlled Current Distribution antenna, has been exciting. Many telephone calls and letters have come from coast to coast, universities, and from out in the Pacific.

Enthusiastic comments and data were volunteered by Professor Arthur Erdman W8VWX of Ohio State University. His experience is quoted with his kind permission:

"My previous 14-MHz inverted dipole was 45 feet from earth at the center, and surrounded by five trees. It was fed with low-loss 300-Ohm twinlead and a tuner, and produced very poor DX results. Then, a CCD was built and substituted for the inverted dipole, at the same height and using the same tuner and feedline. The results are amazing! My DX is summarized:

14-MHz Inverted Dipole

1. Could work *only* the S-9 DX stations—my reports were S-4 to S-5.
2. Never any answers to my DX CQs.
3. Last one in a pileup.

14-MHz CCD Antenna

1. Can work DX stations I can scarcely hear!
2. After ordinary CQs, more DX stations answer.
3. Usually 5th to 10th in large pileups!"

The Ohio State University Electrical Engineering Department feels that further research into the CCD principle is definitely justified. Professor Erdman will direct the investigation, utilizing already-written computer programs.

Additional data are presented in this article that will be helpful in constructing and understanding the superior antenna. There also is a section on theory. Finally, the questions most often asked are addressed below, in the order of most concern to those interested in the CCD's advantages.

DATE TIME	STATION CALLED	CALLED BY	HIS FREQ. OR DIAL	HIS SIGNALS RST	MY SIGNALS RST	FREQ. MC.	EMISSION TYPE	POWER INPUT WATTS	TIME OF ENDING QSO	OTHER DATA	NAME	QSL S	QSL R
1/17/78					579								
2017	WA1VAB	X	3556	579	449	CCD	ANT		2030	MASS	HENRY		
1/19 1750	CQ	WA2RVO	14097	599	599	"			1800	PORT MONMOUTH, N.J.	STAN		
1930	F6ATQ	X	14035	589	56/79	"			1931	MARSEILLE	JO		
1820	W9JUM	X	14053	589	599	+1508			1835	BELLEVILLE, ILL	NELson		
1835	X	I6ANZ	14053	579	579				1840				
1840	YO2BEO	X	14055	579	589				1845				
1915	CQ	YU3NEQ	14042	449	579				1925	MARIBOR			
1930	CQ	EA7TU	14044	579	579				1935	CADIZ	JESA		
1945	HA8UY	X	14035	599	599				1950	J LASZLO	IMRE		
1955	CQ-DX	PY2BAU	14021	579	589				2000	SAN PAULO	MARC		
2010	IY4FGM	X	1404	599	589	QSL VIA	I4BFY		2015	nr BOLOGNA	ARTENO		
2025	I2OMO	X	14020	589	579				2050	nr VARESE	PRIMO		
2200	UA9URS	X	14045	579	579				2205		GENE		
1810	CQ	W5BVM	14060	579	579	nr Dallas 68 yrs			1830	FRISCO, TEX 56°F	SMITTY		
1755	CQ	DK2BH	14023	579					1800		WALD		
1745	CQ	VE2BA	14017	579	589				1750	VERDUN	AL		
1751	CQ	G8FR	14052	579	569				1752	nr PORTSMOUTH	WALT		
1752	CQ	WD4MMN	14052	589	599	ONE WATT			1753	PORT SAINT JOE, FLA -	STEVE		
1807	CQ	N6HS	14053	579	579	63 YR - Retired	from FAA		1830	SAN BRUNO, CF.	BILL		
1835	CQ	F6DHT	14053	589	569				1836	ANDERNOS	ALAIN		
1836	X-CQ	I6ANZ	14051	379	559				1840				
1845	CQ	K6AYB	14054	57?	589	59 YR			1900	SOUTH SAN FRANCISCO	JACK SON		
2110	CQ	VE7ENG	14096	589	579				2113	QUESNEL B.C.	DALE		
1740	CQ	I0UY	14097	579	579				1749	ROMA	DOMEN		
1795	CQ	G3ZDW	14097	579	589				1800	nr LINCOLN	ROGER		
1830	VP9JH	X	14046	599	599				1833	PAGET	JACK		
1833	CQ	GM3COB	14046	589	589				1840		JOHN		
1840	SP2BLC	X	14048	579	579				1845				
1850	CQ	I1KWG	14055	599	579				1855	SARZANA	ENRICO		

150 WATTS CCD ANT

Fig. 1. A sample log sheet from W8VWX, while using the CCD antenna and 150 Watts input.

Testing

Previous comparisons of CCD antenna performance against a reference dipole at 7 MHz had been cumbersome, due to the sheer distances required to separate test antennas from the Ferris Model 32-B laboratory-type field-intensity measuring instrument. But to con-

struct a valid antenna range for HF antenna measurements becomes a monumental task: building an adequate, level ground plane of suitable dimensions, maintaining constant spacing of test antennas, and clearing of vegetation.

VHF frequencies permit closer control of test conditions, due to both smaller radiators and antenna range dimensions. A Taco/Jerrold Model AIM 719-B laboratory-level field-intensity instrument covering 54 through 900 MHz and calibrated to 1 dB was purchased, and construction of a VHF antenna range was begun.

A section of level land was selected, and vegetation cleared to a radius of 63 feet (approximately 9.2 wavelengths at 144 MHz). Projecting near-future plans to test many CCD beam configurations, a ground plane twenty feet square was constructed, using close-mesh woven wire. A rigid support post for test antennas was mounted at plane-center, with a compass and means for accurately spacing radiators at specific heights above the effective ground.

Two independent power sources were provided: commercial 115-volt and lead-acid storage battery. Operation solely from the battery would quickly reveal any distortion of radiated field patterns which might result from reflections by commercial power feedlines. Also importantly, the more constant battery power would eliminate errors in pattern measurements that could result from commercial power fluctuations.

Five different designs of 2-meter CCD radiators have been used at W4FD to consistently activate repeaters 90 miles away while using one-Watt power. The CCD design selected for the initial range measurements was 7 feet long, made up of 40 sections of ¾-inch OD aluminum tubing, each 2 inches long. (Except: two sections at the feedpoint and also the two at each end are 2½ inches long.) The 38 fixed capacitors connecting these are each 24 pF.

Two identical simple dipoles were constructed of ¾-inch OD aluminum tubing, each 3′¾″ long. One serves as the reference dipole, the other as the field-meter antenna, located 9.2 wavelengths from the test antennas.

For valid comparisons of the CCD versus the reference dipole, the precise adjustment of equal input power to each is most critical, and was greatly facilitated by use of a line-to-antenna impedance-matching system which we call the "trombone match."

Some disturbing variations in field-meter readings were caused by the movement of personnel. By also applying the trombone match, immunity to such movements was achieved, and uniform readings were then possible from any convenient position.

Careful preliminary measurements were first made with power to the range supplied through a 115-volt ac line laid flat on the ground and laborously positioned at 90 degrees to the test antenna during measurement at each 10-degree point around the range. Then the ac source and line was completely removed from the range and replaced by storage battery. The same readings were again taken at each 10 degrees of azimuth for both the CCD and reference dipole test antennas, each mounted in exactly the same position. Absolutely no difference in values was found (the AIM 719-B instrument is easily read to 0.1 dB).

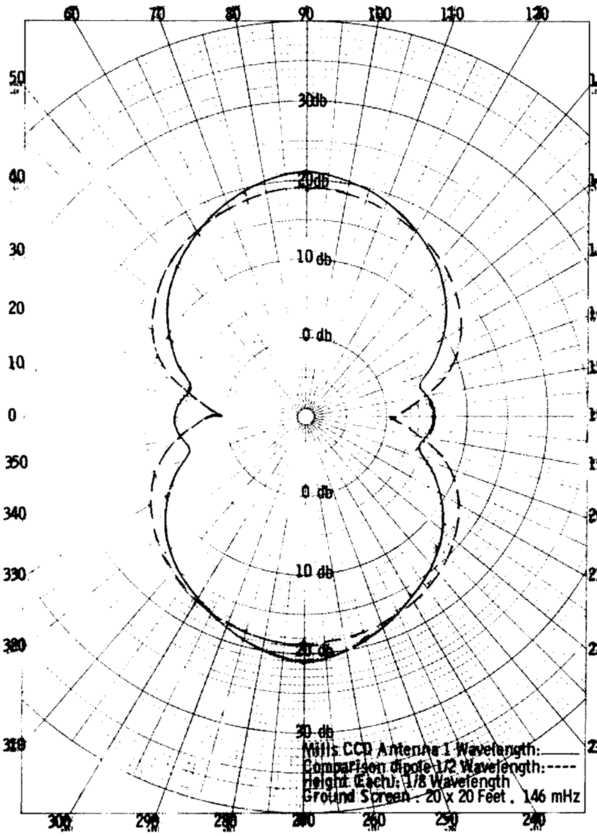


Fig. 2.

As mentioned, the 2m range was fitted with a flat, close-mesh ground plane 20 by 20 feet square, and the new Taco/Jerrold Model AIM 719-B laboratory-level field-intensity instrument, which covers 54 through 900 MHz and is calibrated to 1 dB, was used. In order to eliminate the possibility of pattern distortion by proximity of the transmiting equipment, an excavation underneath the ground plane contained the TS-700 SP 2-meter transceiver and power source.

The new range will be used to make vertical pattern slice measurements at varying angles, equidistant from ground, to reveal the low-angle characteristics which are so vital to DX communications. It also will be used to study the effects of adding capacitive loading discs at the CCD radiator ends, to extend current flow even more to the antenna ends. Following this, measurements will be made of patterns radiated from multi-element CCD arrays, showing the gains and advantages which can be obtained when employing all-driven or parasitic elements. The trombone match will be utilized to provide equal power division to driven array elements.

Some Theory

An antenna is a transducer for coupling rf energy into space. Its function is analogous to that of a loudspeaker and its system of baffling which functions to couple low frequency energy into the air to achieve efficient sound reproduction.

Over many long years, we have become accustomed to regard space as being "empty." This is because early scientists and physicists advanced a medium theory whereby radio and other magnetic energy

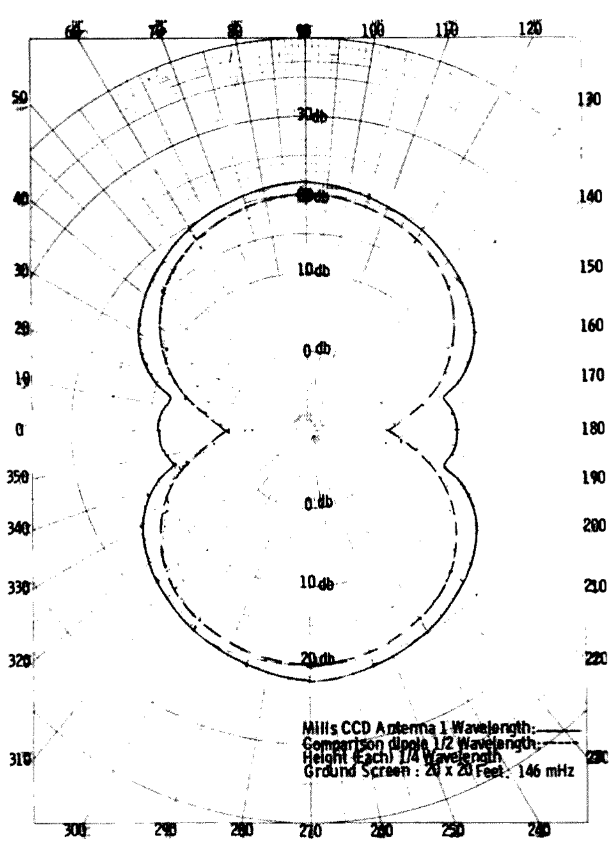


Fig. 3.

fields traveled through the "ether," an unfortunate choice of words, which suggested that propagation was through a medium of gas. That concept has fallen into disuse. However, the vast radiation energies now known to be resident in space provide ample reason fo. keeping an open mind to any new explanation of electromagnetic theory.

We express an opinion that consideration should be given to the theory that light itself, that ever-present photon, may be the medium through which many forms of radiations are propagated through space. Some known facts lending credence to this theory include: 1) Light is known to have definite mass (as does any "solid") a determinant in its velocity which is 186,000 miles per second (the same velocity as other known radiations). 2) Light is "bent" by the presence of intense magnetic fields, as theorized by Dr. Einstein and proven by actual tests. 3) The sun's light rays, interacting with our planet, form ionized radiation around it. 4) Light may be said to be "modulated" by vortical changes in the temperature of the light-emitting body, as sunspots create intense magnetic fields which occasionally disrupt communications as far away as our planet. 5) Stars throughout the universe emit light; even planets may be said to emit photons, although the level is below the detection threshold of human eyesight. (Light is present, even in the darkest cave, only our unaided eyes are not sensitive enough to detect its low level). 6) A photon is a single quantum of electromagnetic energy. Maxwell's equations form the basis of classical electromagnetic theory, but quantum theory requires that we postulate the existence of photons to carry the energy of electromagnetic radiation. Quantum field theory pictures the coulomb forces and magnetic forces between particles as being associated with a kind of photon exchange beween particles. The pressure of sunlight is very small. It has, however, been observed to have a measurable effect on the orbits of earth satellites, particularly on that of the large satellite *Echo I*, launched in 1960.[1]

Questions and Answers

Q. My real estate seems too small for the CCD antenna dimensions given. What are my options?

A. Several space-saving arrangements are possible without reducing CCD efficiency. When mounted as an inverted dipole, much less ground space is required. Also, since the new design is a low-impedance device with greatly reduced high-voltage points, it may be arranged effectively in a zigzag configuration. Another space-saving plan is to mount the middle portion horizontally and allow the ends to hang vertically. This latter scheme will add vertical polarization to the composite pattern, which is beneficial during some propagation conditions. When antennas for different bands are desired but space is limited, they may be efficiently fed by a single feedline. The low-Z property of the CCD renders it very tolerant to nearby trees and structures, with much less detuning and losses than is experienced with a conventional dipole. This factor reduces the space requirements, and, surprisingly, a CCD radiator performs very well on DX when only 7 feet above ground. So, the importance of tall supporting towers is greatly reduced and most city lots will accommodate 14-MHz and higher frequency CCD antennas which will rival a rotary beam in performance.

Q. Why is one full wavelength at the lowest operating frequency used instead of some shorter length?

A. At approximately one physical wavelength, a desirable condition such as cancellation or near-cancellation of the wire section inductive reactance by the capacitive reactance of the next adjoining capacitor in the series chain results. Also, a great reduction of end effects occurs when the overall radiating system is made resonant. Reflections from the radiator ends are markedly reduced, so that a traveling wave may move efficiently from the transmission line and the radiator into space.

Q. I have a number of capacitors on hand other than the values specified in the guidelines table. May these be used efficiently in a CCD antenna?

A. Yes, definitely. It is necessary only to adjust section wire lengths and the number of sections proportionately. For example, suppose that 470-pF capacitors are on hand and a 7-MHz CCD is desired.

First, find the even number of wire sections required, finding K for 7 MHz from Table 1 in original article: 470 pF/8.48 = 56. Overall antenna length (from Table 1) is 140 feet or 1680 inches.

Next, find the length of each wire section: 1680/56 = 30 inches. The number of capacitors is always 2 less than the number of wire sections; 54 in this example.

Q. How many capacitors are necessary in the CCD, and should they have a high-voltage rating?

A. There is no set number of capacitors required. Within practical reason, the larger the number of capacitors used, the more uniform the current distribution and the more effective

the radiator. In general, 40 to 60 fixed capacitors will provide very effective current smoothing throughout the antenna. (Upward of 1,000 capacitors have been successfully employed at W4ATE.)

Best broadside gain results when all capacitors are of equal capacitance. When as many as 40 capacitors are connected in series with wire sections of the CCD radiator, the rf voltage applied across each individual capacitor is quite small (typically under 80 volts, even with 1 kW input to the final amplifier). This permits the use of conventional-sized polycarbonate (most stable), polystyrene (lightest weight), silvered mica, mica, dipped mylar®, and other low-loss capacitors. The capacitance tolerance should be within 5%, which narrows the off-the-shelf choice to the first three types named. Wider tolerance capacitors may be used provided that they are selected by accurate measurement to the 5% tolerance required. Any units selected should have substantially strong wire leads or terminals.

Q. What type of antenna will perform best inside a building or attic (assuming no metallic Faraday shielding is present)?

A. Definitely, the CCD type of radiator. It should be remembered that the high-voltage, high-impedance characteristics that exist over the large outer portion (away from the center) of the conventional dipole produce high dielectric loss in the radiator even though the walls, ceiling, and roof are of dry wood and shingles. Therefore, design your antenna as a current-operated device free from points of high voltage throughout, and the dielectric losses from the surroundings will be greatly reduced. W4FD had these advantages amply demonstrated while working DX with attic CCD antennas on 10, 15, and 20 meters under the previous call W3UZ, in Washington, DC.

The increasing trend toward condominium and apartment living with their restrictions against outdoor antennas, presents another application where an indoor CCD will provide performance which is much superior to the conventional indoor dipole. Even where outdoor antennas are employed, very little dielectric loss will occur when the CCD antenna is strung through trees or shrubbery.

Q. Why does the CCD antenna produce good signals and provide good DX reception at heights of only six to eight feet (albeit down about 10 dB from one elevated to ½ wavelength) whereas a simple dipole at the same low level usually does not?

A. This is a question for which all the answers are not yet formulated. However, it is believed that there are several reasons for the improved performance of the CCD at very low elevations. First, it is known that low-angle radiation (the requirement for DX) occurs in the center, highest-current portion of the conventional dipole, and for the simple horizontal dipole at low heights, the radiation resistance is known to drop off very rapidly, nullifying most if not all of the low-angle radiation. Not only is the dipole then coupled closely to its ground "image" but the "hot spotting" center current produces excessive ground losses, as does the dielectric end effect. That energy which would have been reflected at least partially at lower angles (assuming a ½-wavelength height) is sporadically reflected at higher angles, chiefly useful for close-in communications.

In sharp contrast, the low-mounted CCD antenna stretches out the antenna current to the very ends of the radiator (when end-loading capacity-producing discs are added). Now the antenna current is no longer bunched at the center portion, but tends to produce a focus or aggregation of lower-angle currents across the radiator. When the CCD is mounted at widely varying heights, the center feedpoint impedance variation is only a fraction of the excursions produced when the height of a simple dipole is changed the same amount.

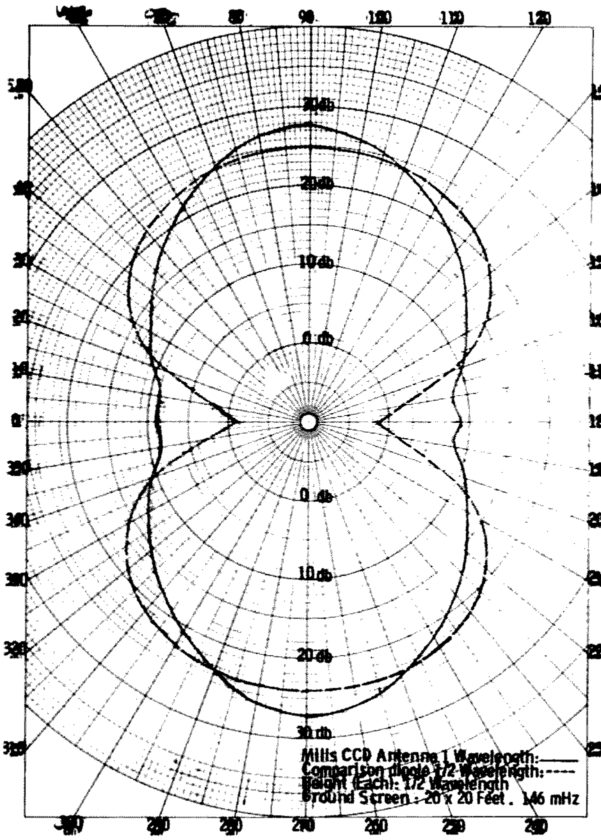


Fig. 4.

During actual tests, DX beyond three or four thousand miles has been worked with the CCD antenna lying flat on the ground, although the reported level is then down 20 to 30 dB. Field Day hams take note!

Q. How does the bandwidth of the CCD antenna compare with the conventional dipole bandwidth?

A. A CCD antenna which contains near or equal capacitance values and wire section lengths has a three to four times wider bandwidth than the usual dipole counterpart. Extremely wide bandwidths have been attained (at some sacrifice in gain) when the capacitor values and radiator section lengths are made progressively smaller, beginning at the feedpoint and with the smallest values at the radiator ends. This form of CCD results in a reflection-free radiator with waves *traveling* in only one direction from the feedline, through the antenna and into space, *without* standing waves. Measurements show that voltage and current disappear at the antenna ends. This configuration has produced a UHF radiator that is matched across 340 to 550 MHz.[2]

Q. What are the antenna resistance (load impedance) characteristics of the CCD antenna?

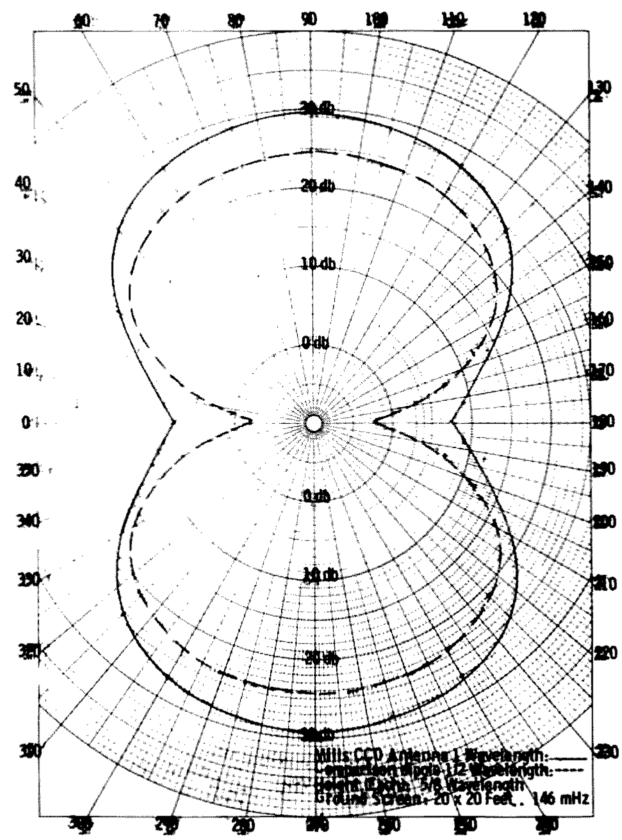


Fig. 5.

A. The load impedance of a conventional horizontal dipole (antenna resistance at resonance) may vary as much as 10 times or more, with wide variations in antenna height. The controlled-current distribution antenna resistance change is only a fraction of this for the same variations in height. Indeed, the main determinant of the antenna resistance will be the design selection of the wire section lengths and capacity values, together with any loading screens employed at the radiator ends. With capacitor and wire section values within the ranges covered by the formula, antenna resistance values around 250 Ohms may be expected.

Thus, 300-to-450-Ohm, open-wire balanced line used with a transmatch will work well with very long transmission line lengths. For shorter lines, 50-to-73-Ohm coaxial line with a 4-to-1 balun at the antenna terminals works quite well. The very high ratio of radiation resistance to loss resistance and the greater aperture of the CCD produce a much greater signal than can be realized with the conventional dipole design.

Q. How effective is a 160-meter horizontally-polarized CCD antenna, both as a nighttime skywave radiator and a ground-wave daytime antenna?

A. The results from testing the 160-meter CCD under these conditions will agreeably surprise many readers. Nighttime performance was as good or better than with the best of conventional antennas. Our mutual friend John Sharpe W5AB at Houston, Texas, is broadside on the southwest lobe of the W4FD 160-meter CCD, and reported both CW and SSB signals were never below S9. He further reported that 90% of the time the signal was 20 to 25 dB over S9. Contacts were made on two different nights on 1808 kHz, with the same reports. The power input was 100 Watts to the Swan 160X equipment. Daytime coverage has been 80 to 100 miles with the same input power.

Q. Is there a value of radiation resistance in Ohms which, if maintained, will produce optimum radiating efficiency?

A. This question has been of great interest to us for some time. Although no firm answer has yet been formulated, there are indications suggesting such a possibility. The following is intended to arouse interest among members of the amateur fraternity, to encourage experimentation along these lines.

Assuming that light may indeed be the medium in which signals are propagated through space and that the intrinsic impedance of space itself is 377 Ohms, would a continuous radiation resistance of 377 Ohms (or even crossing through this impedance value many times), produce optimum coupling efficiency to the radiator? This is a most intriguing question.

The radiation resistance of the simple dipole sweeps through 377 Ohms only twice. It occurs a number of times in the collinear antenna and even more in the rhombic. Each type of antenna produces an ascendingly improved efficiency. The CCD antenna produces scores of sweeps through 377 Ohms. Aside from any theoretical considerations, tests with the multi-section CCD suggest that there may be some optimum (if continuously maintained) radiation resistance such as 377 Ohms.

Q. How may I determine that capacitors out to the very end of my CCD antenna are all functioning?

A. In a properly constructed CCD (wire lengths and capacitors correct according to formula), defective capacitors will be revealed by exploring the radiator with any simple voltage or current indicator while *low* power is applied. The indicator may be a hand-held neon or fluorescent lamp, a miniature dipole feeding a solid-state diode and sensitive dc current meter, or a dip meter in the diode mode. Starting at the feed point, be sure that an indication of rf is present while the indicator is moved out to the extreme end of each half of the CCD. If a point is reached where no indication is obtained, the last capacitor passed over may be defective. If, however, an rf indication is lost at *both* ends of the antenna and at approximately the same distance from the feedpoint, the wire section lengths may be shorter or the capacitors may be larger than specified by the formula. Both values should be carefully verified.

Also, it is possible that one is attempting to operate the CCD below its resonant frequency, in which case it functions as a high-pass filter, preventing rf from traveling beyond a few sections from the feedpoint.

To explore this possibility, temporarily feed twice the design frequency, i.e., 14 MHz to a 7-MHz CCD, and repeat the preceding rf probing tests. If indications of rf are then obtained out to the radiator ends, the capacitors are functioning, and steps must be taken to resonate the CCD to a frequency near the low-frequency end of the design band, as described earlier.

Wire sections which are shorter than specified by formula will prevent rf from reaching the antenna ends because the X_C will be much larger than the X_L. Also, when wire sections

which are too short are used, one may continue to add any number of sections and never achieve resonance! This can be very baffling and discouraging until the importance of making X_L approximately equal to X_C is realized.

Q. Will you please furnish the calls of some successful builders of the CCD antenna so that I might contact them and profit from their experiences?

A. Yes; we believe that the following constructors will willingly share their ideas regarding the CCD when you furnish an SASE:

K2GGN, W2IMU, W2SVJ, W4DNX, W4KIX, W4OQT, W4KXC, W8VWX, WD4DSX, AC5P, K8AA, AA6US, WB8RGN, and KK4X.

Q. Can the CCD antenna be operated at harmonics of the fundamental frequency?

A. Yes. But please note that the positive inductive reactance, X_L, and the negative capacitive reactance, X_C, move in diametrically opposite directions, when the exciting frequency is changed, to a series circuit such as the CCD. Therefore, harmonics as we are accustomed to regard them, will *never* occur close to whole number multiples. For example, in a reasonably well-balanced chain of alternate wires and capacitors in series, with fundamental resonance at 14 MHz, a second "harmonic" indication at average antenna height occurs at slightly over 1.6 times the fundamental frequency.

These relationships between fundamental and "harmonic" frequencies in a typical, balanced CCD are shown graphically in Fig. 1 of our previous article. In another example (from the same graph), in order to produce a second harmonic near 28 MHz, a CCD radiator would necessarily have a fundamental resonance near 17 MHz. In a futuristic example, the harmonic of a CCD designed for the new 18-MHz band falls neatly near 28.9 MHz!

Actually, this offbeat harmonic relationship provides a great advantage in practical operation. Instead of the wide swings in load impedance experienced with a conventional dipole when changing from even to odd harmonics, the CCD user employing a transmatch will find relatively small changes in loading. Moreover, the effects of improved current distribution and smoothing out of the broadside radiation field pattern will carry over to the second and third frequency multiples.

Q. Is there a simple formula or formulas which I may use in a step-by-step manner to calculate with reasonable accuracy, the design parameters for a CCD operating at any frequency within the HF bands?

A. Definitely yes.

Formula 1. $S-2 = fC/59.35$, where $S-2$ = number of capacitors, S = number of wire sections, and f = resonant frequency in megahertz. (Note: 59.35 is an empirically derived constant.)

Formula 2. $L_T = 984/f \times 12$, where L_T = total length in inches (for 1 wavelength) and f = resonant frequency in megahertz. 984 is double the usual 492 because the CCD is one wavelength overall.

Formula 3. $L_S = L_T/S$, where L_S = length of sections in inches, S = number of wire sections (from Formula 1), and L_T = total length in inches (for one wavelength).

These three simple formulas can be combined in a single comprehensive formula. However, it has been found that less confusion results when specific parameter values are determined by using the formulas in the above order. A sample calculation is contained in the answer to the following question.

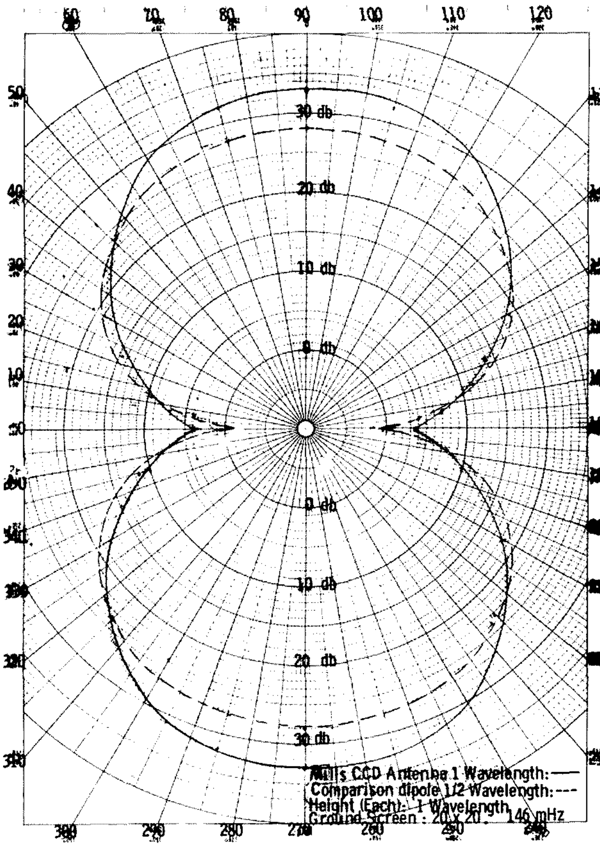


Fig. 6.

Q. I have on hand 50 fixed mica capacitors, each 390 pF in value. Do I have enough of them to construct a 7-MHz CCD antenna, assuming that I have a sufficient amount of #14 copper wire? How do I determine all antenna dimensions?

A. Applying Formula 1: $S-2 = (7 \text{ MHz} \times 390 \text{ pF})/59.5 = 46$ capacitors. Then, $S = 46+2 = 48$ wire sections.

Applying Formula 2: $L_T = (984/7 \text{ MHz}) \times 12 = 1686.85$ inches overall length.

Applying Formula 3: $L_S = 1686.85/48 = 35.14$ inches, the length of the sections.

In summation, we have 46 fixed capacitors, each 390 pF, 48 wire sections, each 35 inches long, and a total CCD antenna length of 1686.8" or 140.57 feet.

Wire sizes 18, 16, and 14 all have a sufficiently small length-to-diameter ratio when utilized at the 7-MHz operating frequency.

Q. Can the CCD antenna be operated effectively on frequencies either above or below its resonant frequency?

A. It should be recognized at the outset that this type of radiator is a very broad characteristic type of high-pass filter. It will perform well at all frequencies above its resonant point, but should not be used on amateur bands whose frequencies fall *below* resonance. The broadband nature of this antenna is such that it will operate most efficiently on the lowest frequency band for which it is designed, even in instances where resonance occurs at or near the high frequency end of a band. It is most desirable that the CCD be made resonant within the

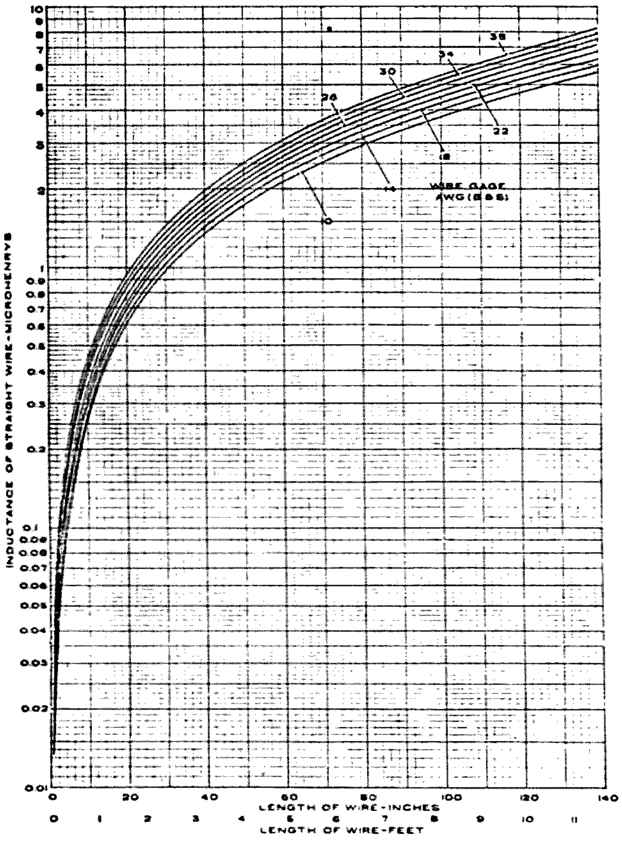


Fig. 7. Graph for determining the self-inductance of straight lengths of wire.

lower frequency half of the band.

Q. What effect does height-above-ground have on the radiated pattern of the CCD antenna?

A. Although complete pattern data has not yet been obtained and analyzed, preliminary measurements made with a commercial field-intensity instrument at the 2-meter range indicate that the sharper pattern lobes occur when the CCD is elevated 1/2λ or higher. At heights of 5/8λ and above, side levels (off the radiator ends) are 22 to 24 dB below the broadside lobes. Dropping the height from 1/2λ to 1/8λ gradually collapses the major broadside lobes. At the 1/4λ height, the broadside-to-side radiation differs by slightly more than 12 dB. At 1/8λ elevation, the difference is even less. See Figs. 2 through 6 for various elevations.

It is interesting to note that the off-end radiation begins to increase markedly below 1/4λ height, and can become almost equal to the broadside value as the elevation is reduced below 1/8λ.

These preliminary measurements were made with both the test antennas and the field-intensity instrument antennas horizontal to flat ground, well in the clear and at the same height. The probing point was 5λ away. A ground-plane screen had been installed at this time.

The test CCD antenna was rotated through 360 degrees and field-intensity readings were taken at each 15-degree interval between full broadside and 30 degrees. Between 30 and 0 degrees, readings were recorded at each 7.5 degree point. Directly off the CCD ends, minor lobes were noted which were approximately 1 dB above the minimum skirt levels of the side radiation. A power input of 1 Watt at 146 MHz was used during all pattern measurements.

Q. What are the advantages gained by the use of capacity-loading disc screens at the ends of a CCD radiator?

A. Although the use of loading discs is not essential to efficient operation of the CCD, some of the valuable refinements are increased radiation resistance, improved broadbanding, improved current distribution, almost complete elimination of end effects, and final adjustment of resonant frequency.

In particular, more current will then flow in the very ends, resulting in a more efficient radiator. Wire screens are recommended over solid discs, for reduced wind resistance. For the 7-MHz band, 16-inch diameter discs are suitable, the diameter increasing in inverse proportion to frequency, for other bands.

The constructor will find that the added discs cause a slight lowering of the antenna's resonant frequency. By adding the discs one at a time and noting a slight frequency decrease with each addition, a positive indication is obtained that all sections are functioning.

A CCD is installed as an inverted dipole at W4ATE, where it is found convenient to replace the discs with small fixed capacitors soldered between the radiator ends and the supporting wire, which is grounded. The desired value of capacitor may be determined by the temporary use of two variable capacitors which may be adjusted for proper operation and then replaced with fixed capacitors.

When loading discs are not employed, it is suggested that the two outer wire sections be dimensioned about 50% longer than the others.

Q. Is there a method whereby a directional array of multi-elements can be optimally adjusted at a particular frequency, or even changed to another band within a few minutes without conflicting reactions?

A. Definitely, yes, where the CCD antenna system is utilized in directional arrays. The method involves a full tuneup of all the radiating elements (CCD or conventional) directly from the operating position, with a simple means for power division to the individual elements. The scheme eliminates the troublesome common-point junction bottleneck and uses an inexpensive tube or solid-state amplifier feeding each antenna element to permit rapid system tuning without interaction problems, which many amateurs already recognize with conventional systems.

Q. Is there a method, particularly adaptable to solid-state linear amplifiers and to transmatch tuners, whereby the conventional, cumbersome wide-spaced tuning capacitors can be eliminated from tank, and the open-end or toroidal coils be henceforth ferrite-loaded and five or six amateur band tanks placed in the area now occupied by one tank?

A. Fortunately, yes. The method involves a controlled-voltage distribution (CVD) system, a blood brother of the CCD scheme developed at the same time. The basic plan is very much like the CCD in that capacitive loading is utilized.

Q. Although my CCD antenna usually produces a stronger signal than my reference test antenna, there are times when my reference antenna produces the stronger signal. Why is this?

A. It is well known that

under certain conditions of sunspot activity and other circumstances in which the Earth's field-ionization pattern is altered (as caused by the sun's activity), the usual ionized layers existent at a particular time of day can become greatly changed. Signals normally bent to Earth by the reflecting action of one or more ionized layers may, because of alterations in the usual layer heights and thickness, be reflected to a higher or lower angle than usual.

Since the CCD antenna is known to produce a considerably lower reflection angle, any circumstance which changes the reflection angle from the ionized layer(s) at which the antenna maximizes, will necessarily produce a weaker signal. Many amateurs who use both horizontal and vertical radiators often find that one or the other polarization produces a stronger signal. Since the CCD antenna's radiation angle can be even lower than that produced by either of the aforementioned conventional antennas, it not only becomes a very helpful third form of advantage, but, on occasion, can receive signals otherwise not even detected. Also, several observers have noted that under most circumstances the CCD antenna will produce the least signal fading.

Q. How may I determine the inductive reactance of straight-wire sections, for further experimental study?

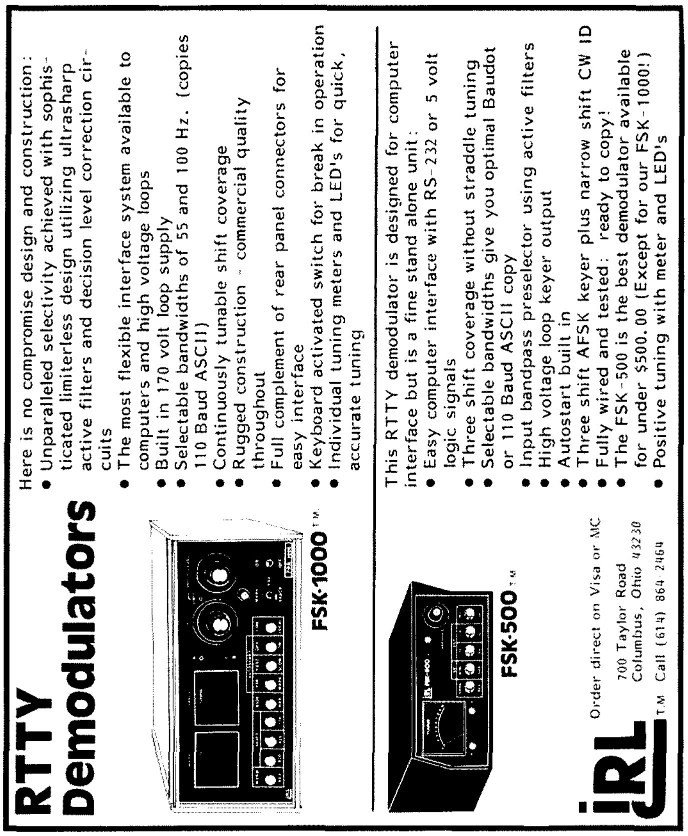
A. This information does not appear in standard wire tables, but may be derived after the inductance value is calculated according to the formula $L = l(2\log 4l/d - 3/2)10^{-3}$, where L = self-inductance, l = length of wire in centimeters, and d = diameter of wire in centimeters. However, the design chart in Fig. 7 more readily provides the self-inductance values of various copper or aluminum wire sizes useful for CCD antenna construction.

For example, to find the inductive reactance at 7 MHz of a piece of #14 copper wire which is 35 inches long, first locate 35 inches along the bottom of the chart. Trace directly up to the curve for #14 wire. From that point, go to the left edge of the chart and read approximately 1.33 μH.

Last, insert this value into the usual formula, $X_L = 2\pi fL$, where f is frequency in MHz and L is inductance in microhenrys:
$X_L = (6.2832)(7)(1.33) = 58.4$ Ohms.

Q. Can a CCD dipole be used as a basic element or building block for more complex arrays?

A. Yes. The CCD principle may be employed in most existing systems and configurations with improved efficiency. The resulting radiation patterns will be different from those with conventional arrays.



Final Remarks

We are grateful for the enthusiasm and suggestions of commercial antenna engineers and many amateurs who have phoned or written: Frank K8AA, for comparison tests with 7-MHz European stations, using less than one-Watt input to his CCD, Ben W5TM, for suggesting static protection resistors across the phasing capacitors, the encouraging notes of Dick W2IMU and Art W8VWX, and for useful construction ideas from the imaginative mind of Larry AA6US.

Larry's experience is typical of CCD builders: "Out here in Los Angeles, I suffer from the "copper curtain" syndrome. California kilowatts wipe out fellows using 100-200 Watts like myself. Oh, we can rag chew with ZLs across the Pacific, but spanning the long overland haul to Europe was unheard of for me. But last night on 14 MHz, I was reading a TA2 in Turkey and G3 stations on the inverted-dipole, 7-MHz CCD antenna. I could not hear them at all on either my 14-MHz dipole or a 130-foot, all-band doublet up 60 feet. Also, when using the CCD my signal reports are usually two S-units above my tried and true 7-MHz double-extended Zepp."■

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2. Hallen, *Electromagnetic Theory*, Chapman & Hall, also Wiley & Sons, New York, 1962, pp. 501-504.

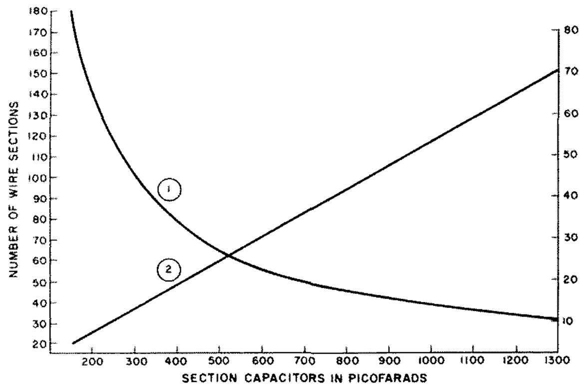

Fig. 8. CCD antenna design chart for a 1-wavelength element. Use curve 1 for wire-section length, and use curve 2 for number of wire sections and capacitor value. The number of capacitors is two less than the number of sections. (Curves derived at 7 MHz.)

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The History of Ham Radio
—part XVI

Reprinted from QCC *News*, a publication of the Chicago Area Chapter of the QCWA.

In 1920, the urge to span global miles via amateur wireless communication was the radio amateur's prime endeavor. The *sine qua non* of hamdom.

In the pre-WWI years, maximum distances were covered via relay routes from one location to another wherever amateur operators were active. They relayed messages from station to station by the fastest and most direct routes. To span great distances, to direct messages across the continent in one hop, to succeed in crossing the Atlantic, the Pacific, was just a wish and a hope to dream about.

Officially, the International Amateur Radio Union received its start on March 12, 1924. A preliminary negotiation meeting was held in Paris. See Photo A. For the first time, ARRL President Hiram Percy Maxim and a group of amateur representives from thirteen countries assembled at the Hotel Lutetia. There was no doubt that worldwide international association was needed to bring about a common understanding toward an eventual world organization.

Early 1920

Soon after the armistice was signed, amateurs in the United States were authorized to resume radio operation in their typical former fashion. However, it did not take long for them to realize that the rotary-gap generator had to give way to the vacuum tube. No longer would the desire to belong to the 200-meter club give satisfaction when it was discovered that the shorter waves held the solution to greater and more reliable DX.

What chance of being heard did signals have crossing the Atlantic if there were no listeners?

Where were the amateurs in foreign countries available to participate in tests?

December 1919

In England, a group of wireless enthusiasts were gathered at an outdoor field day. They were just ordinary experimenters, having organized themselves into a club called the Three Towns Wireless Club of Plymouth (Photo B). They had no permit to use either transmitting or receiving apparatus, since a license to operate was not available. The club secretary was authorized to write a

Photo A. The dinner in Paris where the International Amateur Radio Union was formed.

Photo B. Members of the Three Towns Wireless Club, Plymouth, England.

Photo C. Mr. Deloy at the National Convention, in a group showing amateurs of three countries. Left to right: Charles H. Stewart 3Z3, ARRL Vice-President and Manager, Atlantic Division; Mr. Deloy, French 8AB; Mr. W.D. Terrell, Chief Supervisor of Radio, Bureau of Navigation; A.H. Keith Russell, Canadian 9AL, ARRL Canadian General Manager.

Photo D. A little international group in the courtyard of the Faculte des Sciences, *with seventeen nations represented. (Photo—ROL, Paris.)*

letter to the American Radio Relay League expressing a desire and a sincere hope that the League might resolve to become an international association for the exchange of ideas and mutual information for future activities and planning.

The American amateurs, who enjoyed wireless privileges not available to their English or French counterparts, were well aware of the plight of their foreign brethren, who were constantly imploring their governments to grant them similar operating privileges.

February 1920

As early as February in 1920, Captain F.G. Loring, RN, one of the club members, suggested the following at the first annual conference of the Affiliated Wireless Club of England:

1) To issue receiving licenses freely to all approved persons, with exceptions as regards the use of valves in certain limited areas.

2) To issue 10-Watt licenses wherever this can be done without interference with government installations to approved applicants who can satisfy the Post Office that their personal qualifications, apparatus, knowledge of the subject, and objectives are sufficiently good to justify the grant. License will not be granted for mere intercommunication purposes.

3) To issue licenses for the use of power exceeding 10 Watts in special cases.

4) To issue licenses for the use of an artificial aerial when desired. Here the applicant has in view some definite object of scientific research of general public utility.

5) To issue special permits for specific tests of apparatus on any power and wavelength over and above the conditions of the license. Application for such permit will have to be made in writing at least a week before the test. Such permits to be issued to persons who can satisfy the Post Office that they have occasion to try out in practice an arrangement which had been thoroughly prepared in the laboratory.

6) Make provision that all transmitting licenses be restricted as regards both waves and hours of working.

Early 1921

The ARRL made plans and contacted British radio amateurs and experimenters hoping that they would listen in the vicinity of 200 meters to signals coming from United States amateur stations. All of these planned schedules, however, were unsuccessful.

The few French amateurs also had serious misgivings concerning participation. Their efforts in being allowed to erect receiving aerials fell on silent ears. Officially, any grant given by their government stipulated that reception of only time signals and meteorological information would be allowed, provided they registered and paid an annual tax to the Director of Posts and Telegraphs.

Late 1921

During the fall and winter months of 1921, amateurs made a serious attempt to span the Atlantic. In England, Philip B. Coursney, British 2JK, editor of the *Radio Review* (London), agreed to take complete charge of the receiving stations in England and other European countries where amateurs would be listening and logging signals heard. The ARRL, by request of its Board of Directors, dispatched Paul F. Godley, an American amateur, over to Scotland in an attempt to record any amateur signals crossing the Atlantic. Using his own home-built receiver, the "Paragon," Godley was very successful in recording United States amateur station signals. (Part VI, "History of Ham Radio," *73 Magazine*, October, 1978.)

June 1922

The Board of Directors of the ARRL established a new committee designated the International Advisory Committee of the ARRL, whose function was to aid in the development of amateur relay routes in foreign countries. The League did not deem it wise to undertake the formation of foreign branches of the ARRL, even upon request, but agreed to assist in the formation of societies "for and by the amateur" in such countries. One of the more significant tests conducted by the amateurs during the year 1922 proved conclusively that signals originating from east coast United States amateur stations could be heard by English and French amateurs.

July 1922

Even at this date, the British amateurs were still expressly forbidden to transmit general calls, news, etc. Transmissions were permitted for an aggregate maximum of two hours in each twenty-four-hour period, provided that no transmission would commence without previous listening in on the wavelength which was to be used, and provided that no single transmission would last more than ten consecutive minutes. Wavelengths allotted: 150 meters to 200 meters inclusive for Spark, CW, and Telephony.

Fall 1922

By the fall of 1922, the British amateur enthusiast,

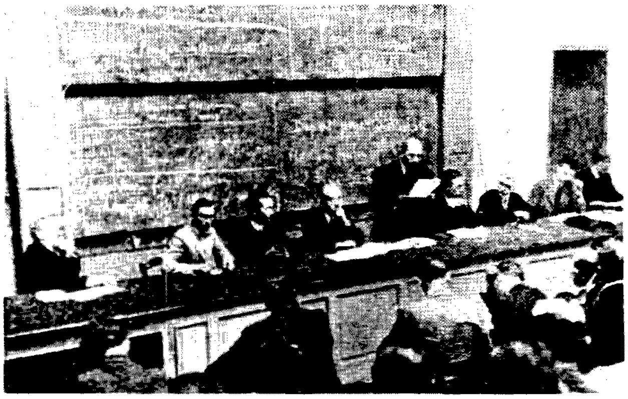

Photo E. The Amateur Congress in session. The Bureau sits at the long table. Left to right: M. Tirman, president of the Legal Congress; Lloyd Jacquet u20Z and Leon Deloy f8AB, interpreters; M. Belin, president of the Amateur Congress; M. Beauvais, Secretary; Jean G. Mezger f8GO, interpreter; Mr. Maxim; Mr. Warner; a stenographer. (Photo—Delano, Paris.)

undaunted, finally obtained permission from the Postmaster General to form a British Wireless Relay League and to solicit correspondence with British radio amateurs. Conditions in other European countries still gave amateurs no outlet for participation in even simple listening pleasures. Governments in general passed decrees which forbade the use of simple test equipment, at the same time acknowledging that it was impractical to regulate the receiving of wireless signals by decree.

1922-1923

During the winter of 1922-1923, a series of tests arranged by the ARRL resulted in signals being copied both in England and on the continent. The French wireless enthusiasts, few in number, having obtained permission to operate by declaration to the Postal Telegraph Administration, enthusiastically prepared themselves to fully participate. A few of their number, and especially Leon Deloy, French 8AB, were successful in obtaining licenses to build up to 1000-Watt transmitters.

1923

The year 1923 was a year of triumph. Many tests were planned and carried out successfully. Two-way schedules were met and both oceans were crossed. Reports of reception came from Australia, from China, from Iceland, and from all over South America. With such gratifying results accomplished to the surprise of the various governments, it became possible for the British amateurs to be granted permission to organize The Amateur Society of Great Britain and obtain licenses to operate up to 1000-Watt transmitters. In Australia, a radio league was formed under the auspices of the Wireless Institute of Australia, its object being to organize a system of relay communication routes throughout Australia and New Zealand.

The second International Amateur Radio Convention, held in Chicago, brought together amateurs by the thousands. They came from every location in the United States, from France, England, and Canada. Actual two-way communication across the Atlantic via amateur wireless took place for the first time on November 17, 1923.

1924 and the IARU

The numerous conventions, the daily exchange of messages between amateurs now worldwide, the many committees formed to discuss plans and to formulate decisions . . . all of these activities gave the Board of Directors of the ARRL an opportunity to initiate a most imposing event, culminating in a meeting of all international amateurs. In March, 1924, there was convened in Paris, France, The Congress of International Amateur Union. During several preliminary meetings at this congress, a temporary committee of organization was named. All assembled agreed that a second meeting would convene in the following year in Paris.

Delegates from the various national societies of radio amateurs met at the *Faculte des Sciences* in Paris on April 17, 1925, in the first International Amateur Congress. They elected officers, adopted a constitution, and formed four national sections. All agreed that the International Amateur Radio Union would henceforth be the coordinating vehicle to foster international amateur two-way communication. Membership was available to anyone interested in the objectives of the Union. Twenty-five or more members from each country would organize as a National Section and be part of the Union.

The IARU thus brought all radio amateurs together under one canopy. ■

Photo F. Four members of the IARU Executive Committee. From left: M. Mezger, France; Hiram P. Maxim, USA; Mr. Marcuse, Great Britain; Mr. Warner, USA.

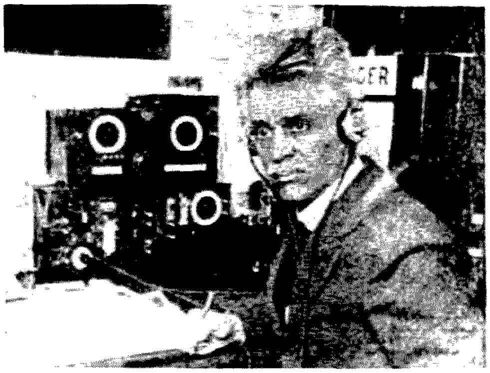

Photo G. Hiram P. Maxim, member #1 of the IARU, in the "static room" of the SS Belgenland, *on his return trip to the USA.*

Paul Grupp KA1LR
73 Magazine Staff

The Radio Amateur's Conversation Guide

The Radio Amateur's Conversation Guide *by Jukka Heikinheimo OH1BR and Miika Heikinheimo OH2BAD. Published by Transelectro-America, 2301 Canehill Ave., Long Beach CA 90815.*

There's no question about it—English is the *lingua franca* of the ham bands. When working DX, few American hams ever pause to consider that the person on the other end of the QSO may be speaking a language that is not his native tongue. Still, in most countries in Africa, Asia, and Europe, if a ham is speaking English, chances are good that he went to a lot of trouble to learn it. To a ham who has spent many years in countries where English is rarely spoken, some of the comments heard from Americans about the linguistic abilities of foreign hams seem a bit hypocritical. I always wonder how well-acquainted the complainer is with French, Spanish, Russian, or even Arabic! In my humble opinion, the South American station who can barely get out his signal report and QTH in English is light years ahead of his American counterpart who refuses to venture even two words in Spanish.

In all fairness, it is rather hard for Americans to pick up the proper vocabulary in another language. Bearing this in mind, OH1BR and OH2BAD have taken on the formidable task of producing a conversation guide for hams. 147 phrases commonly used on the air are given in English, German, French, Italian, Spanish, Portuguese, Russian, and Japanese. Having trouble copying the suffix of that EA9 station in Ceuta? No problem—just say "No he copiado su indicativo!"

Once you make the decision to learn a bit of another ham's language, you are on the way to making your hobby far more meaningful. There is nothing about the English language that makes it inherently superior to other languages, and the fact that you are struggling to learn another ham's language can create instant bonds of friendship and understanding. If nothing else, you will become acutely aware of the effort required to hold a conversation in another language.

How is the book laid out? Well, an English phrase is listed, followed by the translation in seven different languages. Some of the phrases are only marginally useful, such as "The sensitivity of my receiver is 1 microvolt" or "I have been QRT for five years." Others you may find yourself using frequently, like "I know only a few sentences in . . ." or "Please send me your QSL."

I'm not going to list all 147 of the phrases here, but the general topics include starting a QSO, pleasantries, signal reports, name and QTH, equipment and antennas, weather, signal quality, contest jargon, and the all-important QSL. Also included is a list of phonetics and numbers in each of the languages (very useful when exchanging addresses!) and a dictionary of words unlikely to be found in a more traditional dictionary.

With the exception of Russian and Japanese, the phrases are printed in the original language, with no attempt made to phonetically spell them. A set of cassettes is offered as a companion to the book, to aid in learning pronunciation. The tapes weren't supplied with our review copy of the book, so I can't comment on their usefulness. Without the tapes, a raw beginner at a language may have difficulty with pronunciation, since phonetic spellings or pronunciation hints are not offered in the book. For example, "Sorry, but I did not understand completely" is written as "Sumimasenga kanzenniwa rikaidekimasen" in the book's Japanese translation. The same phrase in German is "Tut mir leid, ich habe nicht alles verstanded." I don't know about you, but not knowing the first thing about the proper pronunciation of these languages, I have a rough time guessing how these phrases are supposed to sound. In my case, the French translations in the book are easy going, because I remember enough of my college French to pronounce the words properly. Someone else who knows some German but never studied French may find the French difficult and the German a piece of cake. If you haven't studied a particular language at some point in your life, you'll want to get someone more knowledgeable to teach you the basics of pronunciation, or check out the cassettes that go with this book.

One use that doesn't require pronunciation help is writing QSL cards. You might enjoy filling out a card in the other ham's own language as much as I do, but be careful: You might get an extensive reply that you won't be able to translate!

However you use this book, it is a bargain at $10.00 and deserves a place in the ham shack of every DXer interested in something beyond a mere signal report.■

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Aerial Heirlooms

—towers from the past

The history of the early days of radio is well established and documented. It has been searched and researched until it is now uncommon to uncover something truly new on the subject of Marconi's early experiments.

But history, besides being a great healer, is perhaps the greatest forgetter. In the end, only the highlights of the first, the greatest, the most powerful, etc., finally survive the test of time. Often the fascinating glimpses of work by common people and events close to the historical highlights are forgotten forever.

Likewise, only a few historical objects can be preserved. It is relatively easy to preserve a spark-gap transmitter, crystal receiver, telegraph key, or pair of headphones when compared to the monumental task of preserving the towers or antennas. But without these truly historical items, there could never be radio memorabilia. Old towers eventually rot or rust away, fall prey to wind, lightning, salty sea air, or other elements, and are finally completely lost. For example, at Poldhu, England, where the first transatlantic signals were broadcast, all that remains is a Cornish granite memorial. Hardly a trace can be found of the famous towers which graced the spot for 33 years. For this type of historical object, we must rely on photographs, if there are any, and written records about them.

Recently, I rediscovered a tape recording which combined the rare personal insights of one who worked on early Marconi projects with some almost forgotten details about Marconi's early tower construction. The tape was made by a man who helped construct some of the early towers used by Marconi.

This rare personal glimpse is from a speech made by Reverend Wilfred Wallis, speaking in February, 1956. My father, Loren Greiner WØGTW, had the foresight to tape the brief speech. Now, with the help of Mrs. B. Hance, the Marconi Company Historian, I have been able to corroborate part of the facts given by Reverend Wallis (who died in 1973 after serving the United Methodist Church in Pawnee City, Nebraska, for 20 years) and add some fascinating details about those early towers.

After the first transatlantic transmissions and Marconi's diligently objective diary notation that "sigs were heard at 12:30, 1:10, and 2:20 on December 12, 1901," the growth of radio communications took a giant leap. The discovery that radio signals could travel long distances was literally the light at the end of an aeons-long tunnel of isolation for ships who were

Photos courtesy of Marconi Company, Ltd., Marconi House, Chelmsford, Essex, England.

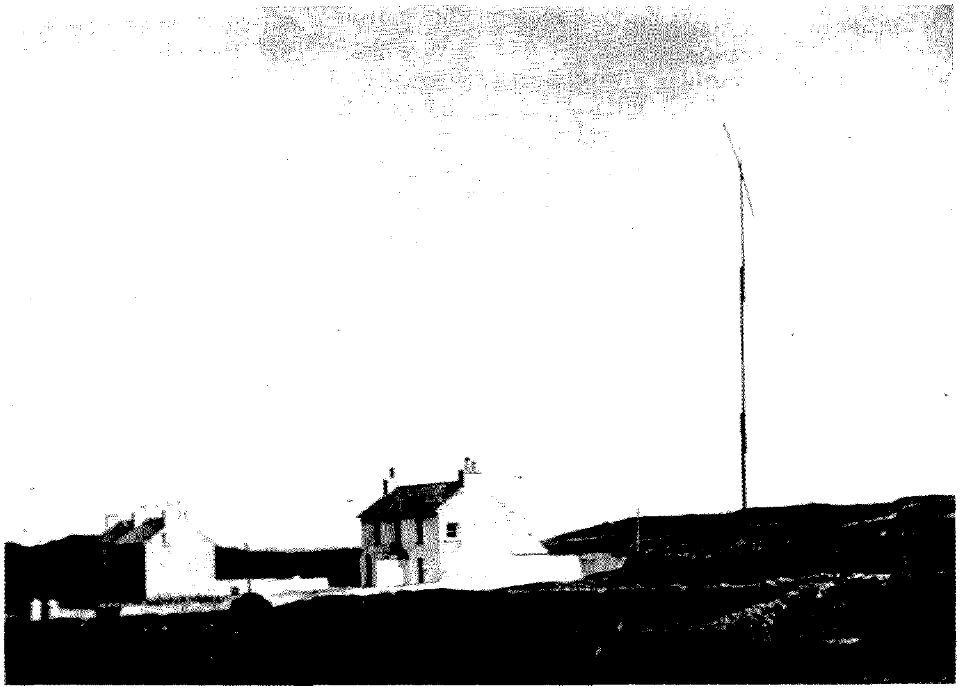

Photo A. The Marconi wireless station at Crookhaven, Ireland, shows the use of three lapped pole towers fashioned from ships' masts.

out of touch with the world for the duration of their voyages.

Immediately, experiments were begun to improve receiver sensitivity and study propagation to find a way to improve on the reliability of transmissions. About this time, other transmitting and receiving stations were installed by Marconi and others. Finally, on June 4, 1903, the silence barrier for ships was truly broken when the prestigious Cunard ship line began a series of onboard daily newspapers called the *Cunard Bulletin* to help travelers keep in touch with the rest of the world.

About this time, Reverend Wallis contributed, in a small way, to the development of radio communication. Here, in his own words, is the story of his involvement.

"I was an apprentice in the shipbuilding yard. I was in what was called the mast-making department. They moved the apprentices from one department to another, every six months, to learn this phase of shipbuilding, then some other, and so on. At each stage you would have an instructor for that department.

"So, I was in the mast department, and word came one day that we were to build three sets of masts in two parts—what they called a lower mast and a top mast: One fits onto the other. As I remember, they were to be 180 feet long. We would take pine trees that they would keep in the yard all the time, and then cut them down and make them round to make a straight mast.

"Ordinarily, in those days, most of our masts were steel, but we also made wooden masts for some of the smaller ships and for some of the boats. So, we had the order for these sets of masts, and everything was sort of secretive. We didn't know a great deal about it, although my instructior was one of the men who had a great deal to do with it. He was in charge of the work on them. They were to be set up at one harbor, the long harbor. In fact, it was large enough to house all the British ships. There was always a number of ships there. There they could come out the open part of the harbor, what they call the Land's End. That was the first station to be built in this particular series. The second station using the next pair of masts was to be at Scilly Isle; the third was to be at Roche's Point in Ireland.

"So, the masts were finally finished and all the fittings put on them, and being an apprentice, I had the disappointment of my life. The instructor got to go over to Ireland to set up the mast there and another man was sent to the other places. When I tried to go, they said 'No! Apprentices are not allowed to go out of the country.' "

Although the masts constructed by Reverend Wallis were made of two parts, many early towers were made of masts from three poles, as shown in Photo A. Each pole had its own set of guy wires. It seems only fitting that a service so related to ships at sea should have its early towers made of

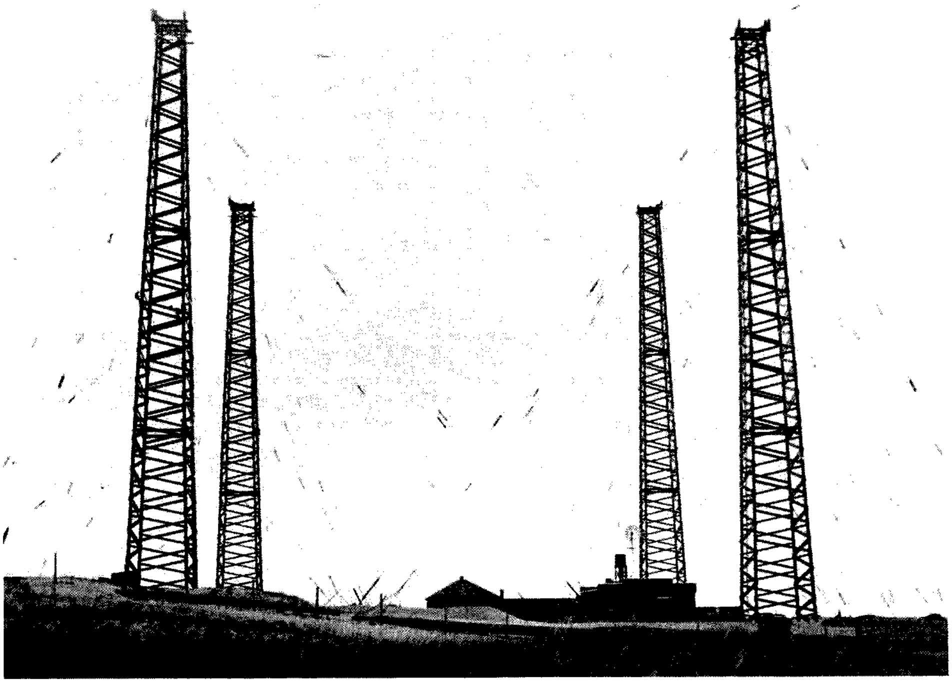

Photo B. These Cape Cod towers were made of wooden planks similar to those described in the text. Close inspection reveals a man about halfway up the tower on the far left (look for him on the left edge of the tower).

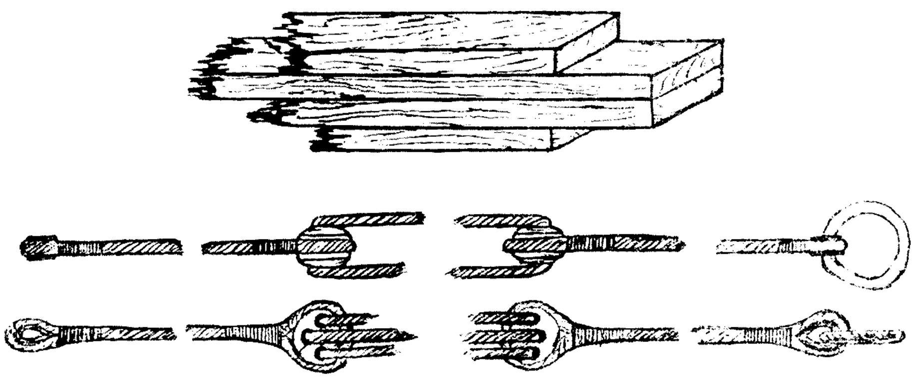

Fig. 1. Drawings from tower specifications for the Marconi wireless station at Poldhu, England. The upper drawing shows the arrangement of planks in a four-sided tower. The lower drawings show the construction of lanyard insulators. These towers were to be built after the first signal crossed the Atlantic.

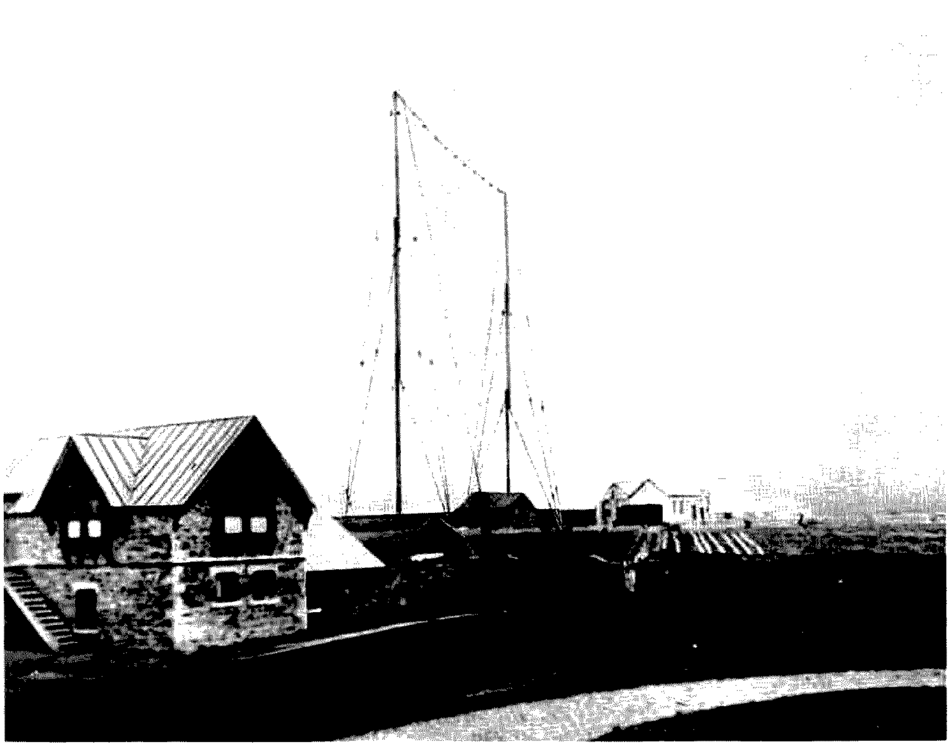

Photo C. This is the Poldhu wireless station from which the first transatlantic signals were sent. As with most early towers, these, too, were made from lapped poles like those used in ships' masts.

the four towers were each guyed with ten wires called "stays." The guys were to be connected at the top of each tower, and at the middle, rather than below the top as with typical modern construction. Guy wires were of 13/16" steel wire with a breaking strength of 18 tons. Upper guy wires were to have two insulators, while lower guys were to have only one insulator.

In today's world, where every broadcast tower uses high-quality porcelain insulators, it is hard to imagine how radio pioneers might have improvised their insulators. The answer lies in the details of the stay in Fig. 1. Marconi's specifications call for "elm deadeyes spliced in ... connected by means of 3" circumference hemp rope lanyard, having a breaking strain of 2.5 tons in single length or a total of 15 tons in the six parts."

these ships' masts erected on land.

Being an apprentice, Reverend Wallis's view of the operation was no doubt tempered by his position, and the fact, as he noted, that the whole operation was somewhat secretive. Records from the Marconi Company shed light on a few of the problems of building radio towers from ships' masts.

Comments by E. A. N. Pochin, a Marconi assistant, have been preserved in the Marconi Company archives. They indicate that one of the major problems was that all of England did not have enough large logs to make some proposed towers, and the designers were faced with project delays of two months if they chose to wait for larger logs to be imported from the United States. As Pochin wrote in July, 1901, less than six months before the first transatlantic transmission:

"I made it perfectly clear to Messers Blythe and Pascoe that the logs must be sound, and insisted on their quotation specifying the fact of the timber being for mast work to prevent their pleading ignorance." (This sounds like most any purchasing agent making sure he's covered in the event the vendor doesn't deliver the goods.)

In any event, the work on the mast was to continue on the assurances from the builders' chief carpenter that the best available logs would "work up perfectly clean." Final approval, however, rested with Marconi.

Even as the first signals were crossing the Atlantic, plans were being drawn up for replacement towers at the Poldhu transmitting station. Specifications dated December 9, 1901, called for four-sided towers like those shown in the often published photographs of the Glace Bay, Nova Scotia, station.

When finally erected, these towers must have been an impressive sight. The four wooden towers were to be placed in a square, with 210 feet to a side. They were to be 215 feet tall, with three and a half feet of that height buried in a concrete foundation. Each tower was a gigantic twenty-one and a half feet square at the bottom and nine feet square at the top.

In today's world, we would think the wooden construction would be standard materials like 2 × 4s or perhaps 2 × 12s. Not so. Records indicate the tower legs were made of boards sized 11" × 3" × 12'. Four planks were arranged together as shown in Fig. 1. Zigzag braces were made of 9" × 3" wood and bolted at each end with 3"-square washers under each bolt head and nut. For extra strength, they had diagonal tie bolts every seven and a half feet.

In order to brace the towers against the possibility of 92-mph winds at Poldhu,

The entire guy wire, including insulators, was to be covered with "two good coats of Stockholm tar." Finally, each tower was to be painted with two or three coats of paint, with no specific color specified.

In the years after Reverend Wallis's participation in the construction of Marconi's pole towers, I know he felt proud to have been a small part of such tremendous events which contributed to greater safety on the seas and better communication between continents. In the same way, the other men and women who participated in unknown but important ways to the building of other Marconi towers and equipment must have known of the importance of their work to these earthshaking events. Perhaps this short glimpse into that forgotten part of history can help us all to honor average people, without whom the more famous pioneers could have never succeeded. ■

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Amateur Telemetry

—monitor your repeater's vital signs with this simple system

A telemetry system is a system for making a measurement of some property such as voltage, current, or temperature, and transmitting the measurement to a remote observer via a communications link. Telemetry systems may be either analog or digital and may be designed to transmit either a single measurement or up to several hundred measurements over a single communications link.

Telemetry systems in the world of commercial communications often are very complex, designed to transmit many channels of information over communication links using sophisticated digital techniques. The telemetry system decribed in this article is an elementary, single-channel, analog system and is designed to transmit voltage readings over a communications link such as a two-meter FM channel. The system is not complicated and can be built by most experimenters who have minimal experience with solid-state electronics.

The basic test circuit given may be breadboarded and tested in an evening, while the practical system will take two or three evenings more. The completed practical system will enable an experimenter to monitor a voltage remotely, using either a telephone line or an FM or AM radio link. There is no special equipment needed to build and test these circuits. The only equipment needed is two meters capable of measuring from 0 to 10 V and a pair of earphones to check the operation of one of the circuits.

Simple Telemetry Systems

Fig. 1 shows a telemetry system in one of its simplest forms. This system monitors a door closure by using a transmitter and a receiver in conjunction with a carrier-operated relay. When the door is closed, the transmitter is turned on, sending a carrier to the receiver at some remote location. The receiver detects the carrier, and the carrier-operated relay activates a light.

This basic system is a single-channel digital system and, although limited in its capability, is perhaps one of the most common telemetry systems. Systems of this type usually use telephone lines to transmit contact closure information. Examples are the remote fire and burglary alarms offered by numerous protection and security firms. These security systems offer door entry and fire monitors which activate a relay which, in turn, sends a current down a telephone line to activate a light or audible alarm at a police station or security office.

Another simple telemetry system is shown in Fig. 2, a diagram of a simple analog telemetry system. In this case, a long pair of wires connects the voltage to be measured to a remote

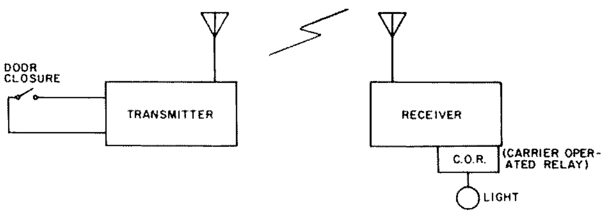

Fig. 1. Simple digital telemetry system. Door closure turns the transmitter carrier on, which activates the light.

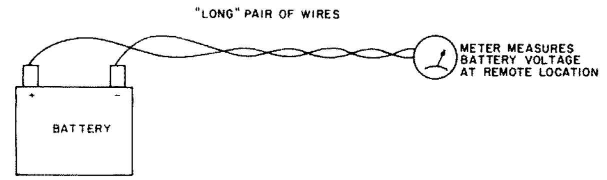

Fig. 2. Simple analog telemetry link. Because of resistance in the wire, there is a voltage drop in the wire. Actual meter reading is $V_{BAT} - V_{DROP}$.

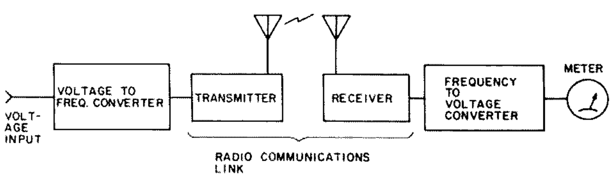

Fig. 3. A single-channel, analog telemetry system.

meter. This system is common, but normally is limited to cases where the distance between the two points is relatively short—perhaps less than 100 feet. This system suffers from accuracy problems since a voltage drop will occur due to the resistance in the wire. The actual reading at the remote location will be V − IR, where I is the current through the meter and R is the resistance of the wire. If large gauge wire is used (to keep the resistance low) or if the distance is kept short, there will be no problems; if the distance is great, however, the remote reading may be erroneous.

As an example, assume that we wish to measure the voltage of a 12-volt battery at a distance of about 25,000 feet (about five miles). If 24-gauge wire is used (with a resistance of about 21 Ohms/thousand feet), the wire will have a resistance of about 525 Ohms. If the meter draws one milliampere, then the voltage drop will be about 1/2 volt. Obviously, the large amount of wire has introduced an error at the meter end. Admittedly, a calibration chart could be made up to correct for the errors, but where will you come up with five miles of wire and how will you string it? While this problem is a bit exaggerated and may seem farfetched, the problem is encountered daily in remote areas. The solution, of course, is to use a radio telemetry system.

A Radio Telemetry System

The problem of monitoring the contact closures shown in Fig. 1 is handled easily by a radio communications link; the problem as shown in Fig. 2, is not. The remote metering problem uses a dc voltage, and there is no way to put dc voltage directly into the transmitter, as if it were a pair of ires. Some means must be used to convert the dc voltage into a form that can be transmitted by radio. While there are numerous methods to do this, one of the easiest is to use a tone-modulation system in which a tone frequency is produced as a direct function of the voltage to be measured. This technique is used to transmit electrocardiograms and other voltage measurements via telephone lines, and may be adapted for radio communications systems.[1]

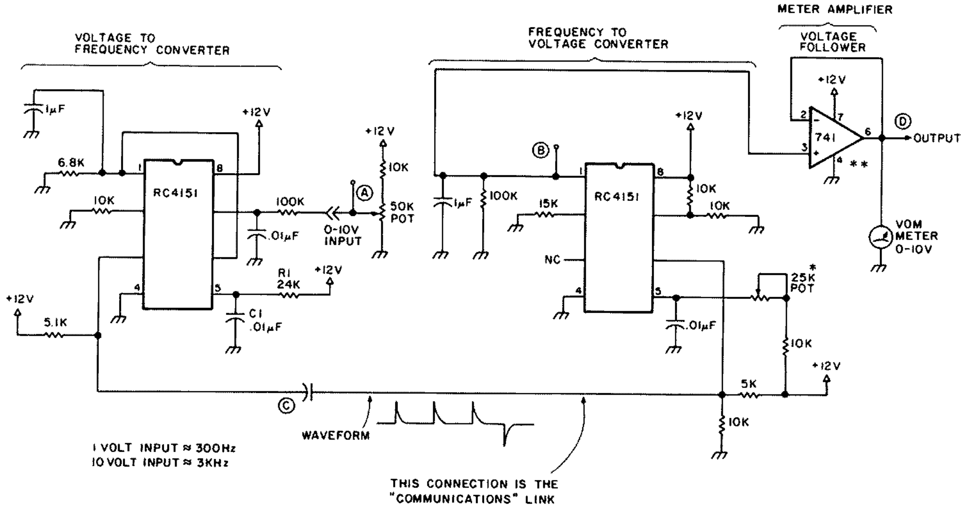

*Fig. 4. Breadboard test setup for voltage-to-frequency, frequency-to-voltage converters. Note: 12 V is a nominal value. May be any voltage from 8 to 15. *Calibration pot—adjust so that VOM is the same as point A. **Pin numbers shown are for 741 in the 8-pin DIP package.*

Fig. 3 shows a single-channel, analog telemetry system. In this example, the voltage to be measured is converted to a tone frequency. The frequency tone modulates the transmitter portion of the radio link, while the receiver demodulates the received signal and sends the tone to a frequency-to-voltage converter. The converter drives a meter to indicate the measured voltage.

Fig. 4 shows a breadboard example of a voltage-to-frequency/frequency-to-voltage telemetry system. This circuit consists of three parts, a V/F (voltage-to-frequency) converter, an F/V (frequency-to-voltage) converter, and a meter amplifier. For ease of testing and experimentation, I recommend that this circuit be breadboarded on a Global Specialties or Radio Shack (276-174) breadboard. This circuit is not difficult to build and should work the first time that it is turned on. The input voltage is not critical and may be any voltage from 8 to 15 V. If a 12-volt battery or supply is not available, an inexpensive 9-V transistor battery may be used. Note that measurements shown on the circuit diagrams were made using 12-V power.

A pair of earphones may be connected to point C through a 0.01-uF capacitor to give an audible indication of the operation of the circuit.

The Raytheon RC4151 V/F, F/V integrated circuit is used in this design in order to reduce the parts count and construction time. Other methods may be used,[1] but this chip reduces the construction time of a practical telemetry system to two or three evenings. The RC4151 can be programmed to operate over any frequency range from 1 Hz to 100 kHz by choosing R1 and C1 according to the expression $f=0.75/R1C1$, where f is the output frequency with an input voltage equal to the supply voltage. Using the components shown in Fig. 4, the frequency will vary over a range of 0 to about 3.1 kHz for inputs of 0 to 12 volts. The F/V converter will convert to voltage over the same frequency range.

The circuit can be tested over this range by connecting voltmeters to points A and B (a high-impedance voltmeter, 1 meg or better, must be used for point B). Point A will indicate the input voltage, while point B will indicte the output voltage. In an ideal circuit, these two points will track together, always giving the same reading. In the real world, however, the voltages may differ due to component variations. The resistor and capacitor connected to pin 5 of the RC4151 determine the frequency range of the circuit. If the values of the components used with the V/F and F/V chips are identical, then the two units will track perfectly and the input and output voltages will be the same. If, however, component variations occur, then the

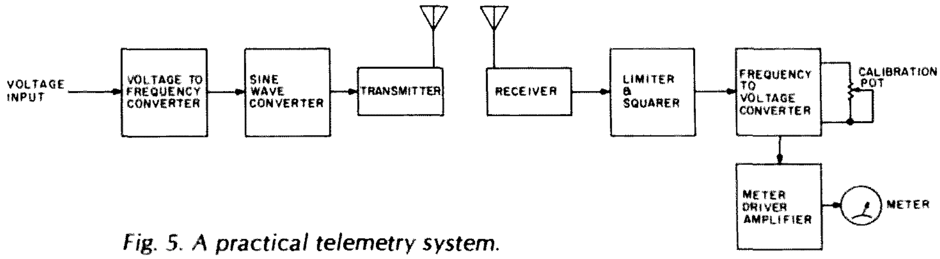

Fig. 5. A practical telemetry system.

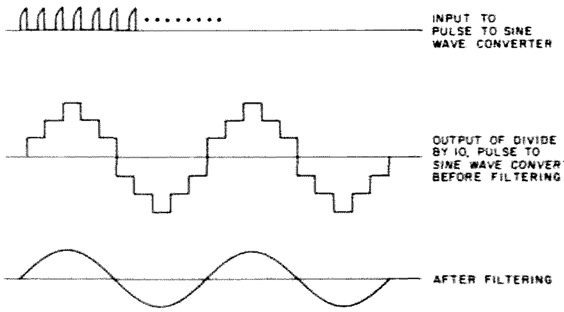

Fig. 6. Waveforms of pulse-to-sine-wave converter.

two circuits may be calibrated by adjusting the 25k pot so that the voltages are identical. This adjustment need be made only once to calibrate the units over the entire voltage range. For ease of calibration, set the input voltage to about 6 volts and adjust the pot so that the output indication is 6 volts.

If a high-impedance voltmeter is not available, then connect any voltmeter to point D. Point D is the output of the F/V converter after going through a meter amplifier configured as a voltage follower. The voltage follower has a gain of one and is used as a buffer between the high-impedance output of the RC4151 and a lower-impedance meter. The voltage follower is configured for a single-supply voltage, and because of this will operate only over the range of 2 to 10 volts. Keep this limitation in mind when using the voltage follower as part of your test setup. If you use a voltage of less than 12 volts, then the voltage follower will follow voltages to about 2 volts less than the supply voltage.

The RC4151 has a linear relationship between voltage and frequency. If the device is set to deliver an output of 3000 Hz for an input of 10 volts, then the output would be 300 Hz at 1 volt, 600 Hz at 2 volts, and so on. If a frequency counter is available, this can be verified by connecting the counter to point C and noting the change in frequency while varying the input voltage.

This basic test circuit has some limitations and is not suitable for integration directly into a communications link. First, the output of the RC4151 is a pulsed output similar to a square wave with a nonsymetrical duty cycle. This pulsed output will not properly modulate a transmitter such as an FM transmitter. Second, the F/V circuit requires a pulse input with a fast negative-going pulse. The output from a receiver will be sine wave for the most part and will not be decoded properly in the F/V converter. Note that in this test circuit the F/V converter, under some conditions at around 9 to 10 V, will not see a good input pulse and will become a bit unreliable, producing fluctuations in the output voltage.

A Practical Telemetry System

Fig. 5 is a block diagram of a practical telemetry system. In this diagram, two items have been added to the breadboard test setup to make a practical telemetry system. A sine-wave converter has been added to the output of the V/F converter and a limiter has been added to the input of the F/V converter.

The sine-wave converter in this design is based around a 4018 Johnson counter. This circuit generates a staircase output, approximating a sine wave, for every 10 input pulses (Fig. 6). The output of the sine-wave converter is fed to a simple RC filter to smooth the staircase output to a good sine-wave approximation. Note that the output of the sine-wave converter, after the simple filter, is not constant with changes in frequency but decreases as frequency increases. This is of little consequence for this experimental telemetry system since a limiter is included with the receiving system. For a sophisticated system, an automatic gain-control circuit could be placed after the filter to provide constant amplitude output.

Since the sine-wave converter divides by 10 during the process of converting the pulse input to a sine-wave output, it is necessary to increase the frequency range of the V/F converter by a factor of 10. This is

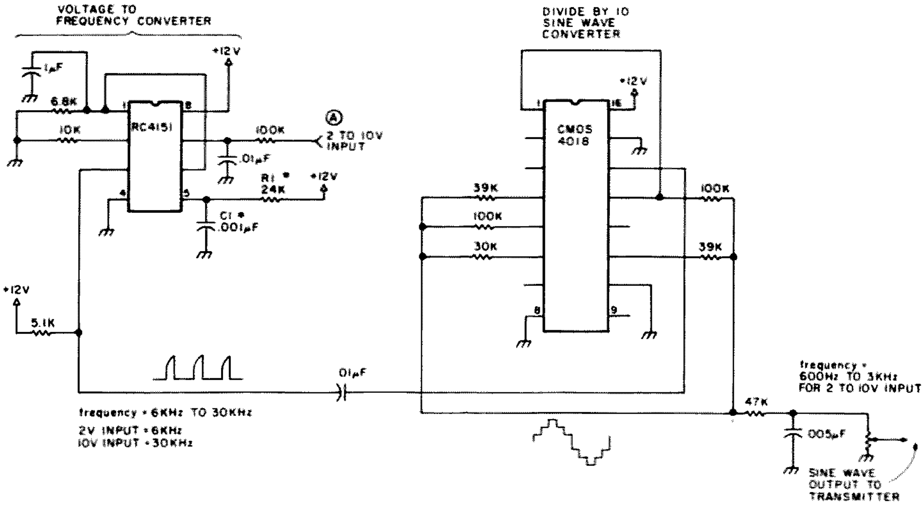

*Fig. 7. Practical voltage-to-frequency circuit. *For best results with frequency-determining components, use low temperature coefficient, high-tolerance components.*

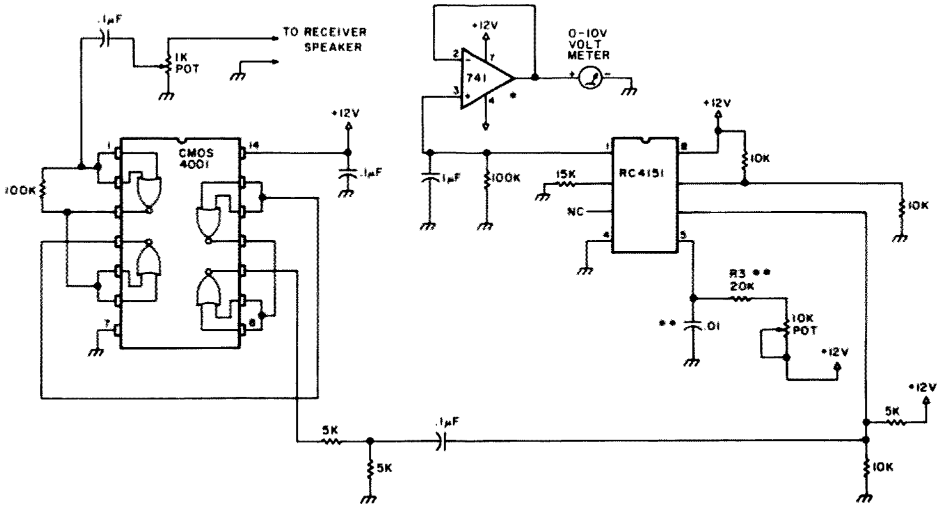

*Fig. 8. Practical frequency-to-voltage circuit. *741 pin connections for 8-pin DIP. **For best results with frequency-determining components, use low temperature coefficient, high-tolerance components.*

done by decreasing the value of C1 to 1/10 of the previous value. The V/F converter then will operate in the 0-to-30-kHz range, and the output of the sine-wave converter will be in the 0-to-3 kHz range. This frequency range was chosen since many transmitters and phone lines have a maximum transmittable frequency of about 3 kHz. The frequency range of the system may be changed easily as required merely by changing the frequency-determining components.

The lowest transmittable frequency, usually about 300 Hz, also must be considered. Since the meter amplifier in the circuit is limiting the minimum voltage to 2 volts, the minimum frequency transmitted will be about 600 Hz, which is above the lower limit of most communications systems.

When monitoring a voltage or making a measurement via a telemetry system, it is important to consider the overall stability of the system. If off-the-shelf resistors and disc ceramic capacitors are used, the stability of the system will be poor. These components will change value as they age and as the temperature changes, giving results that may vary from day to day and hour to hour. In order to maintain a stable, reliable system, low-temperature coefficient, high-tolerance components must be used. For the frequency-determining resistors connected to pin 5 of the RC4151s, precision 1%, low-temperature coefficient resistors of the RN60D variety should be used. For the frequency-determining capacitors connected to the same pins, either mylar™ or polyester film capacitors should be used.

On the receive end, a 4001 CMOS chip is biased into the linear region to act as a high-gain amplifier. The remaining gates are connected into the circuit to help shape the input pulses into square waves with a steep negative-going edge. This limiter will limit with an input of about 0.3 to 0.4 volts peak-to-peak, and should have sufficient gain so that it can be connected to the speaker terminals of most receivers. The output of this limiter is then directed to the input of the F/V converter.

As previously mentioned, the meter amplifier (voltage follower) will operate over a voltage range of 2 to 10 volts, corresponding to a frequency range of 600 Hz to 3000 Hz. The inclusion of this amplifier into the circuit limits the measurement capabilities of the system to the range of 2 to 10 volts. This is not a serious limitation for most purposes, and can be overcome at the transmitting end, if required, by using a scaling technique I will describe later.

The practical telemetry system may be calibrated by measuring the input voltage at point A of the V/F converter (Fig.7) and adjusting the 10k pot on the F/V converter (Fig. 8) so that the meter readings are identical. Note that it is of no importance to know the exact frequency range of the V/F and F/V converters. It is important only to calibrate them so that their ranges are identical. For calibration purposes, merely feed the output of the practical V/F circuit to the input of the limiter of the F/V circuit. The calibration will not change when the units are connected into a radio link.

If the 3-kHz maximum audio frequency of the sys-

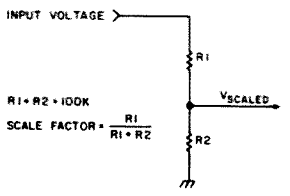

Fig. 9. Input scaling.

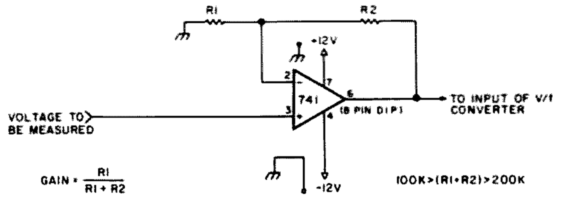

Fig. 10. An input amplifier.

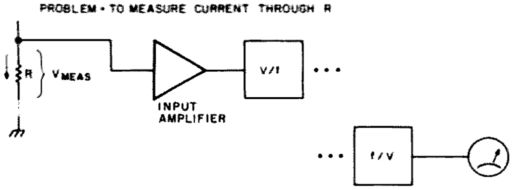

Fig. 11. Current measurement. Example: Assume R = 100Ω. I_{MAX} to be measured = 0.010 Amps (10 mA). Then V_{MEAS} = 0.01 × 100 = 1 volt. The amplifier must have a gain of 10 to bring the V/F input up to 10 volts maximum. The meter will read from 0 to 10 mA.

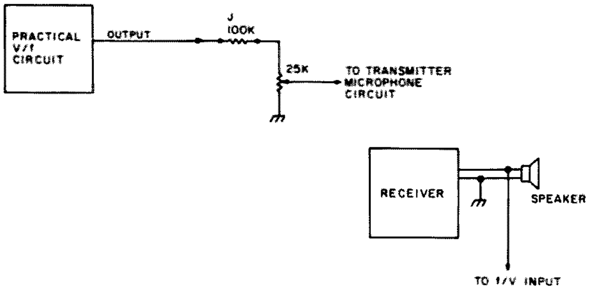

Fig. 12. Interfacing. Replace 100k with 500k or larger, to reduce output.

tem is outside the passband of the receiver and transmitter being used, then the range may be lowered by changing the value of resistor R1 of the V/F converter, according to the formula R1 = .75/C1f. To lower the maximum frequency to 2500 Hz, R1 should be changed from 24k to 30k. On the receiving end, the 20k resistor, R3, should be changed to about 25k. Note that R3 should be about 5k less than R1 to allow for the adjustment range of the 10k pot.

Input Scaling

The practical telemetry system can handle input voltages over a wide range by using a scaling circuit on the input to the V/F converter. For example, if the maximum input voltage is to be 20 volts, then a 2-to-1 voltage divider on the input would provide a 2-to-1 scale factor on the receiving end (Fig. 9). In this example, an input of 20 volts would provide a reading of 10 volts on the receiving end. The scale factor in this case would be two. All meter readings would be multiplied by 2 to give the correct reading. While scale factors may be anything, it is convenient to use whole numbers.

If the maximum input voltage to be measured falls below the 2-to-10-volt range of the system, an op-amp dc amplifier can be placed on the input as shown in Fig. 10. As an example, suppose that the maximum input voltage is to be 0.1 V. The amplifier would need a gain of 100 to bring the input of the V/F converter up to 10 volts. A gain of 100 can be obtained by making R1 = 1k and R2 = 99k.

Current measurements can be made by measuring the voltage drop across a resistor and then using Ohms law to determine the current. The amplifier in Fig. 10 can be used for current measurements provided that the resistor, through which the current is flowing, has one end grounded. Fig. 11 is a block diagram of a current-measurement system.

The 2-to-10-volt limitation of this telemetry system should not prove to be much of a limitation. In most cases, it is not necessary to measure completely down to zero. If it is, then it will be necessary to add a 2-volt offset to the input of the V/F converter and subtract a 2-volt offset from the meter amplifier. Offsetting techniques will not be discussed in this article, but will be left to the ingenuity of experimenters.

Interfacing

The V/F and F/V portions of the practical telemetry system may be interfaced to almost any AM or FM transmitter or receiver available today. The system cannot be used with a single-sideband communications link, however, since any receiver tuning error will change the received tone and this will change the meter reading. Fig. 12 shows the interface to a typical FM transmitter and receiver. Care should be taken not to overload the input stage to the transmitter. If the transmitted tone sounds distorted, then additional resistance should be added where shown.

Applications

Applications of the practical telemetry system are limited only by the imagination. This system may be used to monitor measurements from a remote repeater site such as emergency battery voltage, power output, building temperature, discriminator voltage, and first limiter voltage. The V/F output could be placed periodically on the repeater signal by using a timer, thus using the repeater to transmit the remote measurements. A touchtone™ decoder at the repeater site could be used to switch various inputs to the V/F converter so that many different parameters from the remote site could be monitored upon command.

Conclusion

This article is not meant to be the last word in developing a telemetry system and does not begin to cover all possibilities and all of the various techniques that could be used to make an analog telemetry system. The article was written to provide a starting point for the average experimenter who is interested in telemetry, to help him modify, enhance, and fit the ideas given to his particular application. It is hoped that this article will encourage telemetry experimentation. ■

References

1. "Analog Telemetry Techniques," Joseph J. Carr K4IPV, *73 Magazine*, October, 1979.
2. Raytheon Semiconductor publication on linear ICs.

Parts Notes

All parts except the precision resistors may be obtained from Jameco Electronics. Precision resistors of the RN60D type may be obtained from any major electronics distributor.

The National Semiconductor LM131, LM231, and LM331 are pin-for-pin replacements for the RC4151.

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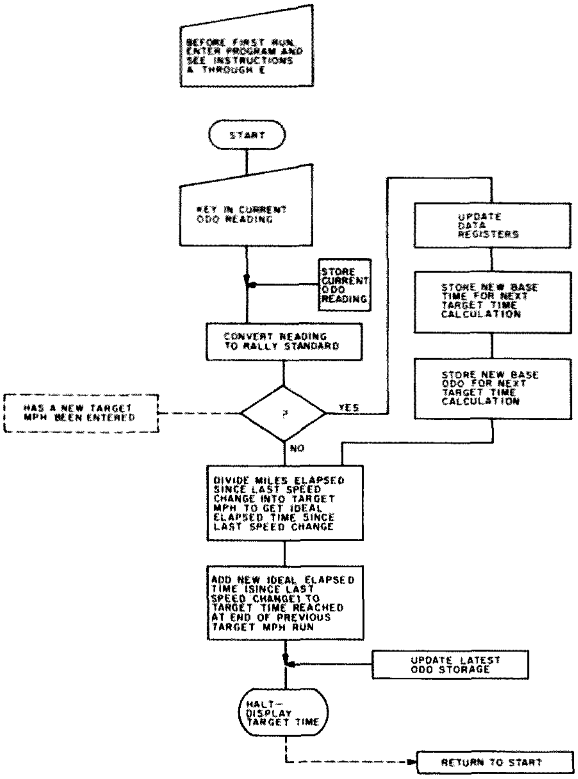
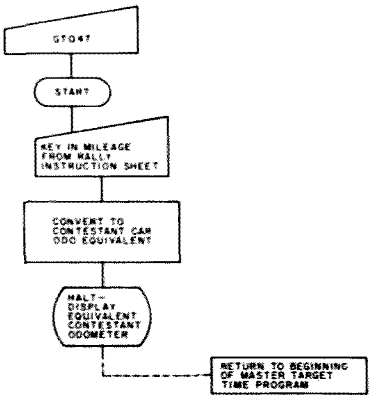
Rallying the HP-55

—gentlemen, start your calculators!



Rallybuster flowchart.



Auxiliary flowchart.

Many of the ham radio operators I have known also rally their sports cars. There seems to be something of a kinship between the precision required for rallying and the technical affinities of amateur radio.

Here's a program for your HP-55 calculator (which can be adapted to

Display Line	Code	Key Entry	Comments
00			KEY IN current odometer reading and punch R/S.
01	33	STO	Saves current odo for use as new base odo for
02	07	7	possible change in instruction speed.
03	34	RCL	Compares instruction speed from last calculation
04	09	9	with current instruction speed in R8
05	34	RCL	(see instruction H) to determine if a new
06	08	8	"target mph" has been encountered. If none,
07	32	g	program pointer jumps to step 19.
08	−19	GTO19	
09	33	STO	If steps 03-07 detect a new speed in R8, this
10	09	9	sequence resets the data base. This has the
11	34	RCL	effect of terminating a rally section driven
12	04	4	at a given speed and setting the termination
13	33	STO	mileage and TARGET TIME as the base for the
14	01	1	section at a new speed. Thus, each section at
15	34	RCL	a given mph is treated, in effect, as a
16	03	3	separate rally "leg." Therefore, encountering
17	33	STO	a speed change *must* be the occasion for an odo
18	00	0	entry and program run. See instruction H.
19	34	RCL	Steps 19-22 save current odo reading in R3 for
20	07	7	use in the next calculation if it entails a
21	33	STO	change in instruction speed.
22	03	3	
23	34	RCL	The base odo at the beginning of the current
24	00	0	instruction speed is recalled and subtracted
25	51	—	from current odo reading and the result converted,
26	34	RCL	using factor in R6, to rallymaster's
27	06	6	odo standard.
28	81	÷	
29	34	RCL	Recalls latest instruction speed and divides it
30	08	8	into miles traveled to determine proper time
31	81	÷	elapsed since last speed change.
32	32	g	Time elapsed since last speed change is converted
33	01	→H.MS	from decimal time to format HH.MMSS.
34	24	FIX	Sets four decimal places to ensure that result
35	04	4	will be displayed as HH.MMSS.
36	34	RCL	Recalls base time from last speed change to be
37	01	1	added to time elapsed to derive TARGET TIME
38	31	f	for ideal arrival at current odo reading.
39	41	H.MS+	
40	33	STO	New TARGET TIME is saved in R4 for use if next
41	04	4	calculation involves a speed change.
42	−00	GTO00	Pointer returned to step 00 for next calculation.
43	34	RCL	This auxiliary program, accessed by keying
44	06	6	GTO43, will convert an instruction sheet
45	71	x	mileage to your odo's equivalent. It
46	34	RCL	accommodates navigation errors (see
47	05	5	instruction K) and cars without a trip
48	61	+	odometer. Calculator returns to master
49	−00	GTO00	program for next TARGET TIME calculation.

Program listing.

A TYPICAL RALLY

Before Setting Out

A. Load program, set switch to RUN, and key BST.

B. STOre your assigned starting time in R1, as clock time in format HH.MMSS, or 00.0000 if you're using a stopwatch.

C. STOre in R8 and R9 the initial assigned speed from the rally instruction sheet.

D. STOre your beginning odometer reading in R0, R3, and R5. This will be 00.0 for a trip odo, but for a car without one, can be any number appearing on the odometer.

E. STOre 1.0 in R6. (See instruction F.)

Upon Completing The Calibration Run

F. STOre the odometer conversion factor in R6. This is derived by the formula:

$$\frac{\text{Your car's odometer reading}}{\text{Rallymaster's instruction odo}} = \text{Conversion factor}$$

Note: For armchair test runs, simply use 1.0 in R8.

During The Rally

G. Keep track of your status. Simply KEY IN your current odo reading and punch R/S. Displayed result is your TARGET TIME to that mileage.

H. When rally instructions require a speed change, *first* KEY IN your current odo and punch R/S. This gives you a TARGET TIME readout for that mileage and (more important) resets the data base for calculations to be made at the new speed. *Then* KEY IN the new speed and STOre it in R8.

I. As with any HP-55 program, you can extend battery life by keying the decimal point to quench the display. *But*, press CLx before your next odo entry; if you don't, you'll be entering .325 instead of 32.5, for example.

J. If you wish to convert an instruction mileage to your car's odo, KEY GTO43. Then KEY IN the instruction-sheet figure and punch R/S. Calculator automatically returns to 00 for your next TARGET TIME calculation.

K. If you find you've made a bad turn and must backtrack, determine the total mileage error (usually double your backtrack distance) and add it to the odo settings in R0, R3, and R5 by keying it into the display and pressing STO + 0, STO + 3, and STO + 5. After doing this, you can continue to enter mileages as they appear on your odometer as though you'd made no navigation error. Readout will show that you have a specific amount of time to make up. Conversions using instruction J will also be accommodated.

Registers

R0	Base odo reading	R5	Beginning odo
R1	Base time	R6	Conversion factor
R2	Available (see below)	R7	Current odo
R3	Saves latest odo	R8	Instruction speed
R4	Saves TARGET TIMEs	R9	Saves last instruction speed

R2 is available to keep track of accumulated points. After initial entries, normally only R8 (speed changes) is hand entered. All other registers are updated by the program, but R0, R3, and R5 are also modified by adding error miles (see instruction K).

Sample Rally

Rally instructions in hand, and having synchronized your digital wristwatch with the rallymaster's, you prepare for victory by following instructions A through E. After (A) loading the program, you (B) STOre your assigned starting time of *1:09 PM* in R1 as 1.0900, and (C) STOre in R8 and R9 the first speed called for in the instructions, which is *22.5 mph*. Then (D), you STOre your beginning odometer of *14,631.6* in R0, R3, and R5. Finally (E), you STOre 1.0 in R6. Precisely at 1:09 PM, you're flagged onto the route, which begins with a calibration zone, often 10 miles in length. Soon, you begin checking your status:

Odometer	Readout	Your Watch	Status
14635.1	1.1820	1:18:20	Exactly right (it would seem).
14637.7	1.2516	1:25:09	Driving fast (7 seconds).
14640.6	1.3300	1:32:59	Running 1 second fast.
14641.5	1.3524	1:35:25	Arrived here 1 second late.

At this point, your instructions tell you that you've finished the calibration zone and that its total length has been exactly 10.0 miles. You determine that your odometer has measured this distance as 9.9 miles (by entering your current odo reading and subtracting the contents of R5 from it). Following instruction F, you now divide your car's 9.9 by the rallymaster's 10.0 and find the calibration factor is .99, which you STOre in R6 (erasing the 1.0 you used in instruction E).

Being a perfectionist, you now recompute the first portion of the rally, which you attempted to run at 22.5 mph. You do this by again KEYing IN your odo of 14641.5 and punching R/S. *Now* the corrected readout gives you this information:

14641.5	1.3540	1:35:45	Your status is that having taken 20 seconds to figure the conversion factor, you're just :05 behind schedule. The readout says you should have arrived here at 1:35:40, and your watch says the time is 1:35:45.

Now navigating according to the clues in the rally instructions, you continue on at 22.5 mph and check your progress:

14647.5	1.5150	1:51:45	You've gained 10 seconds, making up the 5 you were behind and adding a margin of 5.
14651.0	2.0115	2:01:10	Still running fast 5 seconds.

A bit further on, you encounter a speed change (following a rally instruction that says "At sign DONUTS change to 36 mph."). Having rehearsed carefully for this, you now follow instruction H with dispatch, entering your mileage of 14653.5 and getting as output, 2.0759. Having done this (and seeing that you're still 5 seconds ahead because your watch reads 2:07:54), you KEY IN the new speed (36) and STOre it in R8. Now your status checks yield this kind of information:

14655.5	2.1121	2:11:16	Still a 5-second margin.
14660.0	2.1856	2:18:52	Margin reduced to :04.
14662.3	2.2248	2:22:42	Now running fast :06, a reasonable margin.

Suddenly you realize, because the instructions just don't make sense any longer, that you missed a turn clue and you're off course! No matter, for your HP-55 will get you out of this pinch. Reversing course in a handy driveway, you note that your odometer reads 14664.4. KEY that INto the HP's display, and press ENTER. Now you watch (more carefully this time) for the turn clue and discover it. As you do, you KEY IN your new odo reading of 14665.6, hit the minus key, and see a readout of − 1.2. KEYing CHS gets rid of the pesky minus sign, and then you double that figure (2,x) to 2.4, which is the exact error you've made. Following instruction K, you now KEY STO + 0, STO + 3, STO + 5.

Now you're running behind schedule, obviously, but how much? Your HP-55 will tell you. Give it your odometer as input, and it'll tell you what time it should be!

14664.7	2.2248

Aha! 2:22:48! Same readout as your last calculation before you realized you were lost! (You were probably watching the HP-55 do its stuff instead of watching for clues!) but now your watch reads 2:26:18, and it's clear that you have time to make up. 3.5 minutes (3:30) to be exact, though there's no critical need yet to determine just how bad the situation is. Better to watch for clues than to be punching HP-55 buttons just now! It's sufficient to know that you're behind, and that as you catch up, your HP-55 output will begin to look more like your wristwatch time. So you continue, driving faster than the instruction mileage in an attempt to catch up. And you calculate, eventually:

14670.7	2.3254	2:33:30	Having gone 50 mph since picking up the route again, now you're only :36 late.

But here, while still :36 behind ideal time, you see a clue that commands a speed change. Since a tenth of a mile has passed since your calculation, you run another one (following instruction H):

14670.8	2.3304

You don't bother to compare this with your watch, knowing you are behind anyway. But you do KEY IN the new instruction speed of 25.6 mph and STOre it in R8. Now you can do another calculation to check your status:

14671.0	2.3333	2:33:52	Good! Now you're only :19 behind schedule. Run just a bit faster than the 25.6 called for, and soon you'll be fine.
14673.1	2.3831	2:3829	Great! In the last 2.1 miles you not only made up your deficiency of :19, but you're now running ahead by 2 seconds.

At this point, you realize that your HP-55 has not only kept you constantly informed of your status, but it also has discounted the error mileage and is still giving you results based strictly on input from your odometer readings—with no need for you to adjust! (If it could only spot the clues, too!)

Now you come upon an instruction which reads, "At 41.4 accumulated mileage, turn left." Here's a situation where you need to know what that "41.4" is on your car's odometer. No problem. KEYing GTO43, you then KEY IN the 41.4, and get as readout, 14674.9860. This rounds to 14675.0. At that odo reading, you make your left turn. As you do, you run another check, knowing that your HP-55 has returned to step 00 and is ready for a TARGET TIME calculation:

14675.0	2.4259	2:42:56	You're running ahead :03.

Now, still moving at the latest rally instruction speed of 25.6 mph, you round a bend and sight the rally's first checkpoint. Foot off the gas, you coast in and run a calculation just as you are stopwatched in by the checkpoint captain:

14675.3	2.4344	2:43:44	Great! No points here! (It should be so easy!)

In practice, of course, the "you" in this exercise should be the rally navigator, who manages TSD while the driver drives and watches for clues. And while this exercise shows that the HP-55 program can accommodate a rally car with no trip odometer, the numbers will usually be less complex in a rally-equipped sports car. Either way, the program handles *all* the number-crunching for you: mileage conversions, accumulated mileage errors, and reverse mileage conversions.

One last reminder: Keep your batteries charged!

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other programmables) that will help you hit those rally checkpoints on the nose.

Since road rallying is a time-speed-distance (TSD) competition in which the driver and his or her navigator attempt to arrive at checkpoints at precisely calculated times, seconds (or hundredths of minutes) are critical. By the usual scoring methods, every hundredth of a minute early or late at a checkpoint counts as a point. Would-be winners strive for the lowest possible number of points by following route instructions accurately and by precisely maintaining the speed called for in the rallymaster's instructions.

Winning rallyists are successful because they manage TSD calculations well, drive with precision, and keep their eyes peeled for the often obscure clues that show up in the instructions. It's important to spend the minimum possible time doing TSD calculations, because those roadside clues are crucial.

For advanced rallyists, this can mean dedicated computers, electronic or mechanical, tied into their car odometers—but that's an expense that only the fanatics can afford.

The program set forth here not only turns your HP-55 into a TSD manager, but also converts your car's odo reading, almost always at variance with that of the rallymaster when he laid out the course and wrote the instructions, to the odo standard being used by all contestants. It also can be used on casual practice runs to sharpen a driver's ability to hold a given average speed despite variations caused by road conditions and traffic.

During execution, the on-

ly input the program requires (aside from speed-command changes, which are STOred in Register 8) is your odometer reading. As output, it displays a TARGET TIME at which you should have reached that odometer reading. Then, a quick comparison with your time standard (stopwatch, wristwatch, or car clock) tells you whether you're running fast, slow, or on the button. Most drivers attempt to run slightly ahead of schedule, reasoning that they can more easily lose time than gain time as they sight a checkpoint.

The program provides two bonuses. It allows you to correct automatically for misspent mileage after a navigation error, and it provides an auxiliary six-step "reverse mileage conversion." While you'll mostly want to have the program automatically convert your car's odometer readings to TARGET TIMEs, sometimes you'll want to look ahead by converting the other way—from instruction-sheet mileages to your car's odometer. Both features are covered here in the instructions.

The program, with comments, and the operating instructions explain details of the program's calculation. You might want to cut them out and mount them on opposite sides of cardboard as an addition to your rally kit.

Some armchair runs are called for, of course, before you, your favorite navigator, and your HP-55 set out to devastate the competition. But in operation, the program is straightforward and designed for easy use in the competitive environment of a rally. With a little practice, you should be cutting points off your checkpoint times next weekend.

Good luck—and drive to survive! ■

Icing on the IC-2A Cake

—nonstandard offsets for Icom's hand-held

Photos by Vic Klein WA4THR

Photo A. The Icom IC-2AT.

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Knoxville TN 37919

When I first saw Icom's new synthesized handie-talkie, the IC-2A, at the Dayton hamfest, I was impressed by its small size and modest current-drain specifications. I had to dismiss it for my use though, because it was not capable of working odd repeater splits. Furthermore, Icom's representative at the hamfest told me that any modification for odd splits would be difficult if not impossible to make. Since I am caretaker for a repeater with an odd split (1.14 MHz) this handie-talkie was obviously not for me.

Several months later, I began to realize that a synthesized portable rig was becoming a necessity. I didn't need fancy scanning and many-memory capabilities, but I did need ruggedness and long battery life. The IC-2A came to the forefront of my mind.

After conferring a little more with the folks at Icom, I decided to take a chance and see if I could modify the radio for my odd split. I ordered one, and three weeks later I had what I consider to be the perfect handie-talkie.

This modification requires no holes to be drilled or extra switches added, does not change the functions of any of the existing controls, and is completely reversible at a later date, thereby not decreasing the rig's resale value.

Switch Settings	Binary Code	Function
Simplex +600	00	Duplex with odd offset
Simplex −600	01	Simplex
Duplex +600	10	Duplex with +600-kHz offset
Duplex −600	11	Duplex with −600-kHz offset

Fig. 1. DUP-SIMP switch outputs after modification.

How It Works

There are three transmit offset crystals in the IC-2A's synthesizer system. They are for simplex transmit, +600-kHz transmit, and −600-kHz transmit. These crystals are switched in and out by the use of a dc voltage to forward bias selected switching diodes. This means that the DUP-SIMP switch and the (−600)-(+600) switch are merely switching dc voltages and not the crystals themselves. Since two switches are available, with only slight modification two on-off binary bits could be made available. Two binary bits have four possible combinations. These combinations and what they represent after modification are shown in Fig. 1. Only three of the four combinations are used normally. Thus, we have a fourth combination available for switching in the odd split.

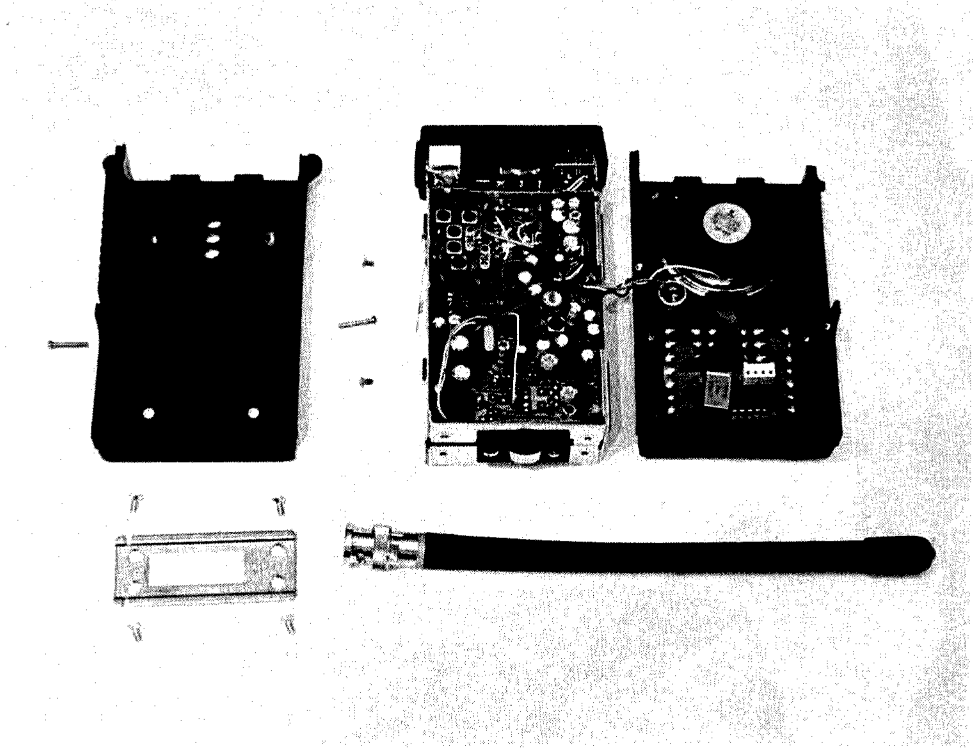

Photo B. A disassembled IC-2AT.

To decode the two binary bits of information from the switches into four dc output lines for the crystal switching circuits, I chose a CD4051 analog demultiplexer integrated circuit for the job. This IC merely routes an input signal, be it ac or dc, to an output line addressed by a binary input. Since this IC is CMOS, it adds only a negligible few microamps of current to the *transmit* battery drain.

The resulting circuit for the entire modification is shown in Fig. 2. Note that the diode switching circuit for the odd offset crystal is identical to the circuit used for the other offset crystals. The two coils shown, LB89 and LB91, are fairly critical so it is best to order them directly from Icom at the address shown at the end of this article. The diodes, 1SS53s, are also critical. 1N914s did not work in my unit. The 1SS53 diodes also should be ordered from Icom. Information for crystal ordering is in Fig. 3.

Installation

The Icom people did a very good job at miniaturization and getting the most into the least amount of space. Consequently, this modification should be attempted only by persons with very good eyesight and a steady hand, a very small-tipped, *low-wattage* soldering iron, and experience in working with miniature circuitry. Others would best serve themselves by turning the project over to a trusted friend having the above qualifications.

Begin the modification by first cutting the unused pins off each of the two coils. Then bend the two remaining leads out at right angles. Wire the remaining components, except for the IC, as shown in Fig. 4. Electrical tape should be wrapped around the crystal to keep it from shorting out other connections. Flex the crystal leads as little as possible to keep from breaking them off. All leads should be kept as short as possible. The entire circuit should also be kept as flat as possible. (No circuit board is used because there just isn't any room for it.) Once this circuit is wired, set it aside for a while. Do not install it in the rig at this time.

Remove the battery pack

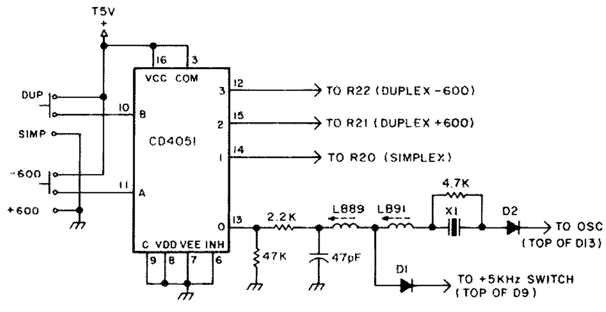

Fig. 2. Odd-split circuit schematic.

Crystal operating frequency = 35.00125 MHz + offset/4

Example: For a repeater with 146.40 input/147.54 output, offset needed = −1.14 MHz

Crystal frequency = 35.00125 MHz − 1.14 MHz/4 = 34.71625 MHz

Order: series resonant, 3rd overtone ±.005% tolerance, HC-18 holder with wire leads.
$5.50 from Jan Crystals, 2400 Crystal Drive, Ft. Myers FL 33907 (813)-936-2397.

Fig. 3. Crystal frequency calculation and ordering information.

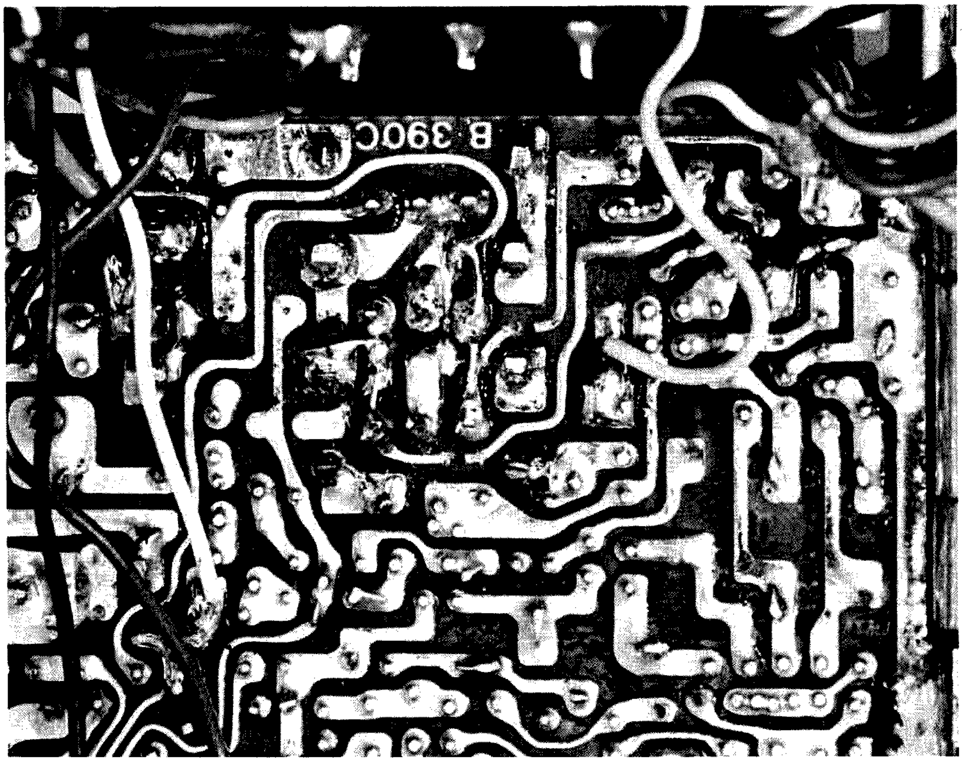

Photo C. Foil side of the PLL circuit board after the traces have been cut and the jumpers installed.

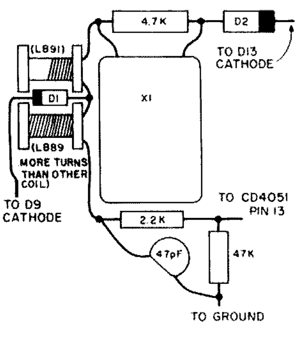

Fig. 4. Wiring pictorial.

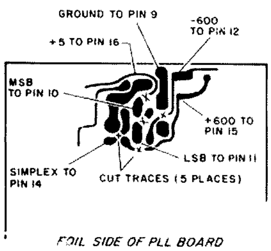

Fig. 5(a).

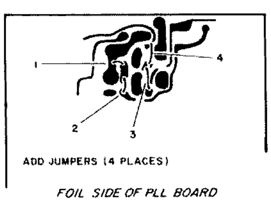

Fig. 5(b).

from the IC-2A. Then take out the four Phillips-head screws holding on the battery clip. Next remove the two Phillips screws on either side of the transceiver case. Now the case back cover can be removed by lifting it from the bottom and pulling it outward. Turn the rig so that the push-to-talk switch is on top, and locate the two Phillips screws that hold the chassis halves together. Remove them and swing the chassis halves apart. Aren't those hinges nice!

On the foil side of the board, containing the switches, there is a jumper wire about ½-inch long that serves to hold down several other wires. Carefully remove this jumper, but note where it attaches since it will need to be replaced later. Move the wires beneath the jumper to one side, cut the five traces as shown in Fig. 5(a), and add the jumpers as shown in Fig. 5(b). The PC should look like Photo C after the cuts and jumpers are installed.

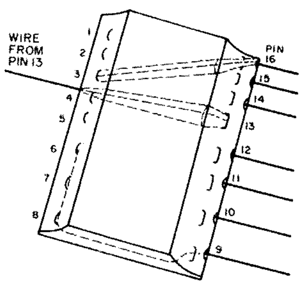

Fig. 6.

Now set the rig aside for a few minutes and get out the CD4051 CMOS IC. Normally, a CMOS IC should be handled as little as possible, but that is not possible in this situation. My only suggestion to avoid static damage in the steps that follow is to work on a grounded metallic surface in as humid an atmosphere as possible. The next step is to carefully cut off the "skinny" portion of each IC lead.

Using small-gauge wire such as wire-wrap wire, solder a minimum-length jumper between pins 3 and 16 of the IC. Solder a 2-inch piece of small-gauge wire to pin 16. Then jumper pins 6, 7, 8 and 9 together leaving a two-inch wire extending from pin 9. Continue by soldering 2-inch individual lengths of wire to each of pins 10, 11, 12, 14, and 15. Solder a 3-inch wire to pin 13. Carefully pull the leads out perpendicular to the IC, parallel to each other, and all on one side of the IC. Then bend the 3-inch lead on pin 13 to the other side of the IC. Remember to use as little heat as possible, allowing the IC to cool between each connection. Once all the wires and jumpers are soldered on, wrap the IC with electrical tape as shown in Fig. 6.

Take the tape-wrapped IC and, inserting it from the component side of the PLL board, route the connecting wires between the top edge of the circuit board and the flex printed circuit attached to the thumbwheel switches. The wire from pin 13 must remain on the component side of the board. Be sure that pin 16 of the IC is toward the switches. The IC should fit nicely into the upper-left corner of the rig when viewed from the back side, as shown in Photo D.

Now solder all wires coming from the IC (except for the one coming from pin 13) to the points shown in Fig. 5(a). When you're confident that everything is right, locate the ½-inch jumper removed earlier. Solder one end of it down. Group all the loose wires pushed aside earlier under the jumper. Then, being careful not to melt any insulation, tack the other end down at its original point. Reclose the chassis halves and put the two Phillips screws back in place.

The last task, now, is to install the coil-crystal assembly. First, make a double thickness of electrical tape about ¾-inch long and place it over the area on the

component side of the PLL circuit board where the flex circuit from the thumbwheels attaches to the main board. This is directly over IC1 and just to the left of the shielded enclosure. Make sure that the tape covers all the protruding solder connections. Now take the coil-crystal assembly and fit it on the taped-over area so that one lead of the 47k resistor goes over the shielded enclosure and so that the coils point to where the battery case is normally. Solder the lead from the 47k resistor to the shielded enclosure. Your assembly should now look like that shown in Photo E.

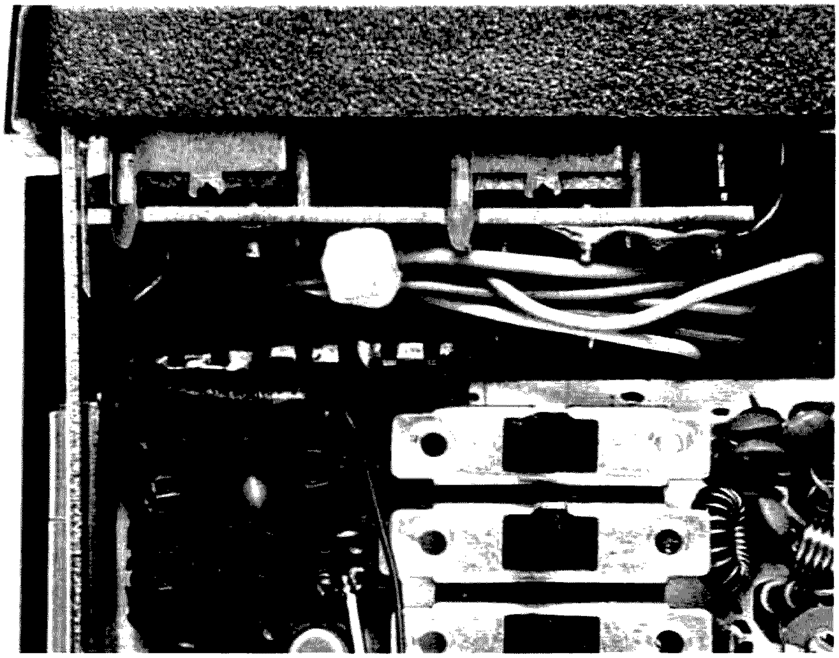

Photo D. Placement of the tape-wrapped CD4051.

Solder the cathode lead of D2 on the coil-crystal assembly to the cathode lead of either D12 or D13, which can be found in a group of four cathode leads sticking up just below the three other offset crystals and to the left of the switches. Make this a quick, low-heat solder connection to avoid overheating any of the diodes.

The next step is to find the cathode lead of D8 or D9. These diodes are a pair which can be found above the offset crystals to the left of the switches and immediately to the right of a couple of coil forms. Quick-solder one end of a piece of small wire to one of these cathode leads. The other end of the wire attaches to the cathode lead of D1 on the coil-crystal assembly. Finally, connect the lead coming from pin 13 of the

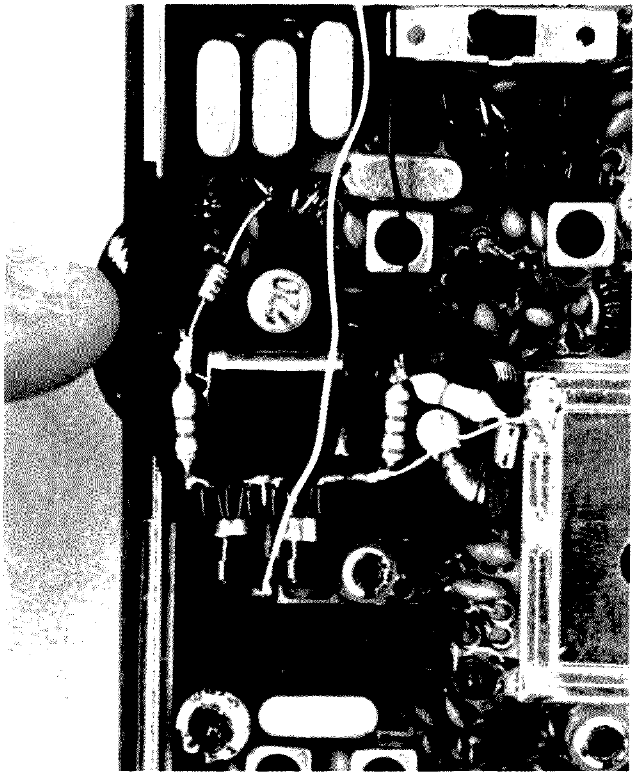

Photo E. Placement and orientation of the coil-crystal assembly.

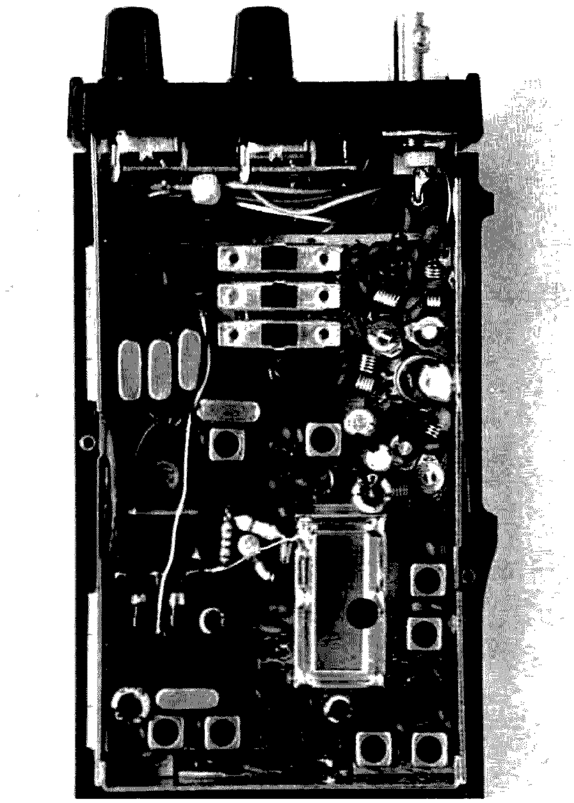

Photo F. The PLL circuit board after modification.

CD4051 to the junction of the 2.2k and 47k resistors on the coil-crystal assembly. This completes the modification.

Check Out

Before putting the case back together, connect the battery to the rig with a couple of jumper leads and turn on the rig. Everything should function normally except when the switches are set for simplex and +600. This combination should switch in your odd offset crystal.

A frequency counter should be used to check the offset frequency. Adjust LB89 on the coil-crystal assembly to adjust the frequency. Then switch the +5-kHz switch on and adjust LB91 to 5 kHz higher. Switch back then to 0 kHz and readjust LB89. Repeat this procedure a couple of times until both frequencies are correct. When the frequencies are to your satisfaction, cover the coil-crystal assembly with one more piece of tape and reassemble the case.

Conclusion

This modification has been made to several IC-2As in my area with complete satisfaction. While no undesirable side effects have been observed to date, I cannot, however, assume any liability for damages or faulty operation incurred by the installation or use of this modification.

Special thanks to Bill Tackett KN4N for offering the use of his week-old IC-2AT as the guinea-pig rig for development of this modification, and to Vic Klein WA4THR for the excellent photographs.

Coils and diodes can be obtained from Icom America, Inc., 2112 116th Avenue, N. E., Bellevue WA 98004. ■

Bruce Weber WB6GZW
1221 E. Cypress, #61
Redding CA 96002

Flexible Couplings

—for every project there is a reason. . . turn, turn, turn

In constructing a remotely-tuned antenna matcher for my ham station, I ran into the problem of coupling a variable-capacitor shaft to a pot shaft. (The pot is used to transmit information on the position of the variable capacitor.) The amount of space I had in the unit was not great enough to permit use of a flexible insulated coupling that is commercially available. Also, misalignment of the shafts was unavoidable due to the lack of space. The sideways force on the shaft of the pot also was of concern.

A simple solution came to me after I had racked my brains on this problem for a couple of days. Why not use some rubber grommets connected together with some heat-shrink tubing? Well, I tried it and it worked. Now I could finish up my antenna matcher.

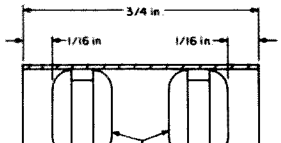

Fig. 1. Cutaway view showing placement of grommets in heat-shrink tubing.

Construction

The shaft size must be measured before selection of grommet size. Selection of heat-shrink tubing can be made next. The pot shaft and capacitor shaft were 1/4" diameter in my antenna matcher. I selected grommets with an inside diameter of 3/16". This fit tightly enough on the shafts so that the pot could turn without the grommet slipping.

Next, a size of heat-shrink tubing was selected that would let the grommets slip into the inside of the tubing. The heat-shrink tubing, when shrunk, must grip the grommets tightly.

As shown in Fig. 1, the length of tubing I used was about 3/4". Longer lengths can be used—more on that later. The grommets are pushed into each end of the tubing leaving about 1/16" of tubing overhang. Next, shrink the tubing with the grommets in place. That's all there is to it.

Limitations

There are some limitations to this type of homemade coupling. First and foremost is the amount of torque that is required to turn the shaft. In my case, the pot shaft takes very little torque to turn. Mount the grommet on whatever is to be coupled and try turning the grommet with you fingers. If the grommet rotates instead of the shaft, this type of coupling will not work. Something else must then be considered.

The heat-shrink tubing can be longer than I used by inserting a piece of rubber hose into the tubing. The length of hose is determined by the length of the tubing minus the total width of the grommets plus the 1/16" overhang of heat-shrink tubing on each end. The diameter of rubber hose must not be greater than the outside diameter of the grommets nor smaller than the inside diameter of the grommets. When the heat-shrink tubing is shrunk, it will grip the inserted rubber hose and add support to the extra length. Some trial and error assemblies may be necessary to get the results you need.

This type of coupling can melt if it is too close to some component that produces much heat. Also, make sure there is no grease or oil on the shafts when mounting the coupling or slippage may result.

In conclusion, this grommet and heat-shrink tubing combination has been working fine in my antenna matcher. As long as the torque requirements are taken into consideration, this coupling works great and, most important, it is cheap to make! ■

The Bobtail Curtain: Round Three

—wherein this author turns two previous articles upside down

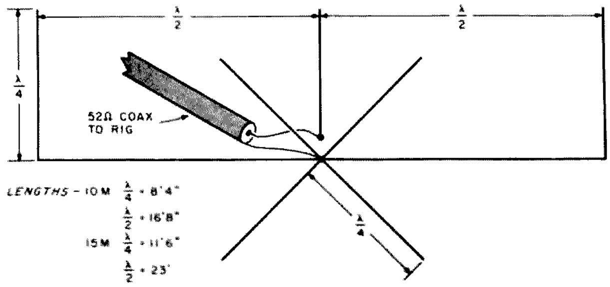

Fig. 1. The upside-down Bobtail curtain. Direction of radiation is broadside. The radials are each one-quarter wavelength long and spaced 90°.

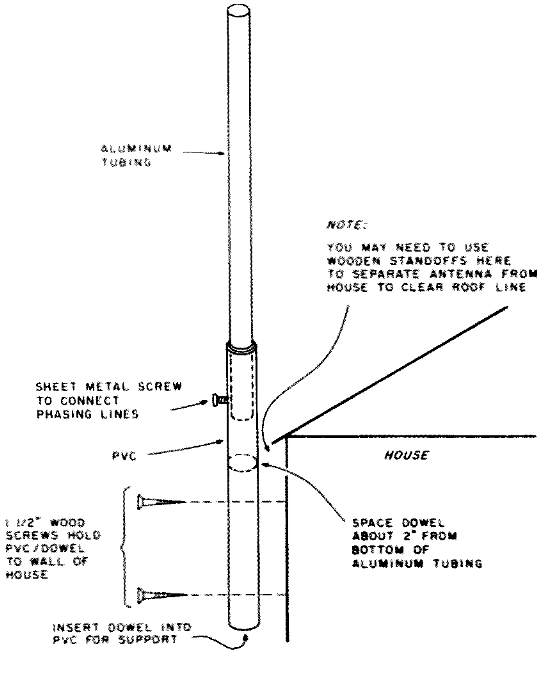

Fig. 2. Vertical element mounting details. Note that this mounting method is not strong enough to support vertical elements for 20 meters.

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The first time W8HXR wrote about the Bobtail curtain in *73 Magazine* (May, 1980, p. 44), I thought it sounded like an interesting antenna but the elaborate matching device was far too elaborate for me to build. The second time he wrote (*73 Magazine*, December, 1980, p. 110) I knew he had something that even I could handle, a top-phased, top-fed array.

The first article discussed voltage-feeding the antenna, that is, feeding the antenna at the bottom (at a voltage point), which required a tuning network. His second article suggested current feed (at the top at a current point which would be a good match for 52-Ohm coax).

The more I looked at the sketch of his design, the more I wondered why the antenna couldn't be turned upside down so it could be bottom fed. After I looked at it long enough, I decided to do just that. I decided on an antenna for 15 meters which would not use wire for the vertical sections, but tubing, so it would be self-supporting atop the roof. It works better than I expected. See Fig. 1.

I constructed the vertical elements out of 6' lengths of 0.058" wall aluminum tubing (Fig. 2). I used 3/4" o.d. pieces for the three base sections and 5/8" o.d. pieces for the tops. I chose 11'6" as my arbitrary starting point and slipped the smaller diameter tubing inside the larger to a depth of about 6", drilled through one wall of both tubes, and fixed them in place with a sheet-metal screw.

I mounted each of the verticals inside a piece of 3/4" i.d. PVC sprinkler pipe for an insulator and mounted each of those to the top of the house wall (it pays to have a flat roof) so the metal part of the antenna started about 9" above the roof and rose vertically from there. I spaced the three verticals 23' apart (it also pays to have a house 46-feet long on at least one

side). I drilled a hole in each vertical element about 1/2" from the bottom of the aluminum tubing (drill through one wall of the PVC and into one wall of the aluminum). I put a sheet-metal screw into each hole and prepared to attach the coax and the wire phasing lines. Since I made each vertical element 11'6" long and they were 1/4 wavelength long, I doubled the figure to get the half wavelength for spacing.

Since I needed two half-wave phasing lines, I decided to cut a single piece of wire a full wavelength long—46 feet. Each end of the wire attaches to the sheet-metal screws on the two outer verticals. The center conductor of a piece of 52-Ohm coax connects to the sheet-metal screw on the center vertical and the outer shield attaches to the center of the one-wavelength phasing wire. I used another sheet-metal screw through the center vertical PVC to hold the phasing line and ground shield away from the conductor.

Now, remember at this point that I was using the empirical method of antenna construction (cut and try). I knew 11'6" was close to a quarter wave (not taking time to use the formula, length = 243/f(MHz) and to calculate the Q of the tubing). So, for the smoke test I fired up the rig, loaded it up for CW with an swr bridge in the line, and was pleasantly surprised that the vswr was below 1.5 to 1 over the entire 15-meter band.

I tuned around, looking for DX, and I found two countries I had never heard before with the trap vertical I had been using. The two countries were Senegal and the Republic of Volta. Then I heard a lot of South American stations and decided to listen in the phone band. Call areas 4 and 5 sounded the loudest, and since the three verticals run in a line roughly northeast-southwest, I concluded that W8HXR was right, that the antenna radiates broadside the best.

Later that evening, with Steve AA6AA assisting, I found that his signals were about 15 dB stronger on the Bobtail than on the trap vertical using the S-meter on the TS-120S. He reported that my carrier was about 15 dB stronger on the TS-820 when I transmitted with the Bobtail. Two nights later, when 15 meters sounded dead at about 0230 GMT, I heard VU2USA in Bangalore coming through to answer my call (with about 160 Watts dc input to the TS-120S) and I knew the Bobtail curtain was the antenna for me. His longpath signal confirmed that the antenna worked better than I had ever hoped for.

What I didn't count on was making another discovery while trying to improve the signals on 10 and 20 meters on the trap vertical. I reasoned that if a three-element Bobtail works, a two-element Bobtail also must work. So, I decided to set off empirically (again!) in search of a two-element antenna which would use the Hy-Gain 14AVQ as one element and a vertical piece of wire running to a nearby tree as the other. If W8HXR were right and a 20-meter Bobtail would also work on 10 meters, then all I had to do was modify the 20-meter antenna to get two bands for the price of one.

Since the 14AVQ already had a coax feed at the base, I decided to run a half-wavelength radial on 20 meters (33') to a tie point on top of the roof. I mounted the end of the new radial (with an insulator) to a vent pipe. I then took a 16'6" piece of wire, soldered one end to the radial end and installed an insulator on the other. I climbed a nearby tree and pulled the new vertical up and affixed the insulator to a tree branch. The test showed the vswr was okay—not over 2 to 1 on the 10- and 20-meter frequencies that I normally operated. Wow! The thought at the time was that I would install a separate 10-meter Bobtail antenna. (I've never gotten around to it.)

But I did decide to make a change in the original 15-meter Bobtail. I concluded that since the two-element antenna worked well on 10 and 20 meters with four radials for each band, I at least ought to try installing radials on the 15-meter antenna. Since I was already on a streak with the 11'6" measurement, I cut four radials and spaced them 90 degrees apart and attached them to the coax shield at the base of the center vertical. The vswr got even better—no higher than 1.1 to 1 from 21.000 to 21.275 MHz and still below 1.3 to 1 at 21.450 MHz.

What a terrific surprise this whole experiment was. I expected to cut and try various lengths on 15 meters and somehow I lucked out on the first attempt. Then I expected I might run into trouble by adding a Bobtail radiator to the trap vertical—but I didn't. The vswr did go up a little, but nothing unmanageable. And I suspect that if I cut and tried a little harder, I'd be able to solve that, too. So, for an afternoon, a few bucks, and a little inverting of someone else's antenna design, I must say I'm pleased. If you want to write me about the antenna, please include an SASE. ■

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The Micro-Generator

—this diminutive device has a price tag as small as its size

An audio generator is a very handy piece of test equipment to have around the shack. I needed one to meet two design criteria; small size and low cost. I decided that the LM566 voltage-controlled oscillator chip would make an excellent building block since it is cheap, readily available, and requires a minimum number of external components to make it a general-purpose oscillator.

Using National Semiconductor data and making a few calculations, I came up with this circuit (see Fig. 1). This unit is continuously tunable from five Hertz through five hundred kilohertz and has selectable square- or triangle-wave output adjustable from 0 to 5 and 0 to 2.5 volts, respectively. Frequency selection is accomplished by selecting the midband frequency with S1 and then tuning in the desired frequency with R1. The choices for the midband frequencies are 10 Hz, 100 Hz, 1 kHz, 10 kHz, and 100 kHz. R1 will vary the chosen midband frequency from one-half to five times its value.

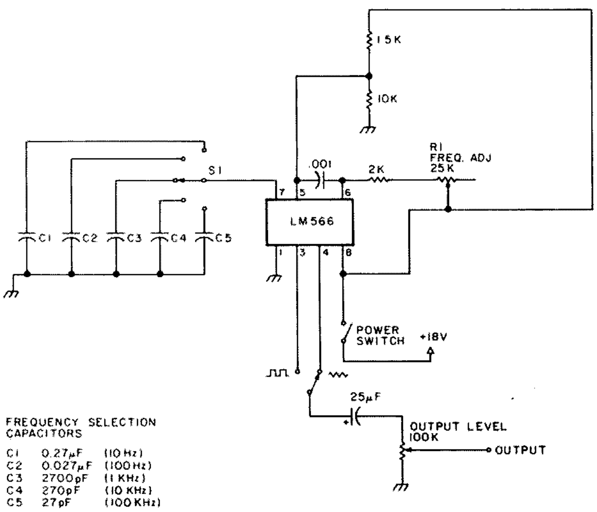


Fig. 1. Schematic for a micro-size audio signal generator.

Construction is not particularly critical. Everything can be bought at Radio Shack, but it is cheaper to shop the *73* ads and use the junk box. Power is supplied by two nine-volt transistor batteries connected in series. The capacitor values should be kept close to the indicated values for frequency readout accuracy. I paralleled junk-box capacitors to obtain the desired values. I labeled R1 as a frequency multiplier control since I wanted to keep the cabinet small. This scheme has accurate frequency readout on all but the high band. If a larger cabinet is used, direct-reading frequency scales for each band will give excellent frequency readout accuracy. Calibration of R1 can be accomplished with a counter or scope. If one is not available, this formula can be used to determine the frequency for a given value of R1: $F_O = 2(Vcc - V_5)/RCVcc$.

Vcc is the supply voltage (18 volts), R is R1 plus 2000 Ohms, C is the capacitor value chosen by S1, V_5 is the voltage from pin five to ground (15.65 volts), and R should be kept between 2k and 20k. Some of the settings for R1 and the corresponding frequencies are: 8k/center frequency, 18k/one-half the center frequency, and 0 Ohms corresponds to five times the center frequency.

I tested my prototype at a University of Maryland lab where I work. The unit had symmetric waveforms and good frequency readout accuracy through the audio range. The 566 is rated to one megahertz, but the waveforms start to become distorted, and frequency does not follow the formula at frequencies much higher than 100 kHz. Overall performance is excellent. The micro-size audio oscillator should make a nice addition to any test bench. ■

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received two months prior to the month in which the event takes place. They should be sent directly to Editorial Offices, 73 Magazine, *Pine Street, Peterborough NH 03458, Attn: Social Events.*

MAPLE RIDGE BC CAN
JUL 4-5

The Maple Ridge ARC will hold its Hamfest '81 on July 4-5, 1981, at the Maple Ridge Fairgrounds, located 30 miles east of Vancouver, Maple Ridge BC. Registration for hams is $4.50, a program with a ticket for a drawing is $2.50, and the dinner and dance is $10.00. Registration for non-hams over 12 years old is $2.00; non-hams under 12 will be admitted free. There will be food and camper space (without hookups) available. Features will include prizes, a swap and shop, a bunny hunt, a ladies' program, and much more. Talk-in on 146.34/.94 and 146.19/.79. For more information and advanced registration, contact Bob Haughton VE7BZH, Box 292, Maple Ridge BC V2X 7G2.

OAK CREEK WI
JUL 11

The South Milwaukee Amateur Radio Club, Inc., will hold its annual swapfest on Saturday, July 11, 1981, at the American Legion Post #434, 9327 South Shepard Avenue, Oak Creek WI. Admission is $2.00 and includes a happy hour with free beverages. Prizes include a $100 first prize and a $50 second prize. Activities will begin at 7:30 am and continue until 5:00 pm. Parking, a picnic area, hot and cold sandwiches, as well as liquid refreshments, will be available on the grounds. Overnight camping is also available. Talk-in on 146.94. More details, including a map, may be obtained from The South Milwaukee Amateur Radio Club, PO Box 102, South Milwaukee WI 53172.

STATE COLLEGE PA
JUL 11

The Nittany Amateur Radio Club will hold its annual Mount Nittany Hamfestival on Saturday, July 11, 1981, at the HRB-Singer, Inc., picnic grounds in State College PA. Registration and admission is $2.00 in advance with no charge for spouse and children; $3.00 at the gate. Flea market space is $3.00 in advance; $5.00 on-site. Along with the flea market, features will include an auction, dealer displays and sales, door prizes including a synthesized 2m handheld transceiver, and free parking. Refreshments will be available. The Central Pennsylvania Festival of the Arts will be taking place at Penn State University the same weekend. Talk-in on .16/.76 and .25/.85 from I-80 and major central Pennsylvania routes; talk-in on .52 for local directions. For further information, write Mount Nittany Hamfestival, NARC, Box 614, State College PA 16801, or call Dave Buckwalter N3BBH at (814)-234-0759.

PITTSFIELD MA
JUL 11-12

The Northern Berkshire Amateur Radio Club will hold its annual hamfest on Saturday and Sunday, July 11-12, 1981, at the Cummington Fairgrounds, Cummington MA (off Rte. 9). General admission is $3.00 in advance, and $4.00 at the gate. Family admission is $5.00 in advance and $6.00 at the gate. Dealers are welcome. Talk-in on 146.31/.91. For further information, contact Herb Blake, PO Box 567, North Adams MA 01247.

DUNSEITH ND
JUL 11-12

The 18th annual Peace Garden Hamfest will be held July 11th and 12th on the American side of the International Peace Gardens (which are located 13 miles north of Dunseith ND). Registration will be at the Lodge from noon to 6:00 pm on Saturday and from noon to 3:00 on Sunday. There will be swap tables and other activities on Saturday, followed by the dance at 9:00 pm. There will be breakfast Sunday morning for all those registered, followed by TX hunts and other activities. The general assembly will be Sunday afternoon. For more information, write Ramsey County Amateur Radio Club (WD0FFQ), Box 5, Devils Lake ND 58301.

MOUNT SINAI LI NY
JUL 12

Radio Central ARC will hold its 3rd annual hamfest on Sunday, July 12, 1981, from 9:00 am to 4:00 pm on the grounds of Mount Sinai Elementary School, Rte. 25A, Mount Sinai LI NY. Admission for buyers is $1.50; XYLs and harmonics will be admitted free. Sellers' spaces are $3.00. There will be door prizes, a grand prize drawing at 3:00 pm, a contest, and refreshments. Talk-in on 145.15 (WA2UEC) and 146.52. For more information, contact Lew Franklin at (516)-265-5614.

MCKEESPORT PA
JUL 12

The Two Rivers Amateur Radio Club, Inc., will hold its 17th annual hamfest on Sunday, July 12, 1981, at the Pennsylvania State University McKeesport Campus, McKeesport PA, from 8:00 am to 4:00 pm. The indoor hamfest will be in the Frable Building and the outdoor event will be in the main parking lot. There is no admission charge. Inside setup is $3.00 per table and outside setup is free. Hot food and cold drinks will be available and door prizes will be awarded throughout the day. There are forums and displays planned. Our location at the corner of Eden Park Boulevard and University Drive in the Renziehausen Park Area is easily accessible from most major routes. Talk-in on 146.22/.82.

ALEXANDER NY
JUL 12

The Genesee Radio Amateurs, Inc., will hold the first annual ARRL-approved Batavia Hamfest on Sunday, July 12, 1981, from 7:00 am to 6:00 pm at Alexander Firemen's Grounds, Rte. 98 (nine miles south of Batavia), Alexander NY. Admission is $2.00 in advance, $3.00 at the gate, and $1.00 for the flea market. There will be many prizes, a large exhibit area, programs, YL activities, contests, and plenty of food. Overnight campers are welcome. A boat anchor auction will take place at 4:30 pm. Talk-in on 146.04/.64 (W2RCX), 144.71/5.31, and .52. For more information and advance tickets, send an SASE to GRAM, Inc., Box 572, Batavia NY 14020.

INDIANAPOLIS IN
JUL 12

The Indianapolis Amateur Radio State Convention and Hamfest will be held on Sunday, July 12, 1981, at the Marion County Fairgrounds. For further information, write Indianapolis Amateur Radio Association, Box 11086, Indianapolis IN 46201.

WILKES-BARRE PA
JUL 12

The Broadcasters' Amateur Radio Club will hold its fourth annual hamfest on July 12, 1981, from 9:00 am to 4:00 pm at Pocono Downs Race Track, Rte. 315, 1½ miles north of Wilkes-Barre PA. Admission is $3.00, XYLs and children will be admitted free, and there will be no additional charge for sellers. Gates will open at 8:00 am for setup. There will be unlimited outdoor and indoor space, refreshments, prizes, a free FM clinic, and ac power available. Talk-in on 147.66/.06 and 146.52. For more information, contact Charles Baltimore WA3NUT, BARC, 62 S. Franklin Street, Wilkes-Barre PA 18773, or phone (717)-823-3101.

GLACIER NATIONAL PARK MT
JUL 17-19

The Great Falls Area Amateur Radio Club will sponsor the Glacier-Waterton International Hamfest on July 17-19, 1981, at Three Forks Campground, Highway 2 between East and West Glacier. Features will include forums, technical presentations, exhibits, demonstrations, and ladies' and children's activities, including horseback riding. Until July 7, 1981, preregistration is $6.00; after that, $7.00. Campsites are $5.00 for a full hookup and $4.00 without. For more information, contact Glacier-Waterton Hamfest, Shirley Smith, Secretary, 1822 14th Avenue South, Great Falls MT 59405, or phone (406)-452-1886.

HARBOR SPRINGS MI
JUL 18

The Straits Area Amateur Radio Club will hold its annual hamfest on July 18, 1981, at the Harbor Springs High School, Harbor Springs MI, from 9:00 am to 4:00 pm. Donations are $2.00 at the door and table space is $2.50. Sellers will be admitted at 8:00 am and tables may be reserved in advance. Features include lunch served from 11:00 am to 1:00 pm, one main door prize and several smaller prizes hourly, free overnight parking for self-contained RVs, and refreshments available all day. Talk-in on .52/.52 and 146.07/.67. For more details, contact Mr. Bernie Slotnick KB8RE, 630 Ann Street, Harbor Springs MI 49740, or phone (616)-526-5614.

MANCHESTER NH
JUL 18

The New Hampshire FM Association will hold an electronic flea market on Saturday, July 18, 1981, at the Manchester Municipal Airport, Manchester NH, beginning at 9:00 am. General admission will be 50¢ per person; sellers: $2.00. Sellers should bring their own tables or tailgate. Commercial displays are welcome. Refreshments will be available and door prizes will be awarded. Talk-in on 146.52 FM and 124.9 AM. For further information, contact Dick DesRosiers W1KGZ at (603)-668-8880, or Doug Aiken K1WPM, 30 Meadowglen Drive, Manchester NH 03103, (603)-622-0831.

CHARLESTON SC
JUL 18-19

The Charleston Amateur Radio Society, Inc., will hold its eighth annual Charleston Hamfest on July 18-19, 1981, at the Omar Shrine Temple, 44E Battery Street, Charleston SC. There will be overnight security guards and refreshments available. For more information, contact the Charleston Hamfest Committee, PO Box 30643, Charleston SC 29407, or phone (803)-747-2324/496-3660.

LOUISVILLE OH
JUL 19

The Tusco Amateur Radio Club and the Canton Amateur Radio Club will present the 7th annual Hall of Fame Hamfest on Sunday, July 19, 1981, at the Nimishillen Grange, 6461 Easton Street, Louisville OH. Admission is $2.50 in advance and $3.00 at the gate per person. People under 16 will be admitted free. There will be a flea market, food, XYL activities, forums, contests, distributors, and awards. For qualified dealers of electronic and ham-radio-related products, 30" x 8' tables are available in an indoor display area (with 110-V ac) on a reserved basis at $3.50 each. Talk-in on 146.52/.52, 146.19/.79, and 147.72/.12 (W8ZX or W8AL). For table reservations or tickets, send a check payable to Hall of Fame Hamfest, 10877 Hazelview Avenue, Alliance OH 44601, or phone (216)-821-8794.

BOWLING GREEN OH
JUL 19

The 17th annual Wood County Ham-A-Rama will be held on July 19, 1981, at the Bowling Green Fairgrounds, Bowling Green, Ohio. Gates open at 10:00 am; there will be free admission and parking. Trunk-sale space and food will also be available, as well as prizes. Talk-in on .52 (K8TIH). Tickets are $1.50 in advance and $2.00 at the door. For information, write to: Wood County ARC, Eric Willman, 14118 Bishop Rd., Bowling Green OH 43402. Advance table rental is available to dealers only ($3.00 per table, payable in advance). Saturday setup will be available. Send checks for tables to: Bill Wilkins, 16220 Portage Rd., Bowling Green OH 43402.

WRIGHTSTOWN NJ
JUL 19

The 3rd annual West Jersey Radio Amateurs Hamfest will be held on Sunday, July 19, 1981, from 9:00 am to 4:00 pm at McGuire Air Force Base, Wrightstown NJ. Admission is $2.50 and spouses and children will be admitted free. Tailgate or table space is $2.50 per space; bring your own table. Refreshments and activities, including contests and films, will be available. Door prizes will be awarded continuously. Talk-in on 146.52, 147.15, and 145.47. Advance tickets and information are available from any club member or send an SASE to Bill Luebkemann WB2LCC, 116 Country Farms Road, Box 140, Marlton NJ 08053, (609)-983-8844 (between 6:00 pm and midnight).

OKLAHOMA CITY OK
JUL 24-26

The Central Oklahoma Radio Amateurs will hold the West Gulf Division ARRL Convention and "Ham Holiday" on July 24-26, 1981, at the Myriad Convention Center, Oklahoma City OK. Pre-registration will be $6.00

✓See List of Advertisers on page 114

if received before July 17th; after that, registration will be $7.00. The program will include an ARRL forum, technical talks, a QCWA breakfast, and a Woulf Hong initiation. In addition, a full program is scheduled for the ladies. Other events will be a Saturday evening banquet with speaker Harry Dannals, President of the ARRL, Sunday noon drawings for the Icom 260 preregistration and TS-830S grand prizes, plus others, and an indoor exhibitor and swapfest area. Tables are free to noncommercial registrants. Mail your registration to CORA, PO Box 20118, Oklahoma City OK 73120.

WELLINGTON OH
JUL 25

The Northern Ohio Amateur Radio Society will hold its 4th annual ARRL-approved NOARSfest on Saturday, July 25, 1981, from 7:00 am to 5:00 pm at the Lorain County Fairgrounds, one mile west of Rte. 58 on Rte. 18, Wellington OH. Admission tickets are $2.50 in advance, $3.00 at the gate, and are good for all prize drawings. Tickets for prize drawings only are available by mail or at the gate for $1.00 each. Children under 12 will be admitted free. There will be plenty of food, free parking, a large indoor exhibit hall for dealers, a huge blacktopped midway for flea market and trunk sales, and free camping (no hookups) outside the gates on Friday night. The gates will open at 6:00 am for sellers and dealers. A Ten-Tec Delta transceiver and a Den-Tron GLA-1000B linear amplifier will be among the prizes awarded. For advance registration, information, or tickets, write NOARSfest, PO Box 354, Lorain OH 44052.

OLIVER BC CAN
JUL 25-26

The Okanagan International Hamfest will be held on July 25-26, 1981, at a new location, Oliver Centennial Park, 6th Street, Oliver BC. Registration is Saturday, July 25th, at 9:00 am (PDT). There will be activities from 1:00 pm Saturday to 2:30 pm Sunday. Also on Sunday there will be a potluck luncheon at noon as well as entertainment and bunny hunts. YLs are asked to bring their hobbies for display or sale and also their flea-market items. Talk-in on .34/.94 and .76/.76. For additional information, contact John Juul-Andersen VE7DTX, 8802 Lakeview Drive, Vernon, BC V1B 1W3, or Lota Harvey VE7DKL, 584 Heather Road, Penticton, BC V2A 1W8.

ANDERSON IN
JUL 26

The MCARC Hamfest will be held on Sunday, July 26, 1981, from 8:00 am to 3:30 pm (vendors' setup is at 7:00 am) at the National Guard Armory, N 109 Bypass, Anderson IN. Ample parking and refreshments will be available. Advance tickets are $2.50 each; at the door, $3.50. Spaces with tables are $2.50 each; without tables, $1.75 each. First prize is an Icom IC-2AT. Talk-in on 146.22/.82 and 146.52/.52. For advance tickets and space, send your check to Everett G. Riley, Activities Chairman, RR 4, Box 354, Alexandria IN 46001.

NASHVILLE TN
JUL 26

The Radio Amateur Transmitting Society (RATS) will hold the Nashville Hamfest on Sunday, July 26, 1981, at the National Guard Armory, Sidco Drive, Nashville TN. Doors will open at 8:00 am. Admission is $2.00 and tables are $5.00 each. Refreshments will be available. Talk-in on .90/.30. For more info, contact RATS, PO Box 2892, Nashville TN 37219.

CENTERVILLE MI
JUL 26

The Amateur Radio Public Service Association will hold a swap and shop on July 26, 1981, at the St. Joseph County Fairgrounds, M-86, Centerville MI. Admission at the door is $2.00 and tables are $3.00. Gates will open at 7:00 am. Talk-in on 146.52.

WEST FRIENDSHIP MD
JUL 26

The Baltimore Radio Amateur Television Society (BRATS) will hold its annual Maryland Hamfest on Sunday, July 26, 1981, at the Howard County Fairgrounds, Route 144 at Route 32, adjacent to Interstate 70, about 15 miles west of Baltimore, in West Friendship MD. Tickets are $3 (XYLs and children under 12 will be admitted free), tailgating spaces are $2, and tables are $5 each. For additional information, write BRATS, Box 5915, Baltimore MD 21208, or call Mayer W3GXK at (301)-655-7812.

WEST YELLOWSTONE MT
JUL 31-AUG 2

The WIMU (WY-ID-MT-UT) Hamfest will be held from July 31-August 2, 1981, in West Yellowstone MT. Lodging and campgrounds are available. There will be product displays as well as activities for YLs and harmonics. Talk-in on 146.52, 3.920 or 1.250. For further information, contact "WIMU '81," c/o Les Belyea N7AIK, Box 327, Belgrade MT 59714.

JACKSONVILLE FL
AUG 1-2

The Greater Jacksonville Hamfest Association will hold the ninth annual Jacksonville Hamfest and Northern Florida Section ARRL Convention on August 1-2, 1981, at the Orange Park Kennel Club, located at the intersection of I-295 and US 17 just south of Jacksonville. Advance registration is $3.50 and registration at the door is $4.00. Swap tables are $12.00 per table for both days (no one-day tables). All events will be held indoors and will include a full slate of programs as well as meetings of several statewide and regional organizations. Door prizes will be awarded at both hourly and grand prize drawings. Plenty of free parking will be available. The headquarters hotel is the Best Western First National Inn just across from the hamfest site on US 17. Special hamfest rates will be available. Talk-in on 146.16/.76 and 146.07/.67. For advance registration, hotel rates, or more information, contact Robert J. Cutting W2KGI, 1249 Cape Charles Avenue, Atlantic Beach FL 32233, or Andy Burton, Jr., WA4TUB, 5101 Younis Road, Jacksonville FL 32218. For swap tables, contact WA4TUB at the address listed above.

ESCANABA MI
AUG 1-2

The Delta County Repeater Association will hold the 33rd annual Upper Peninsula hamfest on August 1-2, 1981, at the Flat Rock Township Hall, Escanaba MI. Registration is $2.00. The many activities will include a DX forum, an ARPSC workshop, a satellite-TV seminar, net meetings, and a swap and shop. There will be prizes and a banquet on Saturday evening. For more information, contact Aileen Gagnon WA8DHB, co-chairman of the prize committee, Kipling Loc., Mtd. Rte., Gladstone MI 49837.

ANGOLA IN
AUG 2

The Steuben County Radio Amateurs will hold their 23rd annual FM Picnic and Hamfest on Sunday, August 2, 1981, at Crooked Lake, Angola IN. Admission is $2.50. There will be prizes, picnic-style BBQ chicken, inside tables for exhibitors and vendors, and overnight camping (with a fee charged by the county park). Talk-in on 146.52 and 147.81/.21.

BELVIDERE IL
AUG 2

The annual Big Thunder ARC Hamfest will be held on August 2, 1981, at the Boone County Fairgrounds, Highway 76. Advance tickets are $2.00. Indoor tables are available at a nominal cost and there will be acres of outdoor space available free. Camping is permitted. For advance tickets, send an SASE and check to Bob Anderson K9DCG, 910 W. Locust Street, Belvidere IL 61008.

COLBY KS
AUG 2

The first Northwest Kansas Amateur Radio Swap Meet will be held on Sunday, August 2, 1981, beginning at 9:00 am at the Community Building, Colby KS. Admission is $1.00 and tables are $1.00 each (same for dealers). An auction will be held at 2:00 pm. Other features will include a TVRO demonstration, activities for the ladies, and old-fashioned informal swapping, selling, and visiting. Lunch will be available. Talk-in on 146.22/.82 and .52/.52. For more information, contact WA0GBN or KA0FBQ.

MOBERLY MO
AUG 2

The third annual North Central Missouri Hamfest will be held on Sunday, August 2, 1981, at the air-conditioned Municipal Auditorium, 201 West Rollins, Moberly MO. doors open at 9:00 am. Tickets are $1.50 in advance and $2.00 at the door. Features include commercial dealers, a flea market (no charge for tables), an ARRL display, exhib-

its, prizes, women's programs, a special forum with Bob Hell K9EID on CB-to-10-meter conversions, and a buffet lunch. Drinks and hot dogs will be available all day. Talk-in on 147.69/.09, 146.52, and 3963. For more information, contact Charles Coy WB0ENV, 601 McKinley, Moberly MO 65270.

LEVELLAND TX
AUG 2

The Hockley County Amateur Radio Club and the Northwest Texas Emergency Net will sponsor their 16th annual picnic and swapfest on Sunday, August 2, 1981, beginning at 8:00 am at the city park in Levelland TX. This event is for the entire family. Bring your own picnic basket for lunch at 12:30. A $3.00 registration is requested. There will be swapping all day, with tables provided. Talk-in on .28/.88 (WR5AFX).

BURLINGTON VT
AUG 8-9

The Burlington Amateur Radio Club will hold its annual International Hamfest on August 8-9, 1981, at the Old Lantern Campground, Charlotte VT (14 miles south of Burlington, just off Rte. 7). Admission is $4.00 (US funds). Planned events include a flea market, commercial exhibits, a CW contest, a tower-raising contest, an HT transmitter hunt, and the traditional Canadian-American tug-of-war. Talk-in on .34/.94. For more information, contact Hap Preston W1VSA, PO Box 312, Burlington VT 05402. For campground reservations, call Old Lantern Campground at (802)-425-2120.

WILLOW SPRINGS IL
AUG 9

The Hamfesters Radio Club will hold its 47th annual hamfest on Sunday, August 9, 1981, at Sante Fe Park, 91st and Wolf Road, Willow Springs IL.

MONTGOMERYVILLE PA
AUG 9

The Mid-Atlantic Amateur Radio Club will hold its annual J.B.M. Hamfest on Sunday, August 9, 1981, from 9:00 am to 4:00 pm, rain or shine, at the Budco 309 Drive-In Theatre, ¼ mile north of the intersection of Rtes. 63 and 309, Montgomeryville PA (6 miles north of the Fort Washington interchange of the Pennsylvania Turnpike). Admission is $2.50 with $1.00 additional for the first tailgate space and 75¢ for each additional space. Tailgate setup begins at 8:00 am. Featured will be an Alternate Energy Fair which will include exhibitions of various energy resources, as well as door prizes and a flea market for both the hamfest and the Alternate Energy Fair. Refreshments

Continued on page 108

HAM HELP

I need a manual or schematic for a Hystar model 100 10-meter transceiver imported from Korea by the Vendetta Corp., Houston TX. This is an AM/SSB rig based on a 40-channel CB unit. I will pay all associated costs.

Bruce Pickering N5CBK
5705 Firewood Dr.
Arlington TX 76016

I recently acquired a Digital model PDP8/E with a teletype model with a paper tape punch and reader. Any help on how to use this or books on it would be appreciated. (Digital seems impractical to try to talk to!)

J.E. Ansley K8ONM
22514 East 9 Mile Road
St. Clair Shores MI 48080

I would like references or info about converting a CB set to 10 meters, a TRC-458 Navaho from Realistic. Any help would be appreciated.

Michael C. Christ XE1MD
Cda Norena 40
Mixcoac D.F. 19
Mexico City, Mexico

I am in need of a schematic and operations manual for a Precision Instruments model PI-2107 seven-channel instrumentation tape recorder. Please call or write if any help is available. I'll pay mailing and reasonable reproduction costs.

John C. Street KA4EPQ
PO Box 275
Niceville FL 32578
(904)-678-5410

I would like to buy, borrow, or copy a manual for the BC-654A. I am willing to pay for postage, Xeroxing, etc. I am also looking for an RS-1 or RS-6 radio.

Gary Cain W8MFL
2464 Hand Rd.
Niles MI 49120

I am looking for a circuit and/or service manual for a Northern Radio Co., Inc., frequency shift converter type 107, model 2, serial no. 1273. Can anyone help?

Lionel L. Sharp VK4NS,
19 Kelso Street
Chermside, Queensland 4032
Australia

I need an operating manual and/or schematic for a Kepco power supply, model #SC-18-1M, range 0-18 V, 1 Amp, fully regulated. I will pay for a copy or will copy and return original. Thank you.

Geoff Chadwick
Box 361
Red Lodge MT 59068

I lost everything—QTH, rigs, logs, QSLs—in a fire on Jan. 9, 1981. I would appreciate dupe QSLs from phone/CW stations worked since Dec. 13, 1979. I also need help to get back on HF.

Art Hadley WA4UDE
PO Box 134
Prince George VA 23875

Help! I need a schematic diagram/owner's manual for a Gonset 2-meter rf power amplifier using a 4X150A tube. I will pay copying and postage fees.

Ruth Valentino KA8GVY
6234 Mentor Pk. Blvd.
Mentor OH 44060

I would like to contact anyone concerning the construction of or conversion of commercially-available converters to 1691 MHz for the reception of WEFAX GOES weather satellites. Thank you for your time and assistance.

Charles T. Huth WB8NLM
146 Schonhardt Street
Tiffin OH 44883

I am in need of a Collins 32S1 transmitter in any condition. Please state condition and price.

Herman F. Schnur
115 Intercept Ave.
North Charleston SC 29405

I am in need of a schematic for a Hallicrafters AM/shortwave receiver (late 40s, early 50s), model number TW-2000. The radio is powered by battery or ac. I would be happy to pay for a copy of such.

Chuck Dicken WD8ICP
1627 Juniper Drive
Bowling Green OH 43402

I need a manual or schematic for a Hammarlund HQ-170A and a Heath VFO-1. I will be glad to pay for copying costs and postage. Thanks.

Richard Smith
214 Wittel Avenue
Opelika AL 36801

I wonder if any readers could tell me what area in Boston sells nuts, bolts, sheet aluminum, and similar items—roughly equivalent to Canal Street in New York.

Neil Johnson W2OLU
Box 585
South Orleans MA 02662

I am in serious need of a Collins mechanical filter number F455B08. I am willing to pay any reasonable price.

Tim Goad KA9AMO
RR 2
Princeton IN 47670

I need a service manual for a Hallicrafters S-120 receiver and a National NCX-3 transceiver. I will pay for copying and postage.

A. Hoogenraad WB0RAF
7204 E. 28th St.
Kansas City MO 64129

All hams who are also broadcast engineers are invited to join the Society of Broadcast Engineers chapter-of-the-air. The net is called every Thursday evening at 7:00 pm Mountain Time on 7285, then moved off frequency. SBE membership is not required.

Chuck Kelly WB9GOE
Durango CO

Martin W. Krey K7NZA
7037 E. Chaparral Rd.
Scottsdale AZ 85253

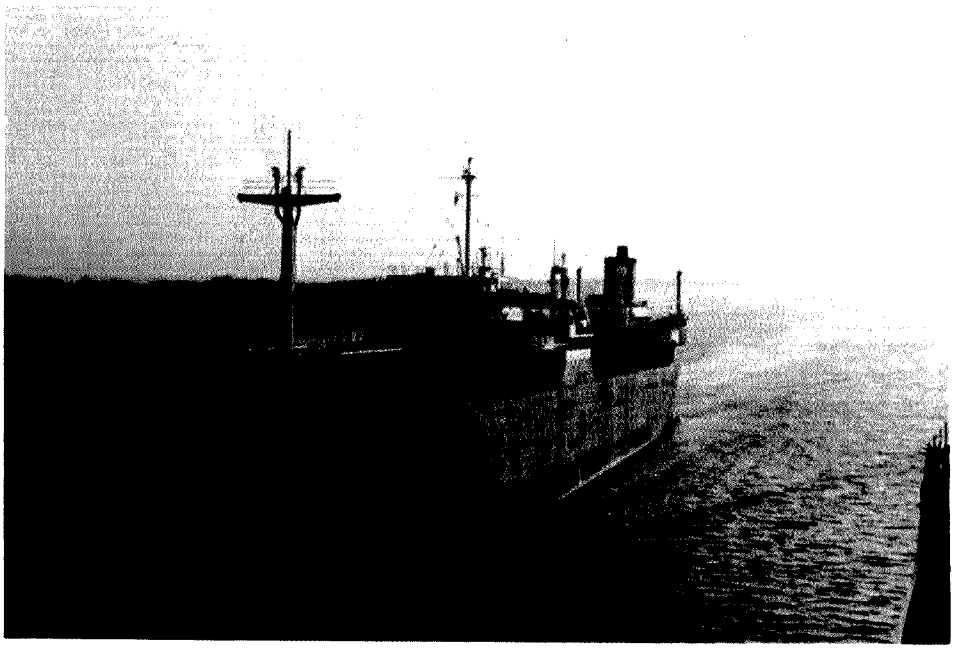
Grandma Packs a Seabag

—lady ham takes to the high seas

When Scottsdale's Lodi Yarbrough AC7V tossed her seabag over the rail of the SS Cove *Communicator* in September, 1980, she sailed as the only lady radio officer in the nation's three major maritime radio unions. And she just might be the only brass-pounding grandma on the high seas.

Lodi is the diminutive YL of Dr. Carl Yarbrough WB7DYC, Scottsdale dermatologist. Her delicate fingers once roamed the keyboard of a Steinway, demonstrating piano technique to hopeful pianists, but now she's known as "Sparkette" on the maritime frequencies.

Lodi's saga in radio began five years ago when she bought Carl a CB radio to brighten his drives from their eagle's-nest home high up on Mummy Mountain to his office in Scottsdale. Fortunately for both Carl and Lodi, there was such a plethora of activity on the CB bands that the good doctor was driven to thinking about ham radio in the hope of establishing a place for himself in that larger sphere. And that's where Lodi got into the act. Early in 1976 she signed up for a Novice radio operator's course in the Scottsdale Educational Enrichment Service.



The American-flag SS Cove Communicator.

"I just had to get involved," Lodi said. "Carl had been a radioman in the Navy in World War II, and I knew when he began talking ham radio with such enthusiasm that there had to be a place in it for me."

Lodi asked Carl to help her learn the code, and he was delighted to do it.

"She was so determined to learn the code that she had me drumming it out with my fingers wherever we might be," Carl said. "Sometimes people around us thought we were a little crazy."

Carl studied Lodi's textbooks, and he and Lodi got their Novice tickets to operate with code in May of 1976. By midsummer, the pair had learned enough

about ham radio to get Advanced licenses, and they began broadcasting with voice from their Mummy Mountain home overlooking Paradise Valley. "That was really great," Lodi said. "We began meeting so many wonderful people on the air."

Lodi and Carl continued studying radio theory, and in September of 1976, Lodi flew to Los Angeles for her amateur Extra license test. There she received her first setback. She laughed about it later. "I was so nervous," Lodi said, "that I couldn't hit the paper with my pencil. I failed the code test."

However, the Scottsdale Radio Club, which Lodi and Carl had joined, showed their faith in Lodi by electing her club president.

"They showed me that it didn't matter that I had failed the test," Lodi said. "That helped."

And then Tom Moore W7FCQ, station manager at Barry Goldwater's Military Affiliate Radio Station, gave Lodi's confidence a further boost by inviting her to become a volunteer operator handling "morale builder" messages for service people in the Pacific. Lodi accepted and donated her time for the next four years.

In November and December of 1976, *73 Magazine* published the "See The World And Get Paid" article by Gerald Hargett, and the idea of doing exactly what the title suggested took root in Lodi's mind. She read and reread the two-part article, carefully stowing away in her mind the methods of getting a radio officer's ticket.

Meanwhile, Lodi kept studying for her amateur Extra license and got it in September of 1977. That's when the Hargett article really began to have an effect. Lodi decided that she had to have an FCC radiotelegraph license, so she began studying for it. The idea of sailing as a radio officer had captivated her imagination.

By 1978, Lodi was getting confident about getting her commercial license, and when she took a Caribbean cruise that summer she took her radio books along so that she could top off her studying. "It was so calm and peaceful at sea that I had a great chance to study radio," Lodi said, "and I did plenty of that."

Several months after the cruise ended, Lodi passed her commercial test. The Federal Communications Commission examiner asked her which ship she was going to sail on.

"None, yet," Lodi told him. "I might just use my license for wallpaper."

But the spirit of sailing and the challenge of maritime radio operating had become Lodi's goal, and it wasn't long before she was checking on maritime unions. "I located not the oldest or the biggest but the best one, and I joined it," Lodi said. "Then the union went to work to find a job for me."

Cove Shipping, Inc., of New York City was the lucky winner of Lodi's radio services. The MEBA/AMO District 2 union (Marine Engineers Beneficial Association/American Maritime Officer) arranged for her to sign onto the tanker *SS Cove Communicator* as apprentice radio officer.

Lodi's whole family caught the spirit of adventure from Lodi, and they supported her going to sea. But when Lodi's November, 1979, departure was imminent, her mother threw out the anchor. Like a good mother-in-law, her visions of Lodi's husband, Carl, without a wife were more than she could bear. "What about poor Carl?" she demanded of Lodi.

"I had signed on for six months," Lodi said, "and

Lodi poses at Krupp navigational radar on bridge of SS Cove Communicator. *The Captain and mates normally operate the radar to keep watch on sea around for other vessels. Lodi checks the circuitry if the Krupp goes out.*

Mother thought I'd be out to sea for the whole time."

Lodi explained to her mother that she would be in and out of port, and once a month she would fly home to visit Carl, or he could catch a flight to wherever she was, and they would be together for the two to four days it would take to load the ship with oil or to unload it. "Mother decided that it would be all right for me to go," Lodi said.

When Lodi boarded the *Cove Communicator* for her first assignment, she found that all of the crew members with the exception of the captain and the radio officer were in their twenties.

"I quickly became Mama to the whole crew," Lodi said. "But before they considered me a full-fledged crew member, they waited to see if I could climb the ship's ladder with a big carton of Coke and other supplies under my arms."

Somehow, Lodi made it up the ladder, and when she reached the top the whole crew cheered and said, "Now, Lodi, you are part of the crew!"

Like Gerald Hargett, Lodi has high praise for the radio officer's job. "It's a better job even than the captain's," Lodi said. She explained that she is on duty from eight to twelve, three to five, and six to eight. All the rest of the time is her own. "I'm off duty in port and can sightsee or do anything I want to do," she said.

Lodi got her six-months' endorsement in June of

1980 and was then qualified to sail as first radio officer. As an officer, she eats at the captain's table, gets her fourteen-by-twenty-foot cabin cleaned and her bed made, and she gets her sheets and towels washed.

"But I still have to do my personal laundry," Lodi said, "and in an old hand-wringer washer at that."

When Lodi goes on duty, her first job is to tune up all of the radio equipment. Then she gets a time check from the National Bureau of Standards radio station, WWV, at Fort Collins, Colorado, and pipes it up to the bridge for the captain. During her watch, Lodi must record one message heard on the 500-kHz frequency every fifteen minutes. She also gets weather reports from coastal stations and listens for three minutes every half hour for emergency signals from ships in distress.

"I've heard two relayed SOSs from stricken ships and one triple-X emergency signal from a burning ship," Lodi said.

Besides her radio duties, Lodi does all of the clerical work for the captain, signs all hands on and off the ship, and makes up the payroll for the thirty-man crew. One of her most appreciated duties is radioing in for the eight to ten movies that the crew gets to watch every month.

"They're usually movies that I've seen ashore," Lodi said, "but the crew enjoys them."

Once when the ship docked at New Orleans, Carl flew in with a new Atlas 210X amateur radio for Lodi to use aboard ship. Lodi asked Captain Dillon, master at the time, if she could install it on the ship so that she could talk to her husband back in Arizona every day. The captain gave his permission, and Lodi and Carl promptly hooked up the Atlas and installed a vertical antenna on the bridge.

"Lodi comes booming into the valley every noon and evening," Carl said, "and I go home every day to talk to her. It sure helps to beat that lonesomeness."

Life at sea does not require Lodi to wear a special uniform as sailors do in the Navy or on pleasure cruisers. "The men wear regular work clothes, and I wear a blouse and slacks because of all the ladders we have to climb," Lodi said. "I take short-sleeve blouses for Florida and the Gulf coasts and long-sleeve blouses for the New England waters. I've got so many winter clothes aboard that you wouldn't believe it. Even thermal underwear."

"We go from the tropics to the freezing north in five days," Lodi said, "but everybody comes prepared, and there are very few illnesses at sea."

Lodi describes the food aboard the tanker as good but nothing fancy. "We have wine on the table only at special times like Christmas," she said.

On her first journey, Lodi found her hair curlers and clothes iron to be superfluous, so she sent them home. "It was impossible with the wind and bad weather to keep my hair set and my clothes pressed, so I wear a scarf over my head and wear my clothes as they come out of the dryer," she said.

A big event on board the ship is "slop chest," according to Lodi. Once a week after fire drill and abandon-ship drill, the captain opens a locker near the radio room and sells cigarettes, candy, and personal things.

"The first time I went to 'slop chest' I stood in line and when I got to the captain I asked for lipstick and perfume," Lodi said. "The captain looked a little shocked and said, 'That's the first time I've had a request for those things.' I told him times were changing, and he'd better get them in!"

Lodi had high hopes that there would be some feminine touches added to the *Cove Communicator*, but when she got back on board for her second assignment in September of 1980, the slop chest still didn't carry a stock of perfume and lipstick.

"I may have to wait for that until we get a woman master on the ship," Lodi said, "and that may not be long in coming." Lodi said that the wife of the owner of the Pointe Shipping Company has offered a $10,000 bonus to the first woman who gets a master's license, and there are several in training for the position now.

Lodi describes her quarters on the *Communicator* as plain but rather large, much roomier than cabins on luxury liners. Besides a table for her ham radio, she has a chair, a sofa, and a cot that is bolted to both the floor and a ship's bulkhead. She found out in a storm off Cape Hatteras why the cot was bolted down.

"We hit force ten winds—near hurricane strength," she said. "They rocked the ship so violently that I was thrown right over backwards with my chair in the radio room." At night, Lodi stacked pillows against the rails on her bed to prevent getting thrown against them. She said the wind blew the windows right out of the bridge on another ship, but the Cove *Communicator* was able to take on seawater ballast and was low enough to weather the storm without damage.

"It always rains at mealtime," Lodi said, "and even going to the mess hall can be a wild experience during a storm." She explained that the radio room is in the center of the ship and the mess hall is a hundred yards away, back by the fantail.

"You have to hang onto anything you can when there's a storm and you want to go to eat," she said.

Lodi keeps a careful log of her sailing experiences. It tells of the time the ship struck something in the Mississippi River and tore a hole in the bow, requiring an eleven-day delay while waiting for repairs.

Probably the most dangerous experience Lodi had was when the hold of the ship filled up with fumes when an exhaust valve failed to work.

"The chief mate went down into the hold with an oxygen mask on, and the others worked on the valve from up above," Lodi said. "The men eventually were able to clear the hold of fumes."

One of Lodi's favorite notes in her log is dated December 25, 1979. She was stuck in port in Port Arthur, Texas, and couldn't get back to Arizona to spend Christmas with Carl.

"I couldn't even contact him on ham radio," Lodi said, "but I luckily hooked up with Tom Hoff WA7MAL in Cheyenne, Wyoming, and he patched me in with Carl. Without that, it would have been a mighty lonely Christmas."

Carl agrees. "We certainly appreciated that phone patch, and do you know," he said, "WA7MAL felt so good about putting us together that he never even sent us a bill for the long distance call."

When Lodi got her six-months' endorsement in June of 1980, she thought of shipping out on one of the Cove Company's supertankers. She thought it would be fun for Carl to go along on a cruise, since each officer can take a spouse along occasionally.

"But I talked to crew members on the supertankers," Lodi said, "And they

told me the crew's quarters are right back by the three big engines that drive the ship, and the vibration is so bad that cups and saucers jump all over the table."

When the time came for Lodi to go out as first radio officer and the call came for her to rejoin the crew of the *Cove Communicator*, Lodi was happy. "It was like going back to an old friend," she said.

Lodi expressed a bit of trepidation about going to sea for the first time as chief radio officer, but her operating experiences and her five years of dedicated study paid off. She handled the usual operating and maintenance duties with no trouble.

"I had to call for a technician a couple of times in port," Lodi said, "but even the old-timers do that. Anyway, I had isolated the problems for the repairmen."

Once, during a hurricane, the VHF antenna broke in two and Lodi had to fix it. "I just grabbed a long extension cord," Lodi said, "and I climbed up and soldered it together again. It worked fine."

Back in Arizona, Carl had decided that he and Lodi wouldn't spend another Christmas apart, so he flew to New Orleans on December 18 and went aboard the *Communicator* as Lodi's guest for a voyage up the eastern seaboard. "The crew accepts Lodi as one of their own," Carl observed, "but the guys still watch their language for 'Sparkette.' "

Carl said that the funniest things that happen to Lodi aboard ship are caused by the responses of shore people who expect the radio officer to be a man. Once when Lodi and Carl were together on the *Communicator*, Captain Hiram Glotfelter greeted a pilot officer in their presence and introduced him to "Radio Officer Yarbrough." The pilot thought the captain meant Carl and turned to shake his hand.

"Oh, no," said the captain to the discomfiture of the pilot, "I mean the lady."

Another time, the captain sent an ITT (International Telephone and Telegraph) inspector to the lounge to look for the radio officer, and he walked right past Lodi. He went back to the bridge and reported to the captain that there was nobody in the lounge but some woman.

"Then you're going to have to go right back to the lounge," said the captain. "That woman is the radio officer."

Another ITT inspector was sent to Lodi's cabin looking for the radio officer and found Lodi drying polish on her nails.

"Oh, pardon me," said the wide-eyed inspector. "I was looking for the radio officer."

"I'm the radio officer," Lodi said, "and if you don't mind waiting until I've dried my nails, I'll talk to you."

"I've waited for a lot of things," said the inspector, smiling, "but this is the first time I've had to wait for that."

Recently, Lodi talked to the radio officer of the SS *Williamsburg*, the ship that rescued the passengers and crew of the *Prinsendom* in the Gulf of Alaska, and the man called Lodi "old man" in customary ham parlance. Lodi quickly informed him that she was a YL. The surprised operator said he didn't know there were any YLs in the big maritime radio unions and asked Lodi to meet him on forty meters for a QSO after going off watch. Lodi agreed, but when it came time for the QSO, her rig wouldn't tune on her trap antenna, and she had to sit and read the mail while the *Williamsburg* operator came on the air and called her and finally hooked up with some other hams and told them about the YL radio officer on the *Cove Communicator*.

Ex-Navy radioman and now Scottsdale dermatologist Dr. Carl Yarbrough hurries home at lunch time to work Lodi when she is out to sea. He says WB7DYC gets mighty lonesome for petite AC7V when she is riding the high seas as a radio officer.

Forms of recreation are scarce on board a tanker, Lodi said. Besides watching movies, the crew reads a lot of good books and shares them with each other. The big social event is off-duty officers getting together in the officers' lounge in the evening to pop popcorn and talk.

"We like so much to eat popcorn out at sea," Lodi said, "that when we come into a port, we sometimes walk for miles to find a store to replenish our stock."

The only time the crew can pick up television programs is when the ship is running north close to the Florida coast, which isn't very often. "Sometimes we're out so far for so long without seeing anything that when a bird comes along, it's a positive delight," Lodi said.

In early January, a banded pigeon came aboard the *Communicator* off the coast of Florida and made three trips from the Gulf ports to New England as the pet of the crew.

"It was really something," said Lodi, "to see those big, burly seamen vying with each other to pluck the pigeon off the fantail and take it into their cabins for the night. They even walked into town from the ports to buy it bird food."

Last year at Christmas time, the *Cove Communica-*

tor was stuck in bad weather at the Staten Island anchorage. The weather was so miserably cold and windy that the motor launches quit running crews to shore or back to their ships. Gales swept the area, and half of the *Communicator's* crew couldn't get back on board for Christmas dinner. But Lodi and Carl were together. Carl had brought Lodi a large case full of radio repair tools, and the ship had been decorated for Christmas.

"They even had a tree in the officers' lounge," Carl said.

While the storm raged around them, Lodi and Carl enjoyed Christmas dinner with those of the crew who had beaten the storm back to the ship. The next day the winds abated, and Carl was able to get ashore and catch a plane back to Phoenix. Lodi, on the *Cove Communicator*, headed for the Hudson River.

"It had been a lousy winter in the East," Lodi said, "so rough and cold. We went up the Hudson all the way to Albany, breaking ice all the way."

Lodi stayed aboard the *Cove Communicator* until late in January, and then she flew home for a four-month vacation in the Arizona sun. When her stay ends and she says goodbye to Carl and her mother and to her children and grandchildren, she'll go back to sea again on a tanker as radio officer, but now she's got her eye on another goal.

"I'd like to get more into troubleshooting," Lodi said. "The time is coming when the radio officer will be the electronics officer and be responsible for all of the electronics equipment on the ship. I'm going to be ready when that time comes."■

SOCIAL EVENTS

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will be available. Talk-in on 147.66/.06 (WB3JOE) or 146.52. For further information, call Don Schuenemann WB3AYT at (215)-822-9076.

AUSTIN TX
AUG 14-16

The Austin Amateur Radio Club and the Austin Repeater Organization will hold the ARRL-approved VHF '81, a combination state convention of the Texas VHF FM Society and the second annual Super Central Texas Swapfest, on August 14-16, 1981, at the Hilton Inn, Austin TX. Registration is $5.00 in advance (August 1st deadline) or $6.00 at the door. Tickets are good for technical sessions, seminars, the swapfest, and more (all indoors and air-conditioned). Other features include the hidden transmitter hunt, the Saturday night boat ride, and the Texas barbecue dinner, prizes, an ARRL forum, and dealers. Talk-in on 146.19/.79. For additional information, contact VHF '81, PO Box 13473, Capitol Station, Austin TX 78711.

OAKLAND NJ
AUG 15

The Ramapo Mountain Amateur Radio Club (WA2SNA) will hold its 5th annual flea market on August 15, 1981, at the American Legion Hall, 65 Oak Street, Oakland NJ, only 20 miles from the GW Bridge. Admission is $1.00; YLs and harmonics will be admitted free. Indoor tables are $6.50 and tailgating is $3.00. Door prizes will be awarded and refreshments will be available. Talk-in on 147.49/146.49 and 146.52. For more information, contact Walt Zierenberg WD2AAI, 344 Union Avenue, Bloomingdale NJ 07403, or phone (201)-838-7565.

TACOMA WA
AUG 15-16

The Radio Club of Tacoma will hold its annual Hamfair on August 15-16, 1981, at Pacific Lutheran University in Tacoma, WA. Featured will be many outstanding technical seminars, games and contests for all members of the family, a large flea market and commercial display area, dinner and after-dinner entertainment, and valuable door prizes. Trailer parking and lodging are available. For more details, contact Eva Anderson WB7QNS, 517 Berkeley Avenue West, Tacoma WA 98466, or phone (206)-564-8347.

MARYSVILLE OH
AUG 22-23

The Union County Amateur Radio Club will hold its fifth annual Hamfest-81 on August 22-23, 1981, at the Union County Fairgrounds, Marysville (near Columbus) OH. Gates open until Sunday at 4:00 pm. Admission is $2.00 in advance and $3.00 at the gate. Children will be admitted free. Featured on Saturday night will be movies, popcorn, round and square dancing to a live band, and overnight camping with hookups, all free. Food will be available all night with a big country breakfast starting at 3:00 am. On Sunday there will be forums, door prizes, and meetings. There will be no extra charge for sellers at the flea market which opens at 4:00 pm on Saturday and 6:00 am on Sunday. Talk-in on 147.99/.39 and .52. For more information, write Union County Amateur Radio Club, 13613 US 36, Marysville OH 43040.

WENTZVILLE MO
AUG 23

The Saint Charles Amateur Radio Club, Inc., will hold Hamfest '81 on August 23, 1981, at the Wentzville Community Center, West Main Street, Wentzville MO. Advance tickets are $1.00 each or 4 for $3.00; at the door tickets are $1.50 each or 4 for $5.00. Parking is $1.00 per car (no camping on hamfest site). Featured will be a reserved flea market for amateurs, a free general flea market area, free bingo, a cake walk, refreshments, and prizes (including a first prize of a Kenwood TS-130S transceiver). Free doughnuts and coffee will be available to the early birds. Talk-in on .07/.67 and .52. For information on motels, tickets, displays, prize lists, camping, etc., write Bill Graham WB0ZEH, 215 Bermuda, O'Fallon MO 63366.

BLUEFIELD WV
AUG 23

The East River Amateur Radio Club, Inc., will hold the Bluefield Hamfest '81 on Sunday, August 23, 1981, at the Brushfork Armory/Civic Center located on US 52, one mile north of Bluefield WV. Admission is $2.00 in advance and $3.00 at the gate, and includes a prize ticket. Tailgaters are $2.00 each and tables are $5.00 each (3 or more are $4.00 each). There will be food, dealers, a flea market, forums, and entertainment. Talk-in on .89/.49 and .52/.52. For more information, write Bluefield Hamfest '81, 2113 Hemlock Hill, Bluefield WV 24701.

TIOGA COUNTY PA
AUG 29

The Tioga County Amateur Radio Club will hold its 5th annual hamfest on Saturday, August 29, 1981, from 8:00 am to 4:00 pm, at the Tioga County Fairgrounds just off Rte. 6, between Wellsboro and Mansfield PA. There will be a free outdoor flea market and inside space will be available. Registration is $3.00. Features will include prizes, demonstrations, and food. Pennsylvania's Grand Canyon is nearby. Talk-in on 146.19/.79 and .52. For more information, write PO Box 56, Mansfield PA 16933.

SEWELL NJ
AUG 30

The Gloucester County Amateur Radio Club will hold the GCARC Hamfest on August 30, 1981, from 8:00 am to 3:00 pm (7:00 am for tailgaters and dealers) at the Gloucester County College, Tanyard Road, Sewell NJ. Admission is $2.00 in advance and $2.50 at the door. Tailgaters' and dealers' charge is $6.00 (which includes one free admission). Refreshments and free parking will be available. Features will include seminars, prizes, contests, and speakers Dale Smith, from the ARRL, and Miles (Brownie) Brown W2PAU, an RCA antenna expert. FCC exams will be given from Tech through Advanced. Talk-in on 146.52 and 147.78/.18. For more information and reservations, send an SASE to GCARC Hamfest Committee, PO Box 370, Pitman NJ 08071, or phone (609)-456-0500 or (609)-338-4841 days or (609)-629-2064 evenings.

LA PORTE IN
AUG 30

The La Porte and Michigan City Amateur Radio Clubs will hold their annual La Porte County Hamfest on Sunday, August 30, 1981, rain or shine, at the County Fairgrounds on Highway 2, west of La Porte IN (50 miles SE of Chicago). There will be an outdoor paved flea market area, indoor tables at $1.00 each, a satellite TV demonstration, and overnight trailer parking for early birds. Advance tickets are $2.00. For reservations or information, send an SASE to PO Box 30, La Porte IN 46350.

GEORGETOWN IL
SEP 5-6

The Illiana Repeater System will hold the 12th annual Danville Area Hamfest on September 5-6, 1981, at the Georgetown Fairgrounds, Georgetown IL. The gates will open at 6:30 am. Tickets are $1.50 in advance and $2.00 at the gate. There will be a flea market, forums, family entertainment, many prizes (including a Santec synthesized hand-held), and free parking. Talk-in on 146.22/.82 and 146.52. For more information or advance tickets, contact Lowell Wells WD9AFG, Hamfest Chairman, RR 3, Box 215, Danville IL 61832, or phone (217)-759-7560.

AUGUSTA NJ
SEP 12

The Sussex County Amateur Radio Club will hold its third annual SCARC '81 hamfest on Saturday, September 12, 1981, from 8:00 am to 3:00 pm at the Sussex County Farm and Horse Show grounds, Plains Road off Rte. 206, Augusta NJ. Pre-registration for outdoor flea-market sellers is $4.00; at the gate, $5.00. Pre-registration for indoor flea-market sellers is $5.00; at the gate, $6.00. Other registration is $2.00. There will be door prizes and plenty of free parking. Talk-in on 147.90/.30 and 146.52. For additional information or pre-registration, write Sussex County Amateur Radio Club, PO Box 11, Newton NJ 07860, or Lloyd Buchholtz WA2LHX, 10 Black Oak Drive, Vernon NJ 07462.

TS-130S *from page 39*

commodate either mono or stereo headphones. Transmit audio was good with the three microphones we tried—a D-104, a Shure 444D, and a Yaesu hand microphone.

Kenwood deserves praise for the quality of the 130S instruction manual. Lots of practical information is provided on installation and use, for mobile as well as fixed operation. As is typical with Kenwood products, no service and alignment procedures are included in the instructions; you'll have to buy a separate service manual for that information. For emergency repairs by those hams brave enough to work on the 130S themselves (see interior photographs), complete schematics and a block diagram are included with the rig.

On the Road!

While the 130S is perfectly at home on the ham shack bench, it really comes into its own when installed in a vehicle. I operated it for several weeks from my car and grew very fond of it in that mode of operation. I sat it on the front seat beside me and ran the power lead directly to the battery. It draws too much current to use with my noise filter, and I was pleasantly surprised when I didn't hear the alternator whine I hear with other rigs that aren't connected through the filter. One feature that I found indispensable in mobile use was the speech processor—it can make a real difference on the other end of the QSO. With the processor on or off, adjusting the mic gain for the proper level using the ALC meter is a simple task. The ballistics of the meter allow sure and fast reading. The mic gain should be readjusted when the processor is turned on or off. The noise blanker did an excellent job of cleaning up ignition noise and I left it on all the time.

A characteristic that I found less than admirable was the limited bandspread of the main vfo knob. Tuning in a signal while jouncing down the road is a challenge—one flick of the knob and you've jumped ten kHz! I eventually learned how to handle the knob with reasonable dexterity, but bandspread is an area in which the 130S could use improvement. Whatever one thinks of the bandspread, it is important to note that frequency stability is not a problem—the rig occasionally became airborne when my driving got, ah, shall we say, over-enthusiastic, but the frequency never drifted.

If the poor bandspread really gets to you, it might help to know that Kenwood offers a nice digital frequency controller that allows tuning of the rig from push-buttons on the microphone.

The real test of the transceiver came on the yearly pilgrimage to the Dayton Hamvention in the infamous *73 Magazine* S-100 van. We installed the 130S on a countertop in the back of the van, connected up a D-104 microphone, and used a Hustler mobile antenna to distribute the rf. The 130S did everything it was supposed to and more, shrugging off a couple of nasty spills onto the floor of the van, a fall of about three feet! A solar disturbance prohibited us from working any DX that weekend, but stations all over the United States were worked, mostly on forty meters.

Conclusions

Considering the price and performance of the 130S, it represents an excellent buy for either fixed or mobile operation. It faces a lot of competition in the small transceiver market, but the current crop of rigs is so varied in concept that each has its own devoted following. If ease of operation, good audio, and a wide range of accessories strike your fancy, the TS-130S might be the rig for you!

For further information, contact *Trio-Kenwood Communications, Inc., 111 West Walnut, Compton CA 90220.* ■

Mark 3CR *from page 46*

Inside, the circuitry has the deceptive aura of simplicity that often accompanies microprocessor-controlled hardware. A couple of glass-epoxy circuit boards take care of all control functions. One handles audio processing such as gating, level adjustments, DTMF decoding, and autopatch phone-line interfacing, and the other is essentially a single-board 6502 computer that performs all the I/O functions for the repeater and any external devices added by the user. A third circuit board contains the front-panel status LEDs and their drivers. The receiver and transmitter boards are housed in separate, fully-shielded cabinets. There is space for an optional receiver on 220 or 440 MHz to be used for control commands to the microprocessor controller.

Selection of Functions

Virtually all commands and functions are selected with a three-digit DTMF code. There are a total of 36 different codes that the controller is programmed to recognize. For security, these codes can be changed instantly by flipping a set of switches inside the repeater. How the controller receives this code is up to its owner. You can use a command receiver, a phone line, or the repeater input for control commands. Using the input frequency is discouraged due to the wild-turkey bonanza this would provide, and is illegal in any case. Flipping the command switch on the front panel removes the ca-

pability of repeater control on the input frequency for all but a select few user commands, such as autopatch access and hangup, and autodial numbers. All other command codes will only be recognized by the controller if they come from the command receiver or the phone line. When a command is received via the control link, it is acknowledged with RRR in Morse the next time the repeater is keyed. This can be a little confusing to users, who inevitably will hear an RRR from time to time in the middle of a conversation.

Basic Features

The basic operating parameters of the Mark 3CR are similar to other repeaters, with some interesting twists. There is a beep at the end of each transmission to let you know when the time-out timer is reset. This timer can be set in 30-second increments from 30 seconds to three minutes via the control link. If a user doesn't wait for the beep before transmitting, he runs the risk of timing out the repeater. If this occurs, the machine will ID and send a CW message such as "beer" or "time" when it comes back on again. There is a timer-reset code that allows users to reset the repeater without waiting for it to recycle.

Any of three preprogrammed CW tail messages can be sent on the repeater tail at the end of each transmission. Oft-chosen messages are Net, 73, and Meet. These messages are enabled and disabled via the control link.

One of the nicest features of the Mark 3CR is its anti-kerchunk system. The controller looks at transmission time and recent repeater activity, and if it decides that there is a pattern of extremely short transmissions, it inhibits the transmitter until a signal remains on for a longer period of time. In practice, this system is extremely effective at discouraging all but the most malicious of kerchunkers, without imposing any inconvenience on other users. It's one of the most effective systems I have seen.

Tones and More Tones!

In a repeater so dependent on DTMF tones, it is important to have a trustworthy decoder. There are two six-pole active filters for high-group and low-group tone conditioning, and the output of these goes to a Mostek MK5102 digital tone decoder. The decoding system is extremely fast and reliable, at the expense of tolerance of improperly-adjusted tone pads. If a user's tone level is set too high, the repeater will not accept his tones. To aid users in adjusting their pads, a clever test sequence is included in the Mark 3CR controller. You send either a row or a column of tones in sequences, and if the level of each tone is correct, the repeater replies with OK in Morse. If the tones are off frequency or incorrect in amplitude, it doesn't do anything. This facilitates adjustment of even the most primitive tone pads.

All the circuitry for autopatch operation is included in the Mark 3CR—just connect the patch to a phone line. It can be configured to operate with either pulse or touchtone™ systems. At present, the patch is not FCC-registered, so if your group is picky about the letter of the law, you'll want to get a Ma Bell approved coupler. Practically speaking, the patch is optically coupled to the phone line, so you're unlikely to encounter any problems with Ma's minions—they can't sense the presence of the patch on the line.

Numbers dialed with the standard autopatch access code can only have seven digits and cannot start with zero or one. A special long-distance access code can be sent via the control link to permit long-distance calls. Five autodial numbers may be preprogrammed, each with its own access code. These autodial numbers may be accessed even when the normal autopatch function is inhibited, allowing emergency access to police, fire, etc., when no control operator is available.

Reverse autopatch is possible, and the procedure is complicated enough to discourage abuse. It would be very difficult for an unauthorized person to "break" the system. It operates like this: When an incoming call is received on the autopatch line, the processor connects the call after about five rings. The caller must enter the reverse autopatch code within five seconds, or the connection will be terminated. If the code is entered correctly, the repeater will transmit a series of Morse Ts. Importantly, the repeater's transmitter will not be activated at all without the correct code. If a user listening to the repeater decides to answer the call, he can enter the usual autopatch code and the call will then proceed as a normal autopatch. It's debatable, of course, but as long as the autopatch phone number and access codes are carefully protected, I'd say that this procedure probably meets the FCC criteria for screening before a reverse patch takes place. The chances of anyone calling your repeater's number and guessing the correct code within five seconds without making a mistake are statistically improbable. Being extremely selective about who gets the code (only hams?) constitutes screening, in my humble opinion. Should someone ever abuse the reverse-autopatch privilege, you can always change the code or disconnect the patch. The FCC may hold a different opinion, however, so you are on your own. If in doubt, don't use the reverse autopatch feature!

The Good Stuff

While the basic operating parameters are almost airtight and very pleasant to have available, things really get exciting when you start using the command and user functions. The Mark 3CR repeater was designed to allow very easy interfacing with external devices. Remember those terminals on the back panel? Here's where they come in!

There are two classes of user functions—those which keep the transmitter on all the time (class I) and those which don't (class II). There are seven class I outputs and four class II outputs. Nominal time-out limits are three minutes for class I and ten minutes for class II outputs. To round out the package, there are three outputs that are enabled and disabled through the control link. How do you use 'em? Simple! Each of the 14 outputs is assigned to a terminal on the rear panel, and each output is enabled by a three-digit DTMF tone. When the controller receives the correct code, the terminal changes state from low to open circuit. The logic outputs are buffered with high-voltage open-collector buffers that can sink up to 30 mA. External pull-up resistors are used to pull the output high. All of you who have suffered long hours with a hot soldering iron and a crate of TTL chips putting together multi-digit tone decoders will understand the value of having the in-

terfaces already in place, ready to go. Link receivers, crossband receivers and transmitters, amplifiers, directional antennas, recordings, all can be added with very little effort and an extremely low external parts count.

An example: Suppose you want to add a tape recording to welcome new users to the repeater. An old eight-track or continuous-loop cassette player takes care of the hardware. Recording the message will be your hardest task! The audio output from the player goes into the auxiliary audio input on the back of the repeater and the control terminal activates a relay to turn the tape drive on and off. Publish the access code for that particular function and you'll be in the "taped-welcome" business! When you grasp the fact that the repeater is capable of supporting fourteen external devices with very little effort involved in interfacing them, you will understand what all the excitement is about.

With all these capabilities, it seems like a terrible waste to put a machine with these capabilities on two meters. I feel like the car buff who is mortified by the Hollywood starlet who uses a Maserati to drive to the supermarket! It would be fitting to put the repeater on 220 or 450 where it could be used in a remote-base configuration with links to 10 FM, a multi-channel 2m rig, and all the other bells and whistles that the spoilers at the FCC won't let us have on two meters. I guess that's one of the benefits of microprocessor technology —products can inexpensively have more flexibility than is really needed for a particular task.

Rf Section

The sophisticated control circuitry of the Mark 3CR threatens to steal the show, but the rf sections of the repeater deserve a fair share of attention. Both receiver and transmitter are conservatively designed, and acquit themselves handsomely at W2NSD/RPT. Special care was given to temperature stability in the transmitter, and immunity to overload and high adjacent-channel rejection in the receiver. Receiver and transmitter boards for 144 and 220 MHz are available. Interface cards to use the Mark 3C controller with GE Masterpro and Motorola Micor repeaters are available for all you old diehards who won't touch anything else.

Power Supply

The 7812 and 7805 regulators used in the power supply ensure that the controller will function correctly under wide ac line-voltage fluctuations. Both sides of the ac line are bypassed to ground with 470-pF, 2 kV caps. The optional 12-volt backup circuitry is highly recommended. Should the ac line voltage fall below an acceptable level, the backup battery is switched in instantly. When the backup supply is in use, a Morse "EP" is sent on the transmitter tail. Should the power ever fail completely with no backup available, a Morse "PF" will be sent on the tail when power is restored. These Morse messages will appear on the tail until removed by a control operator.

Conclusions

No ham product is as uniquely suited to microprocessor control as a repeater, and the flexibility of repeaters like the Mark 3CR is only limited by the imagination of its owners. Best of all, this flexibility is not at the expense of dependability, since the hardware in this controller has a lower parts count than many repeaters that offer only basic features. Its potential for remote-base operation promises to allow that type of setup to enjoy widespread popularity. Whether you use it as a basic local repeater on two or a remote base on 220 MHz, a Mark 3CR should give you or your group years of trouble-free enjoyment.

For more information, contact *Micro Control Specialties, 23 Elm Park, Groveland MA 01834*. Reader Service number 489.■

NCG-15 *from page 42*

midable task. I also had some reservations about hanging my life's savings under the dashboard of my car. After careful consideration, the Hustler antenna was consigned to the yawning void of the hamshack closet. With the NCG now available, all these problems were solved and it looked like I might be doing some mobiling after all!

With a war whoop that brought my faithful hound, Rufus, running, I made for the closet and extricated the Hustler antenna from the forest of aluminum that resides there. Rufus and I grabbed my power drill, some RG-8X, and the NCG, and headed outdoors for the car.

After a quick appraisal of the situation, I concluded that the operation's chances of success were encouraging. I already had a Kenwood TR-7600 2-meter rig screwed to the transmission hump of my Dodge Colt, so I simply placed four squares of 3M double-sided foam tape on top of the Kenwood, and stuck the NCG's bracket to that. If you have never used this tape, you owe it to yourself to try a sample. It has a grip that doesn't quit, yet it rarely leaves any residue when you remove it. I use it to stick radios and accessories together all the time, and even with rambunctious driving on New Hampshire's back roads, it has never come unstuck.

The power connection was a cinch, since I sort of expect this madness to strike from time to time, and I have installed a line from the battery that terminates with a small enclosure inside the car. The enclosure contains a hefty noise filter and a lot of terminal strips to accommodate future expansion of my rolling ham shack.

The antenna was another matter altogether. I suddenly recalled that one of the reasons this particular madness had never struck before was my lack of a mount for the Hustler antenna. Since mounts cost money and money was in short supply, it looked like I would either have to wait until payday or improvise. Rufus was much too excited about the project to put it off until payday, so I decided to improvise.

The rear bumper of the Colt offers a thick flat steel surface that is parallel with the road, and the underside of the surface is accessible. This looked promising! Back in the ham shack, I rifled through my parts drawers, and came up with some thick plastic washers with a raised lip on one side, a couple of lock-washers, a long 3/8-24 bolt, and a female-to-female 3/8-inch threaded collar. I measured the diameter of the washers as I walked back to the car, and promptly blasted a 1/2-inch hole in the bumper. I drilled another, much smaller hole next to the big one to provide a grounding point for the coax.

I used the two plastic

washers to make a sandwich out of the bumper, and then ran the long bolt through a lock-washer to which I attached the center conductor of the coax. The bolt went through the plastic washers and the bumper and the threaded collar was screwed securely onto that. I soldered the shield of the RG-8X to a lug, which was then bolted to the underside of the bumper through the small hole I had previously drilled. All that remained was to screw the antenna itself into the now-complete mount. Once it was in, I stood back and surveyed my work. As it turned out, I'm glad I didn't spring for a commercial ball-type bumper mount—this turned out much better!

I performed the usual series of mundane tests with ohmmeter and swr meter, and finally jumped in the car and grabbed the NCG's microphone with one hand and the vxo knob with the other, intent on some serious operating. W5XX in Mississippi was calling CQ. I called him and he came back immediately, reporting that although my signal strength was weak, the audio quality was good. That's just what I wanted to hear!

For the next several days, I operated whenever I had the chance; I had a lot of rewarding rag-chews, as well as some "59, good-bye" contacts. Some high points included VK4NIC/3X, C5ACA, PV8GG, M1C, and K4EIN/TI4, all with 6 Watts into the antenna, often while rolling down the road! When the DX wasn't rolling in, I had many enjoyable contacts with just about every corner of the US. The NCG provides an extremely high fun-per-Watt and -dollar ratio!

Features and Performance

If you've stuck with me this far, and haven't dropped the magazine in disgust to go fire up your three-kilowatt linear, you might be interested in learning some specifics about the NCG.

The front panel offers the traditional items; volume, squelch, rf gain, mic gain, S-meter, noise-blanker switch, Tx/Rx LEDs, high/low power selector, and an LED digital frequency readout with 5-kHz resolution. Only 5 kHz, you exclaim in dismay? Aye, earthling! The tuning system is unusual for an HF rig, bearing some resemblance to the system found on the Kenwood TR-7400 2-meter transceiver and similar rigs. Rotary switches select the 100-kHz and 10-kHz segments of the band and a push-button adds 5 kHz to the frequency you select. Fine tuning (plus or minus 8 kHz) is facilitated by the vxo knob next to the digital readout. What all this means is that while the radio covers the entire 15 meter band, it is inconvenient to scan from one band edge to the other as you would with a more traditional tuning arrangement. In practice, the tuning system is reasonably workable and you learn to manipulate the controls quickly. There is a sweep control that allows you to scan through the vxo range at a rapid rate but I found that control to be less than useful for my style of operating.

Once you learn to cope with the tuning system, everything else is straightforward. The single-conversion superhet receiver is competent, offering better-than-expected sensitivity, selectivity, and dynamic range for a transceiver in this price range. The agc has a tendency to pump on strong signals, an annoying effect which is easily cured by reducing the setting of the rf gain control. The noise blanker performs as expected, cleaning up a bit of ignition noise without noticeably altering the receiver's performance in any other respect. Audio output is about two Watts and the built-in speaker is perfectly usable, which comes as a pleasant surprise. Only one other rig that I've used in my car has not needed an external speaker for adequate performance!

The transmitter offers no surprises either. There is no provision for ALC metering, but the mic gain control is extremely forgiving, a fact proven to my own satisfaction when I listened at home while someone else operated the NCG from my car. Informal observations by myself and many others indicate that the rig's output is clean and the audio is good. The rig has provision for low-power operation with about three Watts output on voice peaks. Thanks but no thanks—six Watts is enough of a challenge for me! Those of you with monobanders at 70 feet or a penchant for self-abuse may find the low-power position exciting, but I religiously avoid it!

Conclusions

I found the NCG to be a very enjoyable transceiver to work with. For a beginner looking for an inexpensive way of getting on the air, or the mobile or QRP operator, the NCG-15 represents an outstanding value. True, it has a tuning system that only its mother could love, but where else can you get so much rig for so little money? I hope that rigs like this will begin to wean us from the "power trip" so many of us seem to be on. When we use high power to ride over the interference from other hams, rather than to compensate for poor propagation, it's time to rethink our operating habits. See you on 15-meter QRP!

For further information, contact *NCG Co., 1275 N. Grove Street, Anaheim CA 92806*. Reader Service number 477. ■

HAM HELP

Does anyone know anything about the technical operation of the ATC/Zenith "SAVVY" instrument? I will pay a finder's fee for the first good information.

Mike Reynolds W0KIE
3826 So. 92 E. Pl.
Tulsa OK 74145

I am in need of operating instructions and especially the schematic for a Royce CB, model I-636. The fine-tune control is causing some FMing when it is used for a swing of more than 4 kHz. Any comments would be welcomed. I will gladly pay for a copy of the operating instructions and schematic. Many thanks.

Herman H. Franke F0FXX
RAMC—AmEmbassy
APO New York 09777

Can anyone provide me with copies of schematics and/or operation manuals for an Elco model 324 signal generator and an Eico model 368 TV-FM sweep generator and marker? I'll pay copying costs and postage. Any info would be appreciated. Thank you.

Gene Smarte WB6TOV
RFD #1, Box 717
Hancock NH 03449

I am looking for instruction books or diagrams for a WRL Multi-Pak Model PSA-63A power supply and a WRL Meteor Model SB-175 transmitter. I will pay for copies or original manuals. Anyone needing Montana for a sked? Can do, on RTTY, CW, or SSB on 80-10 meters. (And thanks, *73*, for this service. I've been helped before and been able to help others.)

Neil Zimmerman W7MAF
1815-17th Ave. So.
Great Falls MT 59405

The Datong ASP Speech Processor

—will this give you a British accent?

R. Stanley Dicks W8YA
Department of English
Wheeling College
Wheeling WV 26003

Personally, I have never liked speech processors, and my on-the-air friends have tired of hearing me talk about how lousy they sound. I dislike them because almost everyone who uses one turns the gain up too much, thereby causing his signal to become wide and sloppy, and because most operators insist on leaving them on even when they're ragchewing with strong signals, making their audio sound as though it's coming from the bottom of a galvanized garbage can.

I have tried several processors and have never kept any of them. With the alc on my transmitter adjusted properly, processing didn't seem to help much unless the level was turned up so high that I got reports of a spread out, garbled-sounding signal. I resold all of them pretty quickly.

Datong's ASP.

Lately, though, the state of the art in audio processing has improved considerably. The crude diode-clipper-type compressors of years ago have been replaced with sophisticated circuitry using integrated circuits and considerably more filtering than the earlier circuits had. And, I have heard more and more signals on the air from operators who were using processing and whose audio still sounded OK. So, after deciding to give one of the new circuits a try, I went with the Datong ASP.

I chose the Datong unit for several reasons. Datong is a British company which has a somewhat unusual philosophy. In this era of mass-produced, often shoddily-constructed products, Datong believes in turning out quality equipment with some "extra" features. Their receiving audio filters are becoming known among DXers as the best on the market and they introduced a new one at Dayton in 1980 that is incredi-

ble—it's like having a tunable crystal filter. I have used one of their filters for a couple of years and I admired the quality of the components and the workmanship in it. The unit has performed quite well (see the review in the October, 1979, *73*) and it contains some unusually advanced, state-of-the-art circuitry. Because of all of this, the Datong ASP processor seemed to be a logical choice for a try. The results have not been disappointing.

The ASP is an rf clipping device; it has been proven fairly well that rf clipping can provide more average gain with less distortion than audio compression. The disadvantage with most clippers is that they have to be wired internally into the transmitter circuitry. Because they contain filtering circuitry at one of the transmitter's intermediate frequencies, they cannot be interchanged from one rig to another. The ASP unit, however, will work with any transmitter because the rf clipping is all done within the ASP itself.

The unit is hooked up, like audio processors, between the microphone and the mike input of the rig. The audio signal from the microphone goes into the ASP where it is first processed by a special audio processor circuit. The circuit is designed to maintain a constant peak-to-peak speech amplitude no matter how wide the variations in input levels. It also includes a five-second hang time, which means that once the circuit has adjusted itself to a certain input level, the background noise remains constant during speech pauses or loud transients. The circuit thus feeds a controlled, regulated audio signal to the rf clipper and also prevents the clipped, on-again, off-again background rush noise that many processors introduce. The processing in this circuit alone provides considerable enhancement of the audio, and it can be used by itself with no rf clipping simply by pushing a button on the unit's front panel. On-the-air reports indicate that my audio (from an Electrovoice EV-676 mike and a Drake TR-7) is fuller and has more "presence" when the unit is used in this position.

After being processed, the audio is converted into rf through an internal i-f mixer, after which it is fed into another rf stage where it is clipped. The level of clipping is variable in 6-dB increments from 0 dB to 30 dB. After being clipped, the signal is reconverted from rf to af and is then fed directly into the rig's audio input. Because the clipping is all done internally in the ASP, no connections to the transmitter rf circuitry are necessary; you merely plug the mike into the ASP and the ASP into the transmitter.

The ASP comes in an attractive two-tone grey, wrap-around metal cabinet, and shielding seems to be excellent. The only feedback problem I encountered, even while running a full kilowatt, was with a high swr and lots of rf in the shack while operating on 10 meters. The unit requires 6 to 16 V dc at 15 mA; mine is powered, along with several other devices, by a small 12-V dc supply. The front panel contains the mike input connector, push-button controls for on/off and for the clipping level, and three LEDs: one to indicate the unit is on and two to give the operator an indication of how the unit is functioning.

In operation, the unit is switched to the desired clipping level and is immediately operable. There are no gain controls because the unit automatically adjusts in input level from the mike such that just the right amount of af is supplied to the rf clipping section. There is a gain balance adjustment on the back of the unit so that its gain can be matched to the rig in use—this is a one-time, set-it-and-forget-it adjustment. It takes the unit about one second to "learn" the input level from the operator's voice and to adjust to it. Once this learning occurs, the unit "hangs" for about five seconds and keeps itself adjusted during speech pauses. It does this even if the mike push-to-talk button is lifted or the VOX relay drops to receive. If the input voice level is too low, an LED labeled "OK" lights up. If the input is too high, both LEDs light up. A third LED, labeled "SPEECH," follows the operator's voice pattern while speaking. If it stays on during pauses, the background noise is too high and the operator should move closer to the mike or should reposition the mike. I have been amazed at how accurately the three LEDs indicate what is going on with the unit; they tell the operator so much that a meter is hardly necessary.

The ASP has a couple more interesting features. There is a switch on the front panel which allows instant changing from low- to high-impedance microphone inputs, thus allowing for rapid comparison of various mikes. Also, the unit has a push-button labeled "TONE." When this button is depressed, a 700-Hz sine wave is fed into the rig, allowing for rig audio adjustment and even tune-up of the tank circuit.

All of these features add up to a unit that is extremely easy to operate. Usually, using the unit requires merely the pushing of one button and the operator can then forget about it. The operation of the unit is excellent also. On-the-air tests with friends indicate that the audio sounds beautiful in the 6-dB and 12-dB positions and that it then begins to get a little "fuzzy" in moving from 18 dB to 30 dB. Even at 30 dB, however, the signal does not broaden and distortion products are not generated in the transmitter. Compare this to most processors, where setting them at 30 dB, if they will even go that high, produces audio so distorted that it sounds like a tape recording of Custer's Last Stand.

When rag-chewing, I generally leave the unit in the 6-dB position, as my buddies say that they actually prefer it to my normal, unprocessed audio! When trying to bust through a pile-up or work weak stations, I switch to the 18-dB or 24-dB positions. From what I can tell, the unit gets me through pile-ups much faster than with unprocessed audio. I have never had a single report or complaint of "dirty" audio, no matter what setting the ASP has been in. I have to confess it—the ASP has converted me from an anti-processor person into one who will tolerate processing and even use it himself.

The Datong ASP is a top-quality af and rf speech processing device with many extra features. It is probably the fanciest unit on the market today and is also the most expensive ($229.95). It is certainly not meant for the casual operator. However, for serious DXers, weak-signal VHFers, contesters, or avid traffic handlers, the ASP is a unit which can provide a great many benefits.

The ASP is imported and marketed in the states by *AR Technical Products, Post Office Box 62, Birmingham MI 48012; (313)-644-5698*. Reader Service number 476.■

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 18

donned my regulator, tank, mask, fins, depth gauge, and my new Casio skin-diving watch... good to 100 meters. I'd picked that up in Tokyo for about $25. Not bad compared to the old Rolex I used to use, which now costs about $500. Spa-loosh, and I was over the side in about 50 feet of water. It was beautiful and worth all the trouble. I headed for the bottom and the coral-encrusted drop-off nearby... where the head wall dropped beyond sight.

I swam around taking pictures of the fish, the three other divers, the coral... having a fantastic time. I've been scuba diving for at least 25 years... all over the world... so this was blissful for me.

My depth gauge went to 75 feet... then to 85 feet. My watch was doing great at 75 feet... and was out of commission by 85 feet. Hey, Casio! What's this baloney? Without a watch one has a problem. With about 50 minutes of air one likes to keep track of time. It is very difficult when you run out of air at 85 feet and have to work back toward the surface trying to suck the tank through the regulator. And one really has no way to keep track of time under water without a watch. Your sense of time is lost in this slow-motion environment where you are weightless and can go anywhere in three dimensions at will. It's like flying.

With everything but the co-pilot seat filled, I got that choice seat. The hat was to keep my brains from frying in the sun... which is very hot down there.

Despite the rumor of hordes offering special prayers for disaster from somewhere in central Connecticut, all went well. I got a lot of fine pictures and emerged in euphoria.

Sherry was still a bright green. Chuck had been snorkeling (he hadn't been checked out for scuba yet). We headed back to the Inn... a long, long trip over a very bounding main.

Once ashore, Sherry recovered quickly and was ready for lunch when it was served a few minutes later. Hamburgers.

In the afternoon, Jeff made the mistake of going to the bathroom and I grabbed the rig, whipping off about a hundred contacts before he was able to wrest the mike from me again.

I was surprised and pleased to find that an old friend of mine had moved to Provo and was living there. Bob Cooper, the king of the satellite TV game, was there with his family, a big dish, and TV service for the island. Bob and his wife came over to the hotel and we had dinner with them, talking over old times. It was about 25 years ago I first visited him In California as K6EDX.

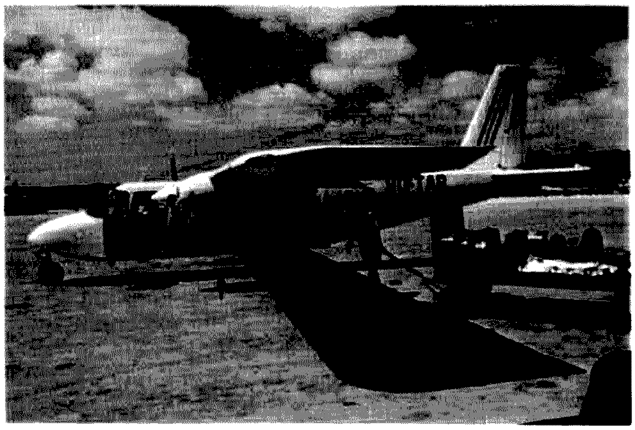
We arrived at Provo on Thursday evening... got our bags Friday evening. I went scuba diving Saturday and Sunday mornings... and got in about a thousand contest contacts from Chuck's station in his hotel room. This was about a couple hundred yards from the Third Turtle Inn... at the Latitude 22 (hotel). He had a wonderful location there, with lots of room for his traveling dipole antenna.

On Sunday afternoon we all (except Jeff, who was contesting) visited Bob's television setup. Formidable. He picks up the signals from the satellites, sends them on channel 7 to the only real hill on the island, and rebroadcasts them from there on channel 4, with a repeater station wich is entirely sun-powered. This provides TV for the island... which has a population of perhaps a thousand. Bob eventually will be charging for this service at around $12 per month/per user, which should keep him in the chips. That's one of the better aspects of a small island government system... it is flexible enough to be practical.

Jeff and Tim did very well in the contest. Jeff was operating at the last minutes and got a scare when his rig blew up just as the contest ended. He was just starting to get some scores from the others when a curl of smoke brought the news... and the rig gasped. The problem is that the rig was not designed for wide variations in power voltage... and a sudden surge wiped out the filter capacitors.

I've found that there are few smaller countries where the power does not go through unbelievable gyrations. I would strongly suggest that anyone going on a DXpedition put in higher voltage filter capacitors... ones which will withstand fast surges to 150 or more

This is the Piper which brought us to Provo from Grand Turk. Chuck brought his guitar... he's getting awfully good at bluegrass these days.



Turks and Caicos National Airlines is about to add our luggage to that of the other passengers... and the commercial cargo... and mail. They just barely were able to squeeze it all in.

line volts. Your rig should also perk at 95 volts, because that is all you're going to get at times. Tim swiped the filters from a second set (which went west during the contest, too, but not with filter troubles), and they were back on the air again... after a couple of hours. The next morning (Monday) Chuck and I went for a swim not far from the Inn, where we found some coral and I took more pictures. Then we had to pack and catch the TCNA plane from Provo (they had room this time, but just barely). By the time they had packed all of our rigs (Tim and Jeff were with us this trip), Chuck's guitar and rig, my suitcases of cameras, skin-diving gear, and other toys, the plane was so loaded the pilot was not sure it would be able to lift off.

We made the takeoff...and eventually got to Grand Turk, where we boarded an Air Florida plane. We stopped off at the Dominican Republic for a half hour...and then were off to Miami, flying up the Bahama chain. We eventually got back to Boston at about 1 am. It was a fun trip and well worth all the troubles...and perhaps even the expense.

CAVEAT EMPTOR

It's bad enough to read a serious review about an antenna which is a hoax, even if the manufacturer doesn't know enough about antennas to know it, but worse things are out there to waste your money on if you are not damned careful. That review came complete with an ad for the silly antenna. I have not permitted that antenna to be advertised in *73*.

Will that same magazine start running ads for a "new" firm which recently turned up? I sure hope not, but apparently ethics are not a primary problem with all of our publications, so buyer beware...*beware!*

It wasn't long ago that a ham firm sort of disappeared after accepting orders, I am told, from about 5,000 people. They'd been at a lot of hamfests, selling their products, so no one suspected what was coming. It is estimated that hams and experimenters were ripped off for about $750,000 and suppliers for another $200,000 or so...damned near $1 million...tax-free, apparently.

One ham mentioned to me that he'd been at a hamfest and seen the owner of the business pocket some $30,000 in cash. Was this going into the company later on? No, apparently not. In one case, I understand that the cash was converted into a cashier's check, which later went into a personal bank account and then was used as a down payment for a very expensive home. Mind you, this chap and his wife were taking home about $100,000 in declared income.

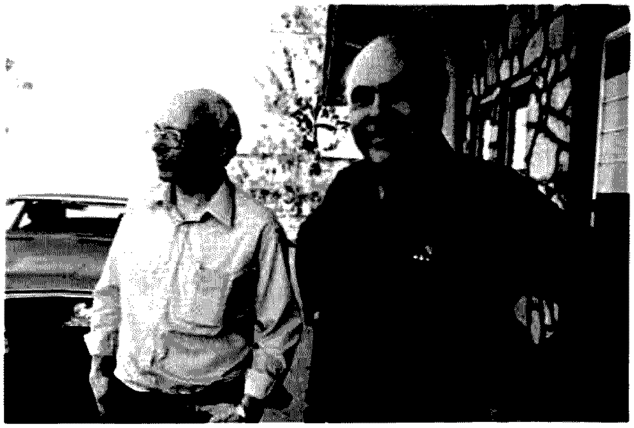
In another case, he paid someone helping him with his booth out of the roll in his pocket, pointing out that this was all tax-free. Well, if people want to steal money from their company, I suppose that would normally be a problem for the government to worry about... but when the hams get it in the neck and someone walks away free and clear, then I *do* take an interest in scuttlebutt. There are a lot of totally innocent people being hassled and even convicted by our government, so I really hate to see someone using amateur radio to clean up...and get away with it.

Other magazines may make a big deal about protecting their readers, but I still see them taking ads from firms which I won't accept. I assure you that this reincarnated firm will have to advertise elsewhere.

Speaking of refusing ads, I ran into Jim Penny at the March San Francisco computer show. He used to run Dycomm and said he didn't need ads in *73* to stay in business. I refused to run his ads because his 2m amplifiers would not meet published specs. So he advertised in *QST* ...and went out of business. He's now living in Egypt, selling air-conditioning equipment.

I do my best to keep the crooks out of *73*, as well as those firms which are so shaky that they may be going under, those whose equipment I think is poor, or firms which I have a reason to believe may not be giving good service. I reserve the right to refuse ads for any reason...or without any reason. I'm not perfect in protecting you, but I think I'm the best you've got.

If you have any problems with any ham firm, please let me know about it right away. I want to know about anything crooked you see going on...bum service support and so on.



Chuck and me. Most of the time I'm taking the pictures, so I don't get into a lot of them. I mostly use a Nikon FE, with a Nikonos IV for underwater shots.

Sherry, our Vice President (someone has to do the work!). She's wearing a Casio C-80 watch. I had mine on when I was swept up in the current while trying to cross a canal. It got dunked to about six feet but didn't suffer. My Casio skin diving watch flooded at 85 feet. We've recently switched to the new Casio CA-90, much the same as the C-80, except they have an alarm and an hourly beeper.

CLIPPING SERVICE

This is my way of thanks to all of the readers who have been taking the time to clip newspaper and magazine items which they think might interest me. They do...and I really appreciate the thought. I'm particularly interested in anything about amateur radio, WWII submarines, microcomputers, radar detectors, etc.

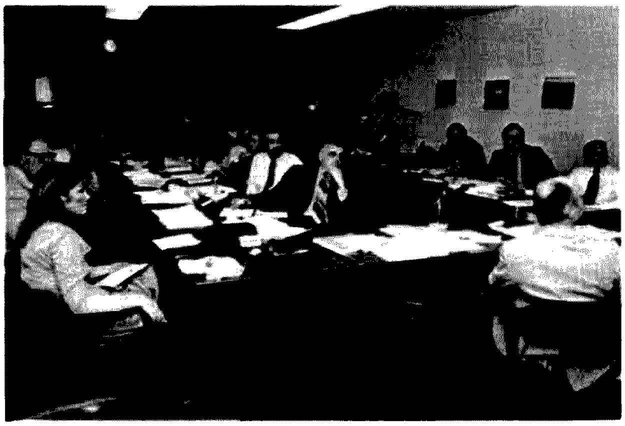
NIAC

A couple of years ago, I was surprised to find myself recommended as a member of the FCC advisory committee on amateur radio emergency measures. This is the National Industry Advisory Committee (NIAC). Well, I'm game to do anything which looks as if it might benefit amateur radio...despite rumors coming from my good friends to the south that I'm out to destroy amateur radio (and, presumably, my magazine). I also perceived the position as one of honor, so my ego puffed up slightly.

Now, with a couple of NIAC meetings under my belt, I think it might be time to throw the light of day on this group. I suspect that not one ham in a hundred even knows that NIAC exists... I know that I was only vaguely aware of it before the knock on the door. When you consider that this is the *only* amateur radio group with an input to the Commission, you perhaps can understand why it *could* have some benefits for us.

The committee used to be run 100% by the ARRL, with the chairmanship passed down from friend to friend without even a vote by the committee.

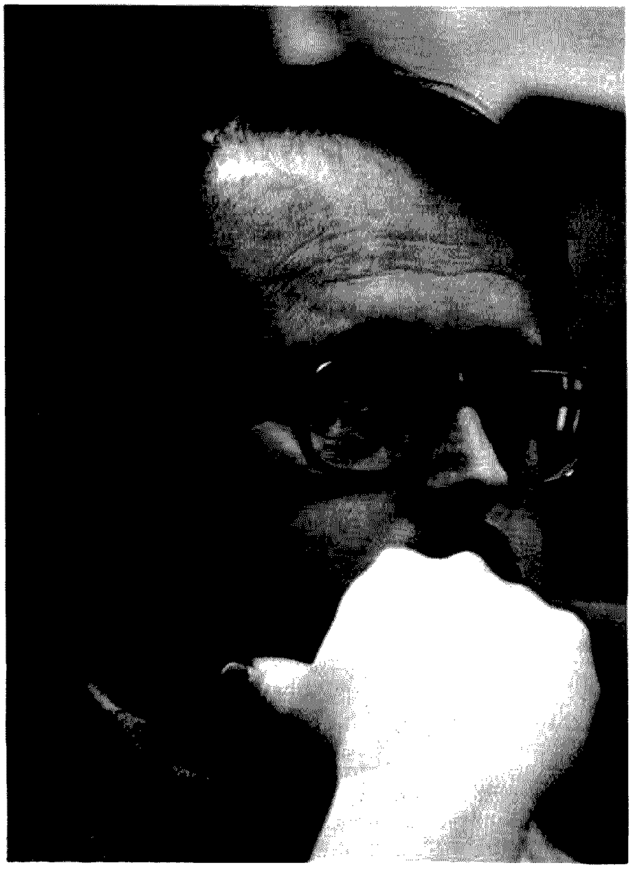
Chris Payne seems a bit disappointed over the chairman problem. He seems very anxious for NIAC to get in there and tackle the problems of the day and get the committee to take some initiative.



The March, 1981, meeting of NIAC. On the left we see Charlie Dunn K7RMG, an FCC secretary to take the minutes, and Chris Imlay N3AKD. At the end of the table is Sherry, with Tony Curtis K3RXX of Tab Books, then Chris Payne W3IRC of NAB, Alan Dorhoffer W2EEK of CQ, and Hal Todd W7ZXM with the red jacket. On the right, from the back, are Rafael Estevez WA4ZZG, Mike Renfro (FCC), and Herb Newman (FCC). The chap in front with his back to us is John Obradavich W3IS, the chairman.

The committee also has an unblemished record of doing virtually nothing. When I was in high school I belonged to an "honor" society like this. It was called the Book Club and I got to be a member by virtue of having been a member of the St. Paul's Choristers (St. Paul's Church was nearby). Well, it provided a private room and a freedom from going to study hall, so who could complain? Yes, I was a choirboy before my voice changed...and a good one, too.

The makeup of NIAC has been changing in recent years. There are about 17 members, of which about 60% manage to get to the meetings. Recent new members, other than me, have been Tony Curtis of TAB Books and Alan Dorhoffer of *CQ Magazine*, neither particularly rubber-stamp-type hams.



Tony Curtis managed to stay awake... just barely... through a long film on Three Mile Island. No one was sure why the film was shown.

There was a good deal of irritation among the more enthusiastic members over the abrupt cancellation of the meeting scheduled for last October. I don't know about the others, but I had gone to a lot of trouble to work my schedule so I could attend that meeting. I felt there were some urgent matters which should be considered by the group. Then, with little warning, the chairman of the committee sent a note saying that he had cancelled the meeting. Hell, he hadn't even come to the previous one in May, 1980!

When asked at the March, 1981, meeting why he had cancelled the October meeting, he said that he had looked over the agenda and decided that there was really nothing important. Without consulting the members of the committee, he sent out the cancellation letters. This triggered an attempt spearheaded by Chris Payne (NAB) to get him replaced as chairman. This was deftly sidestepped and Mr. Obradavich is still sitting in The Chair.

While the cancellation was irritating, particularly since it was so heavy-handed, I really didn't think that a change of chairman was called for. Besides, there was always that lurking fear that I would be asked to take the spot. What does one say to that? There is no way that I could do the job that should be done... it would be impossible. I won't bore you with the burdens I've taken on, but they are more than full time as it is and there is just so much of me to spread around. If I'd been sure that it might go to Payne or one of the others, I would have been more enthusiastic.

One of the limitations of the committee has to do with being involved only with ham emergency matters. As such, the committee has been grinding very small matters into dust rather than taking advantage of its position as a group with the ear of the Commission. To get around that little drawback I pointed out to the committee that any emergency communications system is going to be useless unless it is in regular daily use by amateurs. No special emergency system can be relied upon to work if it isn't in common use. That's the way things go.

With this proviso, we could start discussing special amateur radio satellite communications systems, special modes of communications, and all of the developments which are so desperately needed by amateur radio these days. Further, without some sort of spark to get amateur radio growing again, we may not have an emergency service available.

The "plain language" rules came in for some serious discussion. It had not escaped everyone that the new rules have done away with *all* of the reasons for amateur radio to ex-

Alan Dorhoffer played it cool, letting the others fight.

Hal Todd came a long way for the meeting.

ist. Under the new rules amateur radio comes out looking incredibly like another Citizens Band service. There were so many changes of the rules built into the rewrite that it was difficult to do anything but recommend that the whole project be scrapped. No real plusses were found, and the negatives were legion.

Another NIAC meeting is scheduled for this fall. Other than getting rid of that stupid 10m linear rule, what moves do you think the FCC could make which would improve amateur radio?...with particular emphasis on emergency communications? Is there anything the Commission might do which you think might get amateur radio started growing again?

I did make a stereo tape of the whole meeting, if anyone or any club is interested in hearing several hours of an FCC advisory committee at work. There are about four hours of tapes, so send $10 for the lot.

BEEFS

A reader mentioned he had read some beefs about *73* not being at hamfests these days. Well, we can't get to 'em all, of course, but we do get to as many as we can. Actually, it is rare that someone from our staff doesn't get to the larger hamfests.

At Orlando we had both Bob Lyons and Jim Gray. Bob went from there to the Charlotte hamfest. Just about everyone from our place went to Boxboro last fall, though I was in Tokyo at the time, getting together with the Tokyo International Amateur Radio Association... and visiting the Trio-Kenwood people.

Those of you who went to Dayton this year had your chance to see and hear me.

The microcomputer aspect of my publishing has put a big strain on me, and much of my travel has been involved with that, but I've had to cut down on computer shows, too...such as the recent one in Dallas. I did get to the CES in Vegas in January, the West Coast Computer Faire in April, and NCC in April. Ooops, I almost forgot the NIAC trip to Washington in March...a strictly ham event.

MILLER HASSLE

The storm is still raging over the firing of Don Miller as ARRL director. The Indiana hams seem to be extremely upset over this and most resistant to the HQ-named replacement: Metzger.

Though I was away from the *73* booth at Dayton at the time, one of the *73* team (we had nine people there) reported that some chap claiming to be Metzger's lawyer came by and yelled about the pro-Miller letters we published, threatening to sue over it. There was a general agreement that this chap was loud and obnoxious.

Hear this, Metzger: Threats of lawsuits are not going to keep us from printing the facts. They never have.

Several years ago I had a run-in with another Don Miller, who I understand is now in prison in California for trying to have his wife killed. This chap was DXpeditioning and I exposed his game of claiming to be one place while in reality being elsewhere. He sued for $650,000. He never got a dime from me.

Then Ma Bell sued because I ran some articles showing circuits the phone company wanted kept secret. Only $100,000 that time. I paid them nothing.

The CCAT crowd sued because I ran 2-GHz receiver circuits...and lost the case. Now we're counter-suing to get the legal costs back. They lost double because before they brought the suit they had been able to scare people into not selling receivers on threat of a suit. Now, with that loss on the

Here's a photo of me talking to the TIARA group...and thanks to JK1UFW for sending in the photo. Note the buffet, which was first rate. Yes, I'll fly 10,000 miles for a good meal.

This is the top brass of Kenwood (note Anniversary issue of 73), posing with Sherry and me. Also note those boxes on the right...a complete TR-2400 system. If you're active on 2m, you'll hear me using it when I get to your town...and I do get around a lot.

record, they have little with which to threaten people.

I'm currently being sued for $3,000,000 by a firm because I won't let them advertise. Isn't that ridiculous?

I really hate lawsuits, but I damned well don't back off from them when someone tries to use the threat of one to stop me from printing something I think you should have.

Getting back to the Miller case...it sure looks as if he was shafted by the ARRL because he asked too many questions. I hope they enjoy Metzger.

WIND JAMMERS

A recent talk with some FCC people brought out that the Commission is getting record numbers of complaints of the jamming of ham communications...by hams. To say that this is counterproductive for us is a great understatement. Add this to the other frustrations and you perhaps can understand why many of us were not surprised at the degradation of the amateur "service" which turned up in the proposed "plain language rules."

To understand what is going on you have to look at things from the viewpoint of the FCC, not from *your* position. First, the Carter commissioners came into office at a bad time from our standpoint. They were faced with a serious problem brought on by the illegal use of amplifiers by CBers and HFers. Previous actions by the Commission had put the manufacturers of well-designed "clean" linears out of business, leaving the field to unscrupulous underground firms which spewed out cheap, cruddy amplifiers which were virtual TVI factories.

Rather than tackle the real problem, the FCC went the typical governmental route and chose to stop the manufacture of ham amplifiers which might be used on the Citizens Band. I note that the number of TVI complaints is up substantially for 1980, despite the linear ban and a large drop in CB activity.

We could have prevented this ridiculously futile exercise if the ham industry and the ARRL had worked together and proposed some reasonable solutions for the FCC's problems. What happened was one of the worst debacles in ham history...second only to the 1963 proposed license changes which stopped amateur radio growth for over ten years.

With all of these other problems, one of the things we need the least is to continually frustrate the FCC with complaints that we are no longer able to be self-policing. For many years amateurs had proudly pointed out that they were the least bothersome service due to our ability to do our own policing. Amateurs apparently have just about given up on even trying to be self-policing.

Frankly, I think it is about time that we again assume responsibility for our own hobby...or "service" as the FCC prefers to consider it. Now, I do not question for one minute that our service nets are of great value, but if they are going to continue to get us in trouble with the FCC through their inability to handle their own problems, then perhaps it is time for reevaluation of their worth to us. This going crying to the FCC over jamming is intolerable. The same thing holds for repeater jamming.

It is time that we took the business of being self-policing seriously. I'm open to any articles for *73* which will tackle this problem. I'm open for ideas on why we are having these jamming problems. Some of it is brought on by officious control operators. Many is the time that I have called into a net or in on a repeater only to be met with arrogance and an infuriating attitude. My first reaction is to get even with the damned bastards. That's when I turn off the big switch and walk away from my rig and do something which is more fun. When hamming stops being fun, I stop hamming.

During my recent stint from VP5, I found my signals being jammed every now and then. It was malicious, there was no question about that. On the one hand I was pleased that this happened so infrequently, but on the other I felt this was a problem that needs to be tackled. The jammer(s) were trying to spoil my fun...and the enjoyment of the hundreds of operators who were trying to get through for a contact. There was no way that my fun could be spoiled, for if hamming got to be a pain in the ass, there was always scuba diving, lying in the sun ruining my skin and prematurely aging me, reading (Hey, have I got a good book I'm reading! Grab it if you see it...paperback, but not a pocket-sized book, called *Human Scale*. You'll love it.), talking with Coop about satellite television, etc.

Let's see what we can do to work out solutions to our jamming problems. It may take some cooperation of ham clubs and some direction-finding...if so, let's see articles on this. It may take some psychology. We may just be dealing with insanity, which seems to be a problem predominantly centered in the L.A. area, but which may be leaking out. I feel that since there are more of us who are interested in bettering amateur radio than in destroying it, the good guys can win if they gang together and swap ideas.

If you...or your club...decide to actually do anything to help amateur radio in this time of distress, please feel that *73* is your means of communications with others similarly interested.

PROJECTS

If we are going to get amateur radio moving again, I think we should do all we can to tackle some of the technical projects which seem worthy of experimentation. This holds even more in the light of the recent FCC thaw on Special Temporary Authority (STA) permits for experimentation. I assure you that *73* will do all it can to provide the communications that intensive amateur experimentation needs...so if you are doing any serious experimental work, be sure to report on your progress in *73*.

Some of the projects which show promise for amateurs are: (1) automatic identification of all transmissions...probably via ASCII using subaudible tones; (2) stereo double sideband, which may permit us to get ten to thirty times the number of stations in a given band without serious interference; (3) SSB repeaters for our VHF bands, which may allow us to squeeze in at least three times as many channels in the band as we have at present (just what we needed ...more 2m repeaters); (4) packet transmissions; (5) high-speed message-handling and perhaps the development of automatic forwarding of messages; (6) SSTV transmission of single pictures, probably using a ROM for the picture storage as an inexpensive method of sending along a photo of the operator or the ham station; and (7) the development of amateur use of commercial satellites as an emergency measure...but which will have to be in everyday use to be ready for the emergencies.

With digital electronics moving ahead rapidly, it is up to us to not only keep up with technical developments, but also to be the ones to push the frontiers ahead. *73* is ready to help...if *you* will grab the ball.

HAM HELP

I need a copy of the operating manual and schematic for a Hallicrafters SX-122 receiver. I will be glad to pay copying costs and postage.

Ronald Rubin
1722 Canterbury Circle
Casselberry FL 32707

I would like to buy a matching power supply for a Galaxy V transceiver. Must be reasonably priced. No junk, please.

James King WA5HOE
914 Henslee
Euless TX 76039

I need a Model 28 or a Model 15. I am willing to swap a Model 35, in good condition, for one of the above. If you are interested in this trade, please write for details. Thank you.

Robert Rice K1MIM
Route 1, Box 289
Hillsboro NH 03244

I would like to get in touch with other amateurs who are pathologists.

Philip Altman, M.D.
1050 Linden Avenue
Long Beach CA 90801

DX

Yuri Blanarovich VE3BMV
Box 292
Don Mills
Ontario M3C 2S2
Canada

WORLD OF DXING AND CONTESTING

Welcome to this new column. When I was asked to write the DX column, I felt that there was perhaps a need to have something more: a touch of contesting; most of the magazines have DX columns *and* contest columns. I agree with the *NCJ (National Contest Journal)* that contesting is growing and the amount of space devoted to contesting in the magazines is shrinking. Most of them have only a contest calendar and results or rules for the contests that they sponsor.

DXing and contesting are very close because they have one thing in common: competition. Contesting requires quite a bit of work and effort and generally is confined to 48 hours or less. DXing is more relaxed; there is more time available and deficiencies in the equipment can be "covered up" by persistence.

Contesters often are the better operators, and when they go on a DXpedition, things run more smoothly. DXers enjoy picking at the rare stuff during the contests and provide some precious points and multipliers.

In this column, I would like to report on the past activities from the rare and not-so-rare DX countries, list QSL information, elaborate on some pressing issues of DXing and contesting, and report on what is new and interesting that would help us to improve our equipment and skills.

Due to the lead time required to publish the magazine, it is virtually impossible to write about most of the upcoming DXpeditions. Those hard-core DXers interested in timely DX activity will have to rely on the variety of weekly or biweekly bulletins or DX information nets.

To those planning DXpeditions or Contestpeditions, please let me know in advance (about 3 months) and we will publish the information here. We also solicit your input—especially pictures (color and black and white) and slides.

"You have to keep trying new things. Sometimes you'll succeed and sometimes you'll fail but you have to continue to meet the challenges. That's how you grow!"—Mary Tyler Moore

I like this quotation and I think this is what drives many people on their path towards excellence. Amateur radio is a very special hobby or sport (DXing and contesting) and those who started experimenting way back in the pioneering days of radio have done a lot to get us where we are today.

The question is: "Do we want to sit around with our crystal sets, or do we want to operate today's marvels of technology with all the bells and whistles?" The competitive part of ham radio was there almost from the beginning, when the first transatlantic contact was made. Our fathers wanted some kind of indicator to evaluate their achievements: number of different stations worked, countries, distances spanned, etc.—DX and contests were born.

Being fortunate to be involved in ham radio for a while, I have had the opportunity to get my feet wet in almost all aspects of our hobby: equipment building, communicating, DXing, satellite communication, computers, antenna design, propagation studies, and contesting.

There usually occurs at a certain point in time a situation in which we reach a plateau, or are close to it. Then the interest can start to fade away. One of the most beautiful things about ham radio is the fact that it is always changing and remains challenging.

Let me make one thing clear: I am not against any aspect of our hobby. I went through most of them and I love them all. My longest-lasting "obsession" is contesting. Why? I think it is because with each contest there is always a new challenge. You are starting from scratch at 0000 GMT and it is a new competition for the next 48 hours. It doesn't matter how long you have been licensed or if you were around when Clipperton was activated. It is up to you and your station as to how you'll perform in that short time frame.

What many DXers find after a while is this: After you get all (or almost all) of them, you start asking yourself, "What now?" Many will continue collecting a variety of awards, building, or experimenting with circuits. Some will get involved with contesting. Some of the really hard-core DXers who reach that magic 318 mark become just statistics on the Honor Roll, and you never hear them on the air anymore.

Contesting means that as things get more competitive, you have to dig deeper to get that extra dB out of your antenna installation, improve your equipment, better your operating skills. It is a lot harder to show up in the top six world high listings or beat the old record in the contest. Only few of many that are competing can get there. This is why I think contesting presents more of a challenge.

In the world of DXing, things are a little bit more relaxed. If you get that new one an hour later, that's OK. The contest station has to go further. One more dB of gain from your antenna might bring you another 500 contacts with "little guys"—more points. The competition is getting fierce—one almost can't afford to go to the washroom. Everyone is on his own, as it used to be back in the old days of DXing when there were no repeaters, nets, lists, and bulletins. You had to hunt, and your DXCC total meant something.

But, DXing *is* getting more popular; newcomers get the bug and want to show up on the Honor Roll as soon as possible. This is natural and is to be expected. All you need is to work them all and, most importantly, *get that QSL card*. And here is where quite often it is believed that the end justifies the means. *Anything* to get that QSL! What starts happening? Some "clever" things get invented: lists, nets, repeaters, bulletins, etc.

Let's have a look at lists. I believe that there is room for them. Especially when some poor, unsuspecting brand-new ham becomes "wanted" because he happens to be in Burma, and after his first CQ, the whole "animal farm" descends on him. He wouldn't know that it is not his receiver oscillating, but that the whole DX world is calling him. So then someone will "undertake" the list and things will somehow get rolling. If the new DX baby is born, let's help him to start walking, give him a hand. But let's not keep him in his walker. Let's help him to get on his own feet and eventually teach him to run. Or, do we want to end up as a bunch of handicapped crawlers, being carried over the finish line on a stretcher?

There is a breed of professional list undertakers. They are just waiting for something juicy to show up on the band. They are ready to take the list and get things "organized." When we were on St. Paul Island (the XJ3ZZ/1 DXpedition), we had about four list undertakers come on our frequency and ask us to work the list they had collected. This was usually at the time when we were working the world on our own, at up to 6 stations a minute! How many can you work on the list? Looks like there are quite a few undertakers on this ego trip. You have to get on your knees to get on the list and then wait, sometimes a day or two, to work that rare one. Fun? Sure, just like shooting animals in the zoo.

This is where contesting helps. By operating in a contest you can learn how to manage the pileups and learn to walk by yourself and eventually run. Wasn't that refreshing to hear LU3ZY work the stuff in the contest one after another, rather than sitting like a duck on a string on all those lists? Is it a big challenge to work the stuff on the list? Does it make you or the "lister" grow?

Do you want to grow? If yes, you have to work at it. Nothing

comes easy. You can always make up for the deficiencies in the area of equipment—just use your brain and skills! I am sure that you will be a lot happier that way, rather than being carried over the Honor Roll finish line on the stretcher of lists and nets!

DX NEWS

Bahrain—A9XCE is active on CW. Could be found between 14020 and 14050 kHz daily from 0100Z to set up skeds for your 5BDXCC. QSL to PO Box 5750, Bahrain.

Benin—K4YT operated from TYA11 (incorrectly-issued callsign) until April 25. QSL for this operation to W2TK. Another operator, ON5NT, operated the same station until May 2, strictly CW. QSL via ON5NT home address.

Glorioso was to be on by FR7AI/G until May 11, time permitting. QSL to FR7AI *Callbook* address.

Kingman Reef—A change in the schedule brought this one on before the Palmyra operation. AD0S/KH5K and KB7NW/KH5K were active on all bands with a good signal. The next stop was supposed to be on Palmyra, with calls AD0S/KH5 and KB7NW/KH5. QSL via AD0S.

Saipan is active on 10m near 28580 kHz on weekends from 2100Z; call is KH0AC. QSL to Box 66, Capitol Hill, Saipan, CM 96950. Also look for brand-new AH0AA on high bands. QSL via bureau.

Heard Island—VK9NS (P29JS) writes about his try for Heard Island DXpedition: The transportation was off due to the short weather window. He will be renewing his VK0JS license and he is still hoping for an operation this coming autumn. Jim had 256 donations to the Heard Island DX Association and they were acknowledged by receipt. He says other small ($1) contributions were received which have not been acknowledged, for obvious reasons. Jim VK9NS has opened a number of doors for future operations, and be they by him or someone else, he will be trying.

1A0KM—K3ZJ found the following: The Sovereign Military Order of Malta is an extraterritorial area of Rome. I0MXM, chairman of International Committee of Radio Amateurs for UNICEF, applied to the ARRL for its separate status for DXCC. The following is the endorsement for the validity of the application: The *National Geographic Atlas* recognizes SMOM as the smallest country in the world. The SMOM has been in continuous existence since 1100 AD, making it the oldest diplomatically-recognized state in the world. The courts of Italy recognize their lack of jurisdiction over SMOM territory. Full diplomatic relations were maintained in 1980 with at least 45 countries on all continents. The SMOM has a complete functioning government structure, its passports are recognized by all countries, it issues its own stamps and currency, and the Prince-Grand Master, as head of SMOM, is ceremonially accorded full Head-of-State status when on official visits outside of the SMOM. (Tnx LIDXB)

CE0Z—Dr. Dave Gardner K6LPL opened from Juan Fernandez as planned on March 11 on all bands 80-10 SSB and CW. He was making the trip alone with the second "passenger" being two transceivers, which he had to buy the tickets for. The limit per passenger was 22 pounds, so the linear was left behind. Excellent operation as usual. Dave was supposed to leave the antenna on the island for the next expedition by the Chilean RC. Dave made about 10,000 QSOs in four days of operating. (TDXB)

VK9NYG Cocos—Quite active on 10m around 28540 at 12-1300Z, running 40 W and dipole. Usually calls the stations on CQ. Quite a pleasant surprise call to many during the ARRL Phone contest. QSL via VK6NE.

GU3HFN Guernsey—Operated in the ARRL CW, made about 3000 QSOs, with operators N6RA, GU3MBS, and GU4CHY. QSL via GARS, Box 100, Guernsey, Channel Islands.

A51PN—Pradhan is using "business" rig. He is looking for donation of the rig to ensure the continuation of his operation. Anyone interested should contact W5GAI. (TDXB)

OJ0AM Market Reef—Wayne W6EUF will be accompanying the Helsinki DX gang, with OH1BR and OH2BAD, during the operation from July 6 through 14. The reef will be taken over by the military in the fall so it may become rare. (SCDXC)

5N0DOG—Terminated operation from Nigeria. Dave handed out many contacts and multipliers in the contests. Excellent operation appreciated by many DXers and contesters.

QSL INFORMATION

A22ZM	via KA2GNJ	HM1AQ	JA2AUI	TYA11	ON5NT	XT2AU Enno	WA1ZEZ
A7XE	DF4NB	JA8AQN/JD1	JA8JL	KA4DQR/TI	KA4FHG	YB0ACL	W4LCL
AN3SF	EA3SF	HG19HB	HA5PP	TU2DP	KC4IR	YJ8NPS	KB2KN
C31IU	W8JAQ	WD9IHC/HK4	WD4PTO	VK0JS/VK9	VK9NS	YT0R	YU7BCD
C31VM	EA3BKZ	J5AG	SM3CXS	VK2DCO/LH	K2UO	YT0RA	YU1EXY
C5ADR	DK9KD	HC9A	K8LJG	VP1MK	N0BNY	YZ3F	YU3TAQ
C5ADZ	DK9KD	HL9TU	K2KSY	VP1OA	KB0U	ZF2EC	WA4OBH
CE0CJA	CE5CN	JY9RC	W1CKA	VP1RY	K0BJ	ZF2EX	K4PJ
CT2DQ	W4PKM	J3AE	J3AAG	VP1TKJ	WA0TKJ	ZF2EO	K0CS
DJ5RT/6W8	DK9KD	J88AQ	W2MIG	VP2MU	VE3HD	ZF2EK	W8TN
DL7NS/HB0	DL7NS	KA1AA	KA6CWR	VP2MCL	K1ZZ	3A8EE	3A2EE
EF6BDX	EA6CE	K6LPL/CE0Z	W6ORD	VP2MFC	K1ZZ	4A9LCH	WD8NKT
ED2DSB	EA2OS	KH3AB	KB7MO	VP2M	W1CDC	4N7NS	YU7BPQ
EN3D	UK2DAU	KH6D/KH3	KH6D	VP2MM	W1CDC	4V2BM	KA4MRE
EL5G	K3RB	KL7Y	KL7GNP	VP2MO	KA4BOT	4N0RA	YU1ELM
EL6A	K4SE	KS6DV	WB6FBN	VP2MLB	W2IRS	4Z4WZ	DJ5SQ
EL9A	K4WSB	KN5N/VP2A	K9MK	VP2MN	W1CDC	5Z4YV	JA2KLT
FG0FOO/FS	N6RA	K6SAD/KG6	VE5QY	VP2MLB	W2IRS	5V7HL Rod	KB7HB
FW0AA	N0RR	N4ADJ/KH2	WB4CCT	VP2VIA	W0ANZ	5T5AZ	KB7HB
FB8YH	F3KH	KC6BS	JH7LMZ	VP2VGS	W0JRN	5W1DF	KL7CQ
FB8YI	F3KH	LJ2Z	LA6ZW	VP5KPS	W2NSD	DJ6SI/6W8	DK9KD
FG0GDI/FS	F6AXX	OH3XT/OH0	OH3XT	VP5RFS	N5BET	6Y5DA	VE4JK
FR7AI/G	FR7AI	OH0XX/OJ0	OH2BBM	VP5TDX	W1HCS	8P6M	VE3JTQ
FH8OM	DJ1TC	OH0XZ/OJ0	OH2KI	W2BBK/PJ8	W2BBK	8P6CQ	W2LZX
FO8GW	K6FM	OX3KM	OZ4KM	W5JW/KX	W5JW	8P6JW	W3HNK
FR7BY	IS0IFA	P29GT	K0BTH	WA1SQB/CE0	K1RH	8P6OL	VE3AMJ
FR7CE	DF2OU	PP2ZDD	W4BAA	WB9TIY/VP2A	WB9	8P7A	WB4RRK
G3MUV/CE0	WD4HMG	DK5BD/ST2	DF1BP	VP2VHK	N6ZV	8P6PF	VE3LVK
G3PQA/5N0	G3RPB	DF3NZ/ST2	DARC	VP2VJR	VE3MJ	8Q7BF	JA1ITE
GJ4JVO	GJ2LU	W5JMM/SU	KA5AZT	VP8AEN	GM3ITN	9Q5AB	DL7AH
HG1W	HA1KVM	SV0AO	KA2FRP	VQ9XX	K6OZL		
HG6V	HA6KVB	TL8RC	F6EZV	XT2AU Karl	W2TK		

Thanks: *DX News, The DX Bulletin, VE Canadx* reports.

6Y5KG Jamaica—VE3KGK on between March 21 and 28, all bands, mostly 10, 15, and 20.

JA1JWP/JD1 Ogasawara—On until March 25 operating CW and SSB. Also showed up in the ARRL Phone.

VP8AEO/CE9—South Shetlands active till end of March, Geological Scientific Group. QSL G4DSE.

OY0A, OY5JA—Bunch of pirates! Those callsigns were never issued. Apparently they were quite active in the contests. If you worked them, don't bother to QSL. They are busy enough.

YI1DBG Iraq—Workable on list with "undertaker" I1AGC on Thursdays, 14292 at 2000Z.

ZD9—Expedition by ZD7BW delayed until July.

DJ6SI—Started from 6W8. Should continue to TZ, C5, and possibly 3X. QSL via DK9KD.

VP2MFC Montserrat—Operation by Dave K1ZZ during last two weeks in March and WPX SSB.

VP5—N. Florida contest bunch to fire up from Turks & Caicos during the WPX with monoband stations on 10-40.

5R8AL Malagasy Republic—Being encouraged by 5T5JD to come up more often on 21300 around 1900.

ZL0—Prefix being issued to visitors. *J87*—Issued to visitors, J88 to "natives." Replaces VP2S. *T4*—replaces CM and CO for Cuba. *T5*—Replaces 6O. *T6*—Replaces YA ("free" Afghanistan?).

Thanks: *Long Island DX Bulletin, The DX Bulletin, Long Skip.*

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

DX AWARDS CONTROL BOOK

Today's mail brought one of the finest operating aids I have seen in a long time. Sponsored by the Susquehanna Amateur Radio Society (SARS), the *DX Awards Control Book* is a must buy for any serious DXer. Wouldn't you know it, my pal and yours, Hal Dennin AC3Q, is the driving force behind it!

With this well-published manual, you may organize and document your contacts with a single entry. Thirty-three legal-size pages itemize all the DX countries and their prefixes as you would expect to find them. The book comes spiral-bound at the top for easy access and is personalized with your callsign on the cover.

Using the *DX Awards Control Book* is relatively simple. First log the call worked in the appropriate band column. Note the date and mode of operation. When marking the mode, it is suggested it be color-coded for quick identification. Finally you check the award(s) you wish to apply this contact to. Four common awards are listed: DXCC, WAC, WAZ, and ITU. One of the nice features of the format is that space is provided for up to three calls worked per band. Also included is a block for indicating QSLs sent and received.

The cost of the *DX ~~Award~~ Control Book* is $7.00 to an address within the 50 US states and any territorial possession. Foreign stations must enclose $8.00 in US funds.

The sponsors are so confident in the acceptance of their new operating aid that they will provide a 10-day money-back guarantee that you'll be satisfied with your purchase.

Send your remittance, name, call, and address to SARS, PO Box 326, Montoursville PA 17754.

BEGONIA AWARD

Today I received a very nice letter from Maurie Batt, representing the Ballarat Amateur Radio Group of Victoria, Australia. Maurie enclosed the details about two very challenging awards.

To earn the Begonia Award, operators in VK-land must contact 10 Ballarat stations, while all DX outside Australia must contact a minimum of 5 amateur stations in Ballarat. There are no restrictions as to band or mode.

The following stations qualify as Ballarat contacts: VK3DS, VK3GM, VK3GR, VK3HW, VK3IV, VK3KU, VK3KY, VK3LJ, VK3NU, VK3PH, VK3SE, VK3VU, VK3ZL, VK3AAG, VK3ABI, VK3ADT, VK3AGL, VK3AJR, VK3ALM, VK3AMH, VK3ANH, VK3AQM, VK3ARS, VK3AXH, VK3AGY, VK3AZE, VK3BMH, VK3BML, VK3BNC, VK3BNT, VK3BPK, VK3BQE, VK3BSC, VK3BTX, VK3BWC, VK3NBN, VK3NCU, VK3NGL, VK3NGY, VK3NHN, VK3NHT, VK3NIH, VK3NLH, VK3NLY, VK3NLZ, VK3NRS, VK3NTG, VK3NUI, VK3NUC, VK3NUY, VK3NVC, VK3NVF, VK3NVJ, VK3NVZ, VK3NWN, VK3NWV, VK3NWS, VK3VEE, VK3VEZ, VK3VEI, VK3VOM, VK3VON, VK3VMO, VK3VQA, VK3VQQ, and VK3VSE.

To apply for the Begonia Award, send your list of contacts and $2.00 (Australian) or equivalent to: Maurie Batt, R.S.D. Rokewood Junction, Victoria 3351, Australia.

THE WASHINGTON TOTEM AWARD

The Western Washington DX Club, the northwest's largest and most active DX group, takes pleasure in issuing the first major W7 award. This award is issued to any licensed radio amateur who submits proof of two-way contact with the state of Washington.

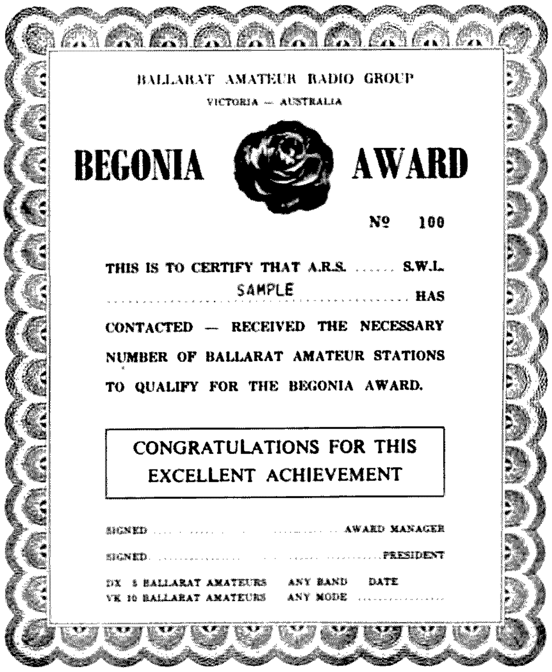
Applicants must submit proof of QSOs with 100 different Washington stations. Twenty (20) of these must be confirmed contacts with different Western Washington DX Club members. DX stations need only confirm 25 Washington stations including 10 WWDXC members.

GCR apply. Submission of QSL cards is not required. DX stations may submit log data in lieu of QSL card confirmation. All contacts must be dated January 1, 1973, or after. Certified lists must be sent in alphabetical order with date and time in GMT.

The Washington Totem Award is free to all stations outside the United States. Stations within the US must enclose $1.00 to defray the cost of processing and mailing your award.

If a special endorsement is required, merely forward supporting documentation or information to substantiate your claim.

If you wish a WWDXC



BALLARAT AMATEUR RADIO GROUP
VICTORIA — AUSTRALIA

BEGONIA AWARD

Nº 100

THIS IS TO CERTIFY THAT A.R.S. ...... S.W.L.
SAMPLE ...... HAS
CONTACTED — RECEIVED THE NECESSARY
NUMBER OF BALLARAT AMATEUR STATIONS
TO QUALIFY FOR THE BEGONIA AWARD.

CONGRATULATIONS FOR THIS
EXCELLENT ACHIEVEMENT

SIGNED ...... AWARD MANAGER
SIGNED ...... PRESIDENT

DX 5 BALLARAT AMATEURS ANY BAND DATE ......
VK 10 BALLARAT AMATEURS ANY MODE

membership list to determine the calls of its members, send an SASE to: Awards Chairman, WWDXC, PO Box 224, Mercer Island WA 98040 USA.

DX AWARDS GUIDE

Contrary to popular belief, neither I nor *73 Magazine* are in any way affiliated with the publication, *The DX Awards Guide*, which I might add consists of numerous volumes. To clear the air about this very popular "guide" and to answer the flood of letters I've been getting about it, I highly endorse the contents. To date, it represents the most composite set of awards information I have received since beginning this column over 2½ years ago.

The price of *The DX Awards Guide* is $6.95 per volume with the exception of Volume C, which is only $4.95. Guides mailed within North America are sent prepaid. All other addresses require additional monies be sent to cover 10 oz. postage per volume. Any extra will be refunded promptly.

Many letters have asked about the contents of each volume, so I will attempt to list the awards as best I can. I apologize to *The DX Awards Guide* publisher and to my readers for any mistakes that may appear.

VOLUME A (Europe):

Action 40	Germany
Amsterdam DX	Netherlands
Cheshire	England
Cracovia	Poland
Diplome de l'Union Francais	France
DIG Trophy & Plaques	Germany
DUF Universe	France
EU-DX-D	Germany
EUR-DIP	Germany
EU-PX-A	Germany
International Airport	Germany
Kingdom Belgium, HF & VHF	Belgium
Olimpiada-80	USSR
Polska	Poland
P-75-P	Czechoslovakia
RAEM	USSR
Slovensko	Czechoslovakia
Two Modes	Germany
Worked All Europe (WAE)	Germany
Worked All Italian Provinces	Italy
Worked All Norwegian Communities	Norway
Worked DTG Members	Germany
Worked German Large Cities	Germany
Worked Hamburg & Harbors	Germany
Worked Norwegian Cities	Norway
ZMT-24	Czechoslovakia
ZMT	Czechoslovakia
9H Diploma	Malta
100 OK	Czechoslovakia

VOLUME B (Europe):

British Commonwealth Radio Transmissions	England
BULL	Sweden
Commonwealth DX Award	England
Cosmos	USSR
Diploma G. Marcone	Italy
Diploma Mediterranean	Italy
Diploma des 100	France
Gold Sardinia	Sardinia
Hampshire County	England
Helvetia 26	Switzerland
IARU Region 1	IARU
ONION	Belgium
R-6-K	USSR
R-10-R	USSR
R-15-R	USSR
R-100-0	USSR
R-150-S	USSR
Serenissima	Italy
Sylt	Germany
S-6-S	Czechoslovakia
WANCA	Norway
White Rose	England
Wool City, HF & VHF	Belgium
Worked All Gozo	Malta
Worked All LA	Norway
Worked British Commonwealth	England
Worked DX Stations	Germany
W-100-U	USSR
1,000,000 Award	Germany

VOLUME C (Europe):

Baronie DX Group	Belgium
DIG Diploma 77	Germany
IOTA	England
Mercury	England
Millenium of Liege	Belgium
Morokulien	Norway
Noord-Brabant, HF & VHF	Netherlands
OHA	Finland
OK SSB	Czechoslovakia
S. R. Macedonia	Yugoslavia
Worked All Zone 14	Sweden
Worked ITU Zones 17/18	Sweden
Worked All SM Laens I & II	Sweden
Worked District Hamburg	Germany
W-DIG-OE	Austria

VOLUME D (USA):

All Call Areas	
BEARS Award	
Century Cities	*73 Magazine*
Countries, Zones & Continents	
CQ DX	CQ Magazine
District Endurance Award	*73 Magazine*
DX Capitals of the World	*73 Magazine*
DX-YL	
DX-YLCC	
Island DX Award (IDX)	Whidbey Island DX Club (KE7C)
Lehigh Valley	
Newark News Radio Club	
Port of Stockton	
Specialty Communications Award	*73 Magazine*
Ten Meter DX Decade Award	*73 Magazine*
Ten Meter 10-40 Award	*73 Magazine*
WAC	IARU
WAC/YL	
WAS	ARRL
WAS/YL	
WAZ	CQ Magazine
White Tail Deer	
Worked All USA Award	*73 Magazine*

One of the nice features of this *DX Awards Guide* series is that the publisher, Chuck Ellis, has made every effort to provide a full and complete application blank for each award listed. In most cases, the entire form and the required columns are formatted into a very impressive presentation.

For further information about these guides or to order one or more of the series, address your correspondence to: Chuck Ellis, PO Box 1136 Welch Station, Ames IA 50010. Be sure to tell Chuck you read about his guide in *73 Magazine*!

GRANDE RONDE AWARD

Grande Ronde Radio Amateurs in Union County, Oregon, now offer an award to amateur operators, domestic or foreign, who submit evidence of having contacted three (3) stations located in the Grande Ronde Valley.

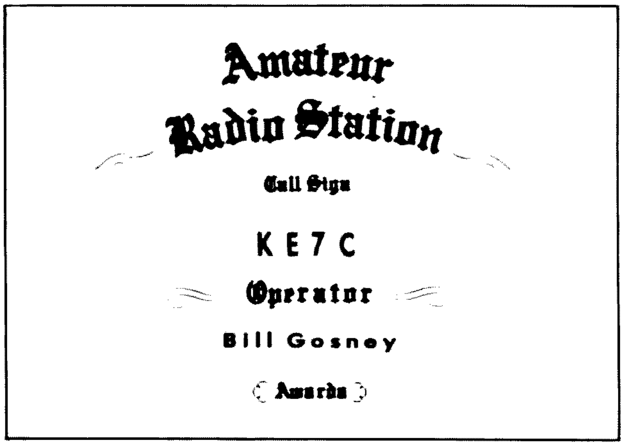
Contacts may be on any band or mode. Do not send QSL cards. Have your list of contacts verified by at least two amateurs or the secretary of a radio club. The fee for this award is $1.00 or 3 IRCs. Applications should be sent to: Matt Sirrine WB7PMG, 803 14th Street, La Grande OR 97850.

To assist interested amateurs, the following list of club members will qualify as "good contacts" for this award: KA7BAK, KA7BBE, KA7EIM, KA7EIP, KA7EJB, KA7EJC, KA7EJS, KA7EJT, KA7EPS, W7IES, W7KVV, W7ULC, WB7FBG, WB7FBH, WB7FDB, WB7FFC, WB7PKX, WB7PME, WB7PMF, WB7PMG, WB7RVO, WB7RVP, WB7RVQ, and WB7WJR.

AMATEUR RADIO STATION CERTIFICATION

While we are discussing the award incentives being sponsored by the Susquehanna Amateur Radio Society, one cannot go without mentioning their very handsome Amateur Radio Station Certificate.

Display this unique certificate on the wall of your shack, den, or family room for all visitors to see. Jet black olde English lettering on expensive tinted parchment gives this certificate the elegance any amateur would



Worked the World Award	*73 Magazine*
Worked All Milford	
Worked All Vermont	
Worked Oswego County	
Worked 100 Nations	ITU
73 DX Country Club	*73 Magazine*

VOLUME E (USA):

Consecutive Country Award	
Distinguished PARS Communicator	
DX Award	
DXCC	ARRL
DXCC Milliwatt	QRP International
DXCC QRPP	WA8CNN
DXCC QRPp	W0RSP
Fort Wayne Radio Club Award	
Great Lakes Award	
KM/W	
Master Novice Award	
Novice Six Country	
Ohio Valley	
Q-5 Award of Excellence	*73 Magazine*
Senior CW-50	
Southern California Award	
Upper Chesapeake Bay Award	
WAC QRP	QRP International
WAS QRP	QRP International
WAS QRPp	QRP International
Washington Totem Award	Western Washington DX Club
WAZ—5 band	CQ Magazine
Worked All Lynchburg Ladies	
Worked Broward County Cities	
Worked DX Mobiles, Air, Land, Sea	
Worked 100 Amateurs	
WPX/WPX Honor Roll	CQ Magazine

VOLUME F (Africa & Oceania):

Algoa Branch Award	South African Relay League
Algoa CW Merit Award	South African Relay League
All African Award (AAA)	South African Relay League
Antipodes Award	New Zealand
Arabian Knights	Arabia
Bird of Paradise	P.N.G.
Captain James Cook	Australia
Endeavour	Australia
ENZART	New Zealand
Guam Award	Guam Island
New Zealand Award	New Zealand
Oman Award	Oman
Rev. John Flynn Memorial	Australia
Royal Jordanian, Coral & Silver	Jordan
VK8 Outback Australia	Australia
W.A.R.O.	New Zealand
Worked All Liberia	Liberia
Worked All New Zealand	New Zealand
Worked All Pacific	New Zealand
Worked All Queensland Cities	Australia
Worked All Queensland Shires	Australia
Worked All New Zealand Counties	New Zealand
Worked All Transkei	Transkei
Worked All VK Call Areas	Australia
YL/ZL	New Zealand
ZLA, ZL Districts, 5 × 5	New Zealand

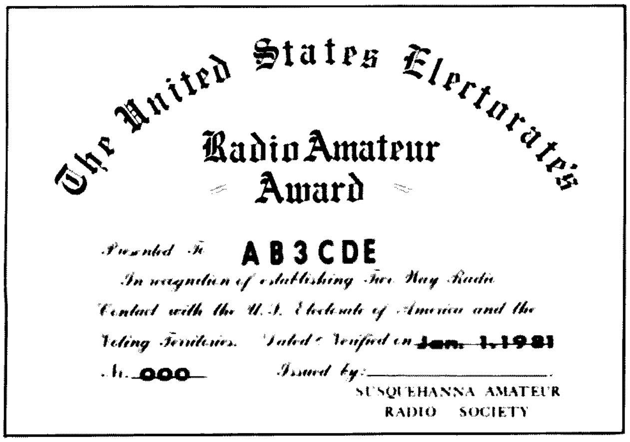
VOLUME G (Asia & South America):

All Japan Districts	Japan
All Japan DX Award	Japan
All Mediterranean Countries	Paraguay
All Zone 11 Prefixes	Paraguay
BRYLA	BRazil
Certificate of Radio Club of Paraguay	Paraguay
CRV	Argentina
CWMG	Brazil
CWSP	Brazil
Diploma Department of Paraguay	Paraguay
Diploma Paraguay	Paraguay
Diploma Sud-America	Paraguay
GPCW	Brazil
Japan Century Cities	Japan
Japan Osaka Century	Japan
Low Band Century Certificate	Japan
Mexico DX Award	Mexico
Nine Dragon Award	Hong Kong
PPC	Brazil
Tropics of Cancer & Capricorn Award	Paraguay
UBR Award	Brazil
Worked All Guns	Japan
Worked All Japan	Japan
Worked All Japan Prefixes	Japan
Worked All ZP	Paraguay
Worked 15 KA Stations	FEARL
XE-EA Award	Paraguay
ZP3 Award	Paraguay
8-PX	Japan
100-X	Mexico

be proud of. Even the XYL will be impressed!

Forward $5.00 for postpaid delivery of this certificate to your door. As with all awards sponsored by SARS, your satisfaction is guaranteed 100% or your money back within 10 days. Along with the US funds, include your name, callsign, address, and any awards you may wish to itemize at the bottom of the certificate.

Send your request to: SARS, PO Box 326, Montoursville PA 17754.



U.S. ELECTORATE'S AWARD

This award is printed on expensive parchment-like paper stock with jet black olde English lettering highlighting the diploma. This unique combination adds a richness not found in a lot of other awards being offered today. Measuring 11" × 14" the certificate is ready for framing.

The award is sponsored by the Susquehanna Amateur Radio Society. To qualify for this award, the applicant must work all (50) fifty states plus the following voting territories: KG6 (Guam), KG6S, T (Marianas), KP4 (Puerto Rico), KS6 (American Samoa), KV4 (Virgin Islands), or KZ5 (Canal Zone).

Applicants are asked not to send QSL cards! You may have your contacts verified by a local radio club secretary or by two licensed amateurs. As a last resort if no amateurs are available in your area, a notary public may countersign your claim.

Forward your verified list along with $4.00 USC or 12 IRCs in a self-addressed envelope to SARS, PO Box 326, Montoursville PA 17754.

EURD AWARD

The DARC announces their new EURD Award to promote RTTY activities. It is available to all amateur and club stations holding the required RTTY contacts. It is based on 2-way contact with different European countries and their prefixes.

Class III requires written confirmation (QSL) from at least 20 different countries (regardless of band) and a minimum of 100 prefix points. The WAE European prefix counts for 1 prefix point per band.

Class II requires at least 30 different countries and a minimum of 150 points.

Class I requires at least 40 different countries and a minimum of 200 points.

The EURD Trophy requires at least 50 countries and a minimum of 250 prefix points.

All amateur bands may be used including VHF; QSLs must confirm 2-way RTTY and shall be dated after January 1, 1965, to be valid.

Contacts made during the European DX Contest, WAEDC, RTTY portion may be used for EURD endorsements, provided the log of the requesting station has also been received. Should this be the case, claims for the EURD Award should not be made until after the contest results have been published.

The fee for each certificate is DM 10 or 15 IRCs. Send a list which has been verified by a local radio club official and the fee to: Klaus Zielski DF7FB, PO Box 1147, D-6455 Erlensee, West Germany.

The following WAE List of DX Countries applies: C31, CT1, CT2, DL, EA, EA6, EI, F, FC, G, GC, GD, GI, GJ, GM, GM (Shetland), GW, GU, HA, HB9, HB0, HV, I, IS, IT, JW, JW (Baer), JX, LA, LX, LZ, M1, OE, OH, OH0,

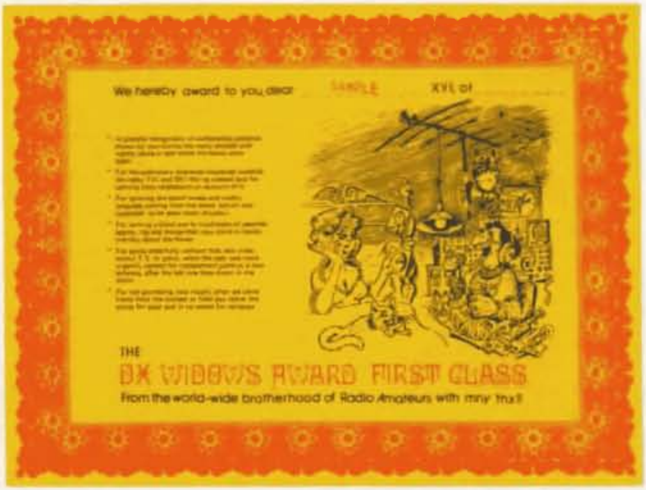
OJØ, OK, ON, OY, OZ, PA, SM, SP, SV, SV (Crete), SV (Rhodes), SV (Athos), TA1, TF, UA1, 3, 4, 5, 6, UA2, UA (Franz), UB5, UC2, UO5, UN1, UP2, UQ2, UR2, YO, YU, Y2, ZA, ZB2, 3A, 4U, and 9H1.

THE FIRST CLASS DX WIDOWS AWARD

This award is also sponsored by the Ballarat Amateur Radio Group of Australia. I am proud to announce that once and for all there is an award celebrating the misgivings of the many XYLs who are married to dedicated DX husbands. Rightly given the title of The First Class DX Widows Award, this certificate requires practically nothing more than your utmost patience as a XYL.

"Wives, for your outstanding patience shown by you during the many endless cold nights alone in bed while the bands were open . . . for the exemplary tolerance displayed towards the nasty TVI and RFI the rig created and for calming the irate neighborhood on account of it . . . for ignoring the weird noises and kooky language coming from the shack (which was supposed to be your room, anyway) . . . for turning a blind eye to truckloads of assorted spares, rigs, and things-that-may-come-in-handy-one-day about the house . . . for going cheerfully without the new dress, color TV, or perm when the cash was more urgently needed for replacement parts or a new antenna, after the last one blew down in the storm . . . or for not grumbling (too much) when we came home from the contest or field day rather the worse for wear and in no mood for romance . . . this certificate of recognition is only for the deserving—the XYL in waiting!"

If you are an XYL, or husbands, if this sounds like something your own XYL deserved long ago, perhaps the least you could do is enclose $2.00 and request this award by sending your remittance direct to: Maurie Batt, R.S.D. Rokewood Junction, Victoria 3351, Australia.



MOUNTAIN STATE AWARD

The Logan County ARC will hold its first annual Mountain State Award expedition from 1600 UTC August 22 until 1600 UTC August 23, 1981. Operations will take place on a West Virginia mountaintop in Logan County, which is located in the heart of southern West Virginia's billion-dollar coal fields.

Phone operating frequencies will be approximately 25 kHz from the low end of the General phone bands as propagation allows. Novice-band frequencies of 3725 and 7125 should be checked each hour from 1600 UTC August 22 to 0400 UTC August 23.

The callsign WD8KWC will be used. A handsome 8" × 10" certificate will be awarded to all contacts submitting a QSL and legal-size SASE to Basil Napier WD8KWC, RFD 1, Box 198, Chapmanville WV 25508.

TIMBER CARNIVAL

The Mid-Willamette ARC will be operating from the World Championship Timber Carnival in Albany, Oregon, 1900 UTC, Friday, July 3, until 2300 UTC, Sunday, July 5. Look for W7SO on 3.975, 7.275, 14.285, 21.375, and 28.575 MHz, and for club members operating their own stations on various other frequencies. A special certificate will be sent to each station sending a QSL card and an 8½" × 11" SASE to Mid-Willamette ARC, PO Box 1226, Albany OR 97321.

THREE MILE ISLAND DXPEDITION

The Central PA DX Club will hold a TMI Fun DXpedition on August 22-23, 1981, from 1200Z Saturday until 2100Z Sunday. Tentative frequencies on phone are 3900, 7240, 14260, 14290, 21325, 21375, 28625, and 146.58. Tentative CW frequencies are 21125 and 7125. The callsign used will be WB3DNA/portable TMI. A QSL card will be sent to all contacts upon receipt of an SASE or IRCs. QSL to CPDXC, c/o WB3DNA, T. Fanus, 6140 Chambers Hill Road, Harrisburg PA 17111 USA.

KAHANER REPORT

Larry Kahaner WB2NEL
PO Box 39103
Washington DC 20016

REACH OUT AND CRUSH SOMEONE

You wouldn't think that the world's largest corporation, one with a $6 billion net income, needed a boost, a little help to compete in the marketplace. Well, think again. In its ruling on cellular radio—a new mobile telephone service that promises a dial tone in every Dodge—the FCC handed AT&T a competitive edge so sharp that others wanting to enter the field may never get a chance to try. First, some background.

It all began about 12 years ago when the FCC and others realized that the then state-of-the-art mobile phone service was heading for disaster. Channels were crowded, voice quality was poor, and waiting lists swelled with those who needed phones in their cars. Things didn't get better and, indeed, couldn't get better because the system just couldn't support high numbers of users. Each city had one mobile operator who had one transmitter and about a dozen frequencies for thousands of users. You waited your turn to get through while someone calling home tied up the frequency all over town. Now, enter the cellular radio concept.

It didn't rely on one transmitter—it relied on many, each in a different section of the city, each called a "cell." They're low power as are the car telephones, so many conversations take place at the same time without bothering someone else in a neighboring cell. As you drive from cell to adjacent cell, you are handed off without interruption. As customers increase, you just divide cells into smaller cells—a sort of electronic mitosis.

AT&T asked for FCC permission to test cellular radio in Chicago, and about two years ago it began. The full-scale experiment involved 2,000 people, mostly businessmen. Things worked splendidly. Voice quality rivaled that of regular landline telephones, and blocking (how often you couldn't get a dial tone) checked in at about 2 in 100 times. Satisfied mobile dialers deluged the Commission with fan mail, saying: "We need this and we need it now."

In Washington, meanwhile, Motorola started its own test in conjunction with a local radio common carrier. That system, compatible with Bell, also worked great, although it still had some minor kinks.

Anyway, everyone agreed cellular radio worked, that it was time to wave the green flag so we could all dial while we drove.

As with all Commission matters, cellular radio traveled through legal mazes until it finally surfaced at the beginning of April with a hearing that ended with a proposed rulemaking, the final step before law. At that

meeting, the FCC decided all sorts of technical and economic issues such as where the service will operate (800 MHz), who can manufacture equipment (anyone), and whether it is indeed in the public interest (of course—what are you, crazy?).

But the most controversial part was the number and kind of common carriers in each market. Two kinds of common carriers exist: wireline and wireless, also called radio common carriers. Wireline common carriers serve the public with copper wires, e.g., telephone companies. Non-wireline common carriers use airwaves, e.g., paging companies.

The FCC decided that each market would host a maximum of two cellular operators, one wireline and one wireless (even though the cellular systems are identical). Each would receive a 20-MHz spectrum chunk. The Commission also said that in each market the wireline allotment would be held for five years. No one else could touch it. Now, the good part.

Since wireline carriers are guaranteed a slot, and AT&T is the dominant wireline carrier (the only wireline carrier in many regions), AT&T is virtually ensured a hook into any market it chooses. And while radio common carriers remain locked in comparative hearings amongst themselves for their 20-MHz piece of the pie, AT&T would have sucked up prime sections of prime markets for themselves. Reach out and crush someone, Ma Bell.

The Commission justified the 2-slot method by saying it's the best way to get cellular radio to the public quickly. They said AT&T might not invest in a market unless it was ensured a clear shot. Also, it deserved special consideration because it did most of the experimental work.

The Justice Department called the split method "blatantly anti-competitive" in a reply it filed last July during FCC procedures. Travis Marshal, Motorola's vice president handling cellular matters, said FCC actions amounted to giving AT&T a lock on the market while everyone else "scrambles for the remains."

One small radio common carrier, Millicom, filed suit in the US Court of Appeals for the District of Columbia, asking the court to overrule the FCC. They said markets should be open to competition no matter who you are or what kind of carrier you are. If AT&T wins, so be it; but let's have free competition, they said. More lawsuits are expected.

All the FCC's general counsel said publicly on the subject was: " The position is defensible in court."

Why the FCC believed it had to give the world's largest corporation a leg up on a system it could dominate very easily on its own in unknown. However, one thing is clear: In its belief that helping AT&T would move things along, the FCC may have inadvertently shifted cellular mobile radio into reverse.

ALL I GET IS BILLS

The FCC would get authority to set minimum interference standards for TV sets and other home entertainment devices under a bill introduced into the Senate by Barry Goldwater. We've seen this sort of thing before—in fact, several times before.

Bill S-929, titled "Amateur Radio Service and Private Land Mobile and Fixed Services Act of 1981," differs from past bills in that it increases amateur license terms from five to 10 years and allows hams and CBers to act as volunteer monitors for the FCC.

Perhaps the most important provision gives the FCC power to regulate or prohibit delivery of transmitters to unlicensed persons. This means you can't buy a rig until your license arrives. Manufacturers and retailers are certain to put up a fuss over that section.

FCC UNHAPPY WITH JUSTICE DEPT OVER ANTI-CASTRO BROADCASTER

The FCC's enforcement teams are bitter over the Justice Department's refusal to prosecute a Miami radio pirate caught broadcasting anti-Castro propaganda in the 40m band. Commission officials say they spent more time on that case than on any other unlicensed operator enforcement matter in recent years. Staffers are particularly miffed because they believe Justice dropped the case for political rather than legal reasons.

The incident involved Jose Gonzalez, charged with unlicensed operation after his transmissions showed up on neighbors' TV sets. Hams all over the world complained of interference, too. The Miami and Fort Lauderdale monitoring stations tracked Gonzalez's clandestine activities from December, 1979, to April, 1981, logging more than 1,000 man-hours. The FCC presented the case to the Justice Department but, on April 14, US Attorney Atlee Wampler dropped the charges on the condition that Gonzalez cease operation from his home. The Justice Department still retains the right to prosecute Gonzalez if he transmits from another site.

Former chief of investigations Jeff Young said that in his personal opinion, because Gonzalez was popular in the Cuban community, Justice decided to drop the case rather than stir up resentment in a neighborhood suffering severe racial problems. Fort Lauderdale engineer-in-charge James Feagles gave us similar thoughts. "We were frustrated... It wasn't our decision, of course; it was Justice's and we have to believe that [politics] was the case in their decision." He said that without Justice's support, illegal operations will continue. "I'm concerned that the Cuban community in Miami might perceive this as a victory. It might lead to increased activity," said Feagles.

Atlee Wamper said politics played no part in his decision. "It's simply not true. Those accusations are blatantly false." He added that with all the criminal cases he must handle, dropping this case seemed justified. "With all the crime perpetrated by Cuban criminals from Castro's jails, prosecuting one 60-year-old man without a criminal record seemed ridiculous," he noted.

He has a point. So does the FCC staff.

LOOKING WEST

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Hollywood CA 90028

One question often asked of this reporter is why we delay in reporting actions by the FCC and other agencies regarding malicious interference. There is a very sound reason for this, which has to do with the Constitutional guarantee that states that a person is presumed to be innocent of a crime until found guilty. While it is very tempting to any reporter to "cash in" as it were on hot news items, especially those which involve the current wave of jamming sweeping over our amateur bands, I always have taken the view that the guarantees afforded to an individual under our Constitution are far more important than any story I might write. Hence, while a matter is under litigation, as was the case in the item you are about to read, I refrained from commenting on it.

Only after a decision has been reached by the powers that be will I go into detail about such matters.

What you are about to read is an actual story about a license revocation in the Amateur Service. This in itself is nothing new. Amateurs have lost their licenses for various reasons, usually some form of major violation to Part 97. Again, this was the case here. But the reasoning behind the license revocation issued against K6EOA is possibly a first on the part of the Commission. It could have far-reaching effects on the eligibility of anyone to hold an amateur license.

The following report was written by Alan Kaul K6RCL, who assists me in the preparation of the weekly Westlink newscasts. It was the lead story in Westlink "QST" number 167 which aired the week of April 11th, 1981. It was prepared from the actual FCC Report and Order dated March 24, 1981, which ordered that the amateur license of John W. Munson, Jr. K6EOA be re-

voked. Here is that report.

"This story centers on an FCC license revocation, but it may be a milestone case because an administrative law judge has decided that mental incompetence is grounds for license denial. The judge also said that when an individual applies for an amateur license, he or she must abide by federal radio regulations, and thus as a licensee does give up certain First Amendment rights.

"The case involves K6EOA, John W. Munson, Jr., of Los Angeles. On October 2, 1979, Munson was alleged to have transmitted an A0 emission on 147.435 MHz, jamming transmissions on a Los Angeles repeater. FCC engineers Lawrence Guy and James Zoulek of the Long Beach, California, FCC office were nearby monitoring the transmission in a van equipped with direction-finding equipment. They recorded the transmission, then knocked on Munson's door. They showed their identification and attempted to inspect his station, log, and license.

"But Engineer Guy said later in his official report that they were not permitted entry and that Munson refused to show them his license or the records of his station. They returned to their monitoring vehicle and again started their tape recorder. This time they not only recorded more A0 emissions, but also threats on their lives if they attempted to inspect the amateur station again. And, as Guy testified later, a threat to kill another amateur as well.

"As a result of the threats against the lives of two federal officers, Guy went to the US Attorney and a complaint was issued which included a warrant to search the premises of Munson's home. Technically, a search warrant wasn't needed because the engineers had witnessed an infraction of federal law, and under Part 97 an amateur who is observed violating the law with his radio transmissions must open his station, log and license to inspection.

"Three days later, on October 5, 1979, Munson showed up at the FCC Office in Long Beach and was arrested. [Note: At the time of the arrest, he had voluntarily gone to the FCC office to give to them an official written apology for his actions.] Guy also served him with the search warrant and entered the ham shack of K6EOA. A stolen portable receiver, a loaded rifle, marijuana plants, and transmitting equipment were seized. On March 19, 1980, a federal grand jury in Los Angeles returned an indictment against Munson for violation of federal radio law and for threatening the lives of FCC enforcement officers.

"But, two months later, the indictments were dismissed when a court-appointed psychiatrist found that Munson was legally insane; he lacked the mental capacity to discern the unlawful nature of his actions.

"In September, 1980, state charges were filed against Munson, and in what is called by lawyers a four-count "criminal information" he was accused of threatening bodily harm. In November, Munson entered a guilty plea to one of the state counts and in January of this year the judge ordered him to pay a $500 fine, not to use his amateur equipment, and to undergo psychotherapy. He was also placed on three years probation.

"At this point one would think this would have been the end of the Munson case, but it wasn't. The FCC reentered the act and ordered a hearing on licensing before the Chief Administrative FCC Law Judge, Lenore Ehrig of Washington DC. [Note: The actual hearing was held in a Federal Building here in Los Angeles.]

"In her findings, Judge Ehrig held that since Munson was not mentally competent to discern right from wrong in his Federal prosecution, he was not mentally competent to operate a lawful amateur radio station, that operating such a station would require adherence to the law.

"The Judge also held that when one applies for an amateur license under Part 97, one also implies consent to certain federal regulations. One doesn't give up his right to free speech, but at the same time, some lawyers would argue that a ham license doesn't entitle you to exercise your right of free speech on amateur radio. As an analogy, you can play music at home, in your car, or just about anywhere else you want except on the amateur bands using your amateur transmitter.

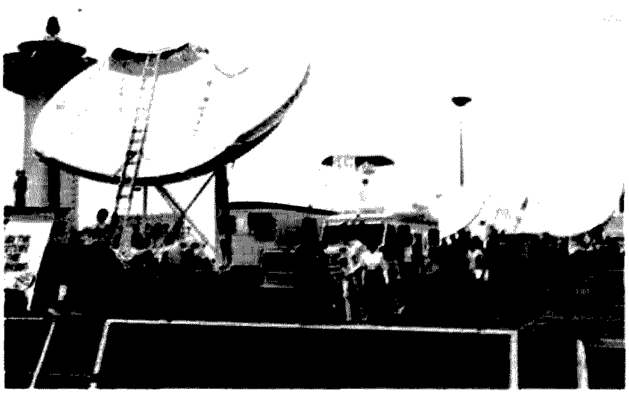
"We might be a bit premature in calling these precedents and findings as landmark decisions, but the actions of the FCC Administrative Law Judge in this case have affirmed the right of the Commission to make laws and to enforce them."

Commentary:

If space had permitted, I would have published the entire 11-page FCC finding in this case. I do have it, but please do not request copies. I have neither the time nor the funds. If you need a copy, I can only suggest that you contact the FCC in Washington and request it. There will probably be a charge for the transcript, though I have no idea as to the exact costs. For those interested, there are a number of news services that supply such information. "FCC Observer Services" you might call them. They're expensive, but if you are an FCC watcher, they're worth their weight in gold.

As to the Munson case itself, I think that I should explain that there is a definite reason for my not writing directly on the matter until now. There are actually several reasons, not the least of which was that I was one of probably hundreds listening the evening that the now proven violation occurred. As you know from my past writings in this column and elsewhere, I am strongly opposed to permitting wanton regulatory violations to continue. I honestly felt that after listening to things first hand, I could not be objective in my reporting. Nor did I want to see John Munson or anyone else "tried and convicted in the press." I do not know the man personally. I had spoken with him on two meters prior to the episode which cost him his license. I had also talked with him on the phone. While our views were not in accord and probably never can be, I still felt a strong obligation to both him and the Commission to permit them to solve things themselves. I told this to John and the local FCC people at the outset, and at that point I removed myself from handling the matter in this column or on Westlink.

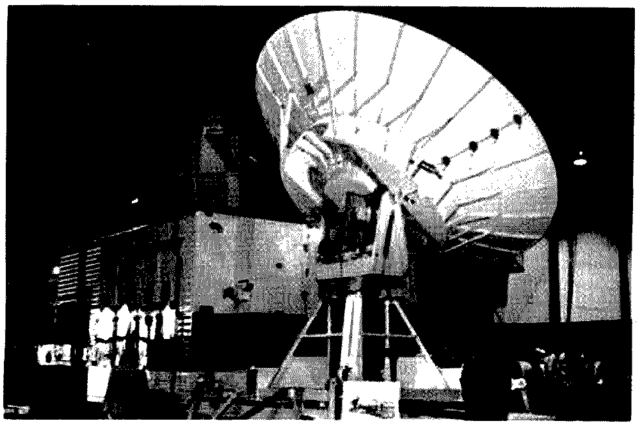
Those of you who heard about John Munson's problems either on Westlink or in *H.R. Report* should be made aware that those were from official reports, court news releases, and other such sources. To paraphrase a well-known expression from the long-expired television program, "Dragnet," it was a case of having one of my coproducers provide "the facts m'am... simply the facts." Maybe you could call this my own personal fairness doctrine, but having Alan write what now appears to be the final chapter in this story was in keeping with what I felt obligated to do. Not being an "earwitness" to the initial happening afforded him a certain objectivity I might not have been able to achieve.



Satellite communication is definitely the wave of the future, as this parking lot full of ground stations will attest.

NAB-IT DEPARTMENT

The initials NAB stand for the National Association of Broadcasters, and each year this august body, which represents every aspect of today's broadcast technology, holds an annual get-together. This year it was the city of Las Vegas that played host to the NAB Convention on the weekend of April 12th, and I had the opportunity to get to NAB '81 thanks to Rupe Good-



This is a complete mobile television studio capable of directly feeding a satellite from any location.

Named by the Dayton Amateur Radio Association to receive the 1981 Specific Achievement Award are (left) Bill Pasternak WA6ITF and Bill Orenstein KH6IAG, for their work in producing the weekly Westlink news bulletins.

speed WA6QLE and Western Airlines; the former going up and the latter for the return trip.

My reasons for attending NAB were purely business, having nothing whatever to do with amateur radio, but nonetheless, I did have the foresight to bring along my Wilson hand-held. I soon found that I was not the only one who had thought of this. As you are probably aware, many people in the broadcast industry have their roots in amateur radio, and 146.52 simplex was very much alive as the unofficial intercom channel. In my 30 short hours I heard someone from every US prefix district, including such well-known people as Jean Shepard K2ORS come onto the channel. By the way, the VoCom gain antenna seemed to garner a lot of attention each time I found it necessary to utilize its efficiency for communication with someone who was marginal on the rubber-duckie. Again, that antenna has come in quite handy, and I can again say for the record that its performance meets its claims.

Probably the most interesting exhibit was in the parking lot adjoining the main exhibit hall. Never before have I seen so many dishes in one place at the same time. I didn't have a wide enough lens to catch everything aimed skyward.

Other equipment shown included the latest in mini-cameras and portable recorders for use in electronic news gathering. Each year the size of field-production equipment seems to shrink, with the old 40-pound cameras giving way to the new lightweight varieties. I was very impressed by one from a company you probably never heard of unless you are involved in television production. The company is called Ikegami, and for many years they have been the trendsetters in portable field-production camera equipment. Many cameramen consider their HL-79 series the state of the art standard. Having used the HL-79 myself, I can see why. They have a new smaller camera called the HL-83. It's a professional 3-tube prism beamsplitter camera that weighs less than most home cameras, with an electronics package that will make your mouth water. It even has provision for attachment on one of the new mini-VCRs directly to it making a one-man ENG operation possible. The only drawback for you and me is the price: many kilobucks.

If equipment was of use to any part of the broadcast industry, it could be found someplace on the convention floor. I spent many hours ogling some of the new production audio recorders shown; wishing I had the kilobucks to buy them for Westlink. Alas, like many other things in life, this is but a dream.

While NAB is not the kind of show that the average amateur will ever attend, it is an interesting experience if only from the standpoint that what one sees at NAB will, in a simpler, less complex form, find its way into the average American home. Today, we take owning a VCR for granted. Five years ago they were found only in television stations, educational institutions, and similar environments. What happens at "that" end of the media stream eventually affects us all. It's nice to see it first-hand and even nicer to be able to share a bit of it with you.

A QUICK THANK-YOU

On behalf of Bill Orenstein KH6IAF, Alan Kaul W6RCL, Burt Hicks WB6MQV, Jim Davis KA6IUH, and everyone else who make up Westlink Radio Network operation, I wish to express my humble and sincere gratitude to the Dayton Amateur Radio Association for selecting the Westlink operation to receive the 1981 Specific Achievement Award. Though the award names Westlink, Bill Orenstein, and myself as recipients, it is something we all share collectively. For the honor you have bestowed upon us, we say thank you for the recognition. It is an honor we will hold dear all of our lives.

FCC

APPLICANTS FOR SPECIAL TEMPORARY AUTHORIZATIONS MUST FOLLOW THESE PROCEDURES

The FCC has announced that requests for Special Temporary Authorizations (STAs) in all Private Radio Services, except Private Operational Fixed Microwave, must be sent to a new address: Federal Communications Commission, Consumer Assistance Branch, Box 441, Gettysburg, Pennsylvania 17325.

STA requests for Private Operational Fixed Microwave (POFM) should continue to be sent to the Federal Communications Commission, Washington, D.C. 20554.

All information must be submitted, in writing, to the FCC preferably on business or company letterhead. Requests should reach the FCC at least ten (10) days before the proposed date of operation.

In an extreme emergency, FCC rules allow a request to be filed by telegram or telephone. Such a request, however, must be followed by a written signed request within ten (10) working days of the telegram or telephone call. If the written request is not received within that time, the FCC will rescind the STA.

General questions concerning STAs and other licensing activities will be answered by the Consumer Assistance Staff in Gettysburg, Pennsylvania. Call (717)-334-9167 or 334-7631.

EXTERNAL RADIO POWER AMPLIFIER TYPE-ACCEPTANCE REQUIREMENTS EXTENDED INDEFINITELY (DOCKET NO. 21117)

The Commission has adopted a rule change extending indefinitely its type-acceptance requirements for external radio frequency power amplifiers.

The requirements apply to all amplifiers and amplifier kits capable of operation below 144

MHz. They cover most amplifiers used in the Amateur Radio Service. Type acceptance requires submission of a sample of each model amplifier, together with technical information, to the FCC for approval before it can be manufactured and marketed. Only 10 prototype units may be built in preparation for model submission for type acceptance.

The Commission on December 18 instructed its staff to draft an order that would extend the type-acceptance and related technical requirements indefinitely. The requirements were adopted in 1978, effective for three years, to cope with the problems created by the large number of amplifiers being marketed and promoted for use in and around the CB frequencies. External power amplifiers of the sort used to amplify CB signals illegally can cause serious interference to TV and radio reception.

The effectiveness of type acceptance in halting promotion of amplifiers for illegal applications indicates that it should be maintained, the Commission said then. Numerous manufacturers and distributors of amplifiers designed or promoted for illegal operation have ceased manufacture or marketing since type acceptance was imposed.

The rule change took effect April 28.

Action by the Commission March 23, 1981, by Second Report and Order (FCC 81-118). Commissioners Lee (Acting Chairman), Quello, Washburn, and Fogarty, with Chairman Ferris not participating. For further information, contact John Reed at (202)-653-6288.

FCC REFUSES TO CONSIDER ELIMINATION OF NEW AMATEUR RADIO SERVICE CLUB LICENSES (DOCKET NO. 21135)

The Commission has denied the petition of the Capitol Hill Amateur Radio Society (Capitol Hill) for reconsideration of its action in discontinuing the issuance of new Amateur Radio Service club licenses.

In June, 1980, the Commission determined that no new licenses would be issued for club, military recreation, and Radio Amateur Civil Emergency Stations, except for modification or renewal of licenses.

Capitol Hill claimed that the Commission was deficient procedurally in discontinuing new club licenses, in that it did not consider the alternative of continuing the system of issuing club station callsigns from the regular format calls. The Commission said it had considered the option of continuing such licensing and rejected it.

Capitol Hill also contended that the amended rules are not in the public interest because they do not foster amateur growth to serve the public in times of emergency. It also maintained that eliminating future club station licenses lessens the likelihood of such emergency preparedness.

The Commission said that operations now conducted by club stations may, in the future, be conducted either by club members operating portable stations or acting as control operators of another member's station. The Commission said it does not believe eliminating club licenses will result in a disinclination of the public to form amateur radio clubs or in failure of educational institutions to fund amateur radio clubs.

Action by the Commission March 26, 1981, by Memorandum Opinion and Order (FCC 81-123). Commissioners Lee (Acting Chairman), Quello, Washburn, Fogarty, and Jones, with Chairman Ferris not participating. For additional information, please contact John Borkowski at (202)-632-7597.

LEAKY LINES

Dave Mann K2AGZ
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Kinnelon NJ 07405

There are hams who have been at it for decades, people who have devoted their best efforts to one or another phase of the hobby with great dedication. In other fields of human endeavor there are tangible rewards to be gained. If you were to dedicate all the energy that is expended by the average ham into, say, the study of some musical instrument, chances are that you would eventually become so accomplished that you could earn a great deal of money. If you devoted yourself with equal persistence to university studies, you could earn an advanced degree. If you displayed as much ingenuity and tenacity in the position you now hold, you might be in your company's top echelon of management.

People find it hard to understand why we amateurs become so deeply involved in such activity, one from which relatively few tangible rewards can be gained. To many ordinary laymen, hams seem like a company of superannuated fools who play with childish toys. Even the families of some amateurs display a degree of vague embarrassment when the subject arises; they would feel much more comfortable if Dad were a yachtsman, a golfer, a fisherman, a photographer, or even a bird-watcher. Such activities are regarded as normal, but for some unfathomable reason, ham radio makes little or no sense at all. You explain that you communicate with others all over the globe, and they view it as something akin to what they did when they were kids and cultivated "pen pals" whom they wrote to during their summer vacations. You tell them that you handle traffic during emergencies, and they tell you about the time some CB oaf on the next block interfered with their TV reception. You show them your RTTY equipment, and they ask you if you can receive police calls or the daily stock quotations.

The most frequently asked question of all is, "What do you get out of all this?" They are unable to fathom any other motivating factor. To them, unless something tangible can be gained, there's no sense in devoting time, energy, and money to such activities. They cannot relate any accomplishment, however worthy, to success unless there is some sort of a payoff.

Like as not, if you were to assemble a group of amateurs and ask each to give his motivation, his purpose in being a ham, you would be likely to get a different answer from each of them. But I doubt that even those who actually work in allied fields would cite material reasons. Sure! There are hams whose careers opened as a direct result of their participation in ham radio, but if you ask them, you will learn that they never regarded the hobby as a mere means to the end.

For at bottom, practically all of us are hams because of one single word—*enjoyment*. I don't care what your bag is. . . handling traffic, slow scan TV, CW, DX, RTTY, satellite, QRP operation, designing and construction, mobile hamming, antenna development, digital techniques, antique wireless, county hunting, public service nets, or just plain garden-variety rag-

NO-CODE POLL RESULTS

The response to the no-code license question that appeared in the April Leaky Lines was rather one-sided: 94% said to keep the code! The remainder indicated that they thought the code requirement should be dropped. However, some of those wanting to keep the code said that they thought the code speed requirement should be reduced for a variety of reasons.

What we found particularly interesting was that the Fun! column poll in the March issue had a larger number of hams respond to it than to the no-code poll, although without the vehemence. Well, there certainly is no accounting for taste.

We would like to thank all who responded, and particularly those who included a comment or two along with their votes.

chewing...I know that I must have omitted at least a dozen more. The essential reward we derive is enjoyment. Not the enjoyment of the sudden flush of an easy victory such as one might feel when winning at cards...not the sort that comes from a sudden stroke of luck. But the sort of enjoyment one feels from honest accomplishment based upon dedicated work and an understanding of problems and obstacles to be overcome. There's a great difference.

I think it is significant that this column, which began as a polemic against the sick public preoccupation with materialistic goals, one of the distressing manifestations of our era, has automatically turned toward another direction. It has become a declaration of pride in the world's greatest hobby—amateur radio. It is the queen of hobbies. To be sure, there are faults to be found; nothing is perfect. But the faults are enormously outweighed by the positive values. And we do tend to focus on the bad rather than the good.

But, for the most part, we hams are chauvinists, in a way; we don't run down other people's preferences, but we are quite firmly convinced that when it comes to hobbies, ours is unquestionably the best.

Well, I'm sure that anglers, philatelists, and photographers must feel the same way. But there is an enormous and most significant difference; ours is a hobby whose entire progress and history is characterized by contributions to the society of mankind. Others have contributed, too...amateur astronomers have produced significant discoveries; amateur explorers have accomplished feats of importance. But there is no avocation which has so consistently broken new ground in the art and science of communications in ways that have so positively affected the lives of those who inhabit the planet.

Radio amateurs have made so many contributions which are now taken for granted, continue to do so to this very day, and will do so in the future. But, as always, whenever you have a record of accomplishment, you must guard it vigorously against those who would seek to exploit it for undue advantage or personal gain. There are those, unfortunately, who are forever scheming toward such ends, and there must be constant vigilance on the part of thoughtful amateurs.

One of the unmistakable hallmarks of the bonanza seekers is their constant emphasis on the growth of numbers rather than increased quality. I must declare that if all the current agitation in favor of the code-free, entry-level amateur license was originating among hams themselves, I would view it with far less apprehension. Whenever there is a cry raised for proposed changes that would increase our numbers through the elimination or lowering of standards, you don't have to search very far to find out where it's coming from. It is inspired by those who don't give a tinker's damn about the future of amateur radio, except in terms of the money that it represents.

They view that huge, untapped ocean of potential customers who will be in the market for equipment, and the saliva oozes from the corners of their slavering mouths!

I honestly and sincerely believe that this is the true origin of each and every proposal of this sort. And I also believe that those among us who have been led to endorse such plans, although they fail to grasp the fact, are simply being used as unwitting pawns. And because I have stated this, there are those who have said of me that "he has an axe to grind."

I wonder...does anyone have a bigger axe to grind than those who seek to sacrifice the integrity and quality of amateur radio on the altar of financial profit? And what about those Judas goats who aid and abet them?

I leave the answer to you. Do you seriously believe that, if I were to deliberately set out to harm the League (although I can't see how my opposition to a code-free license could possibly hurt it), it could be as great a threat as certain people's willingness to do anything for money? Do you think that my interest in promoting increased subscriptions and newsstand sales of this magazine are as great a threat as our failure to organize immediate, vigorous opposition to any FCC proposal that would deleteriously affect amateur radio? What is this mysterious "axe" that I have to grind?

I have been a loyal member of the ARRL for many years. I support it in every possible way. But that support includes an obligation to oppose paths which I consider harmful. And I do not think that the League has to run a referendum or take a poll in order to learn that the huge majority of its members strenuously oppose code-free licensing. I don't care who proposes it—the FCC, the manufacturers of electronic equipment, or goodness knows which of the several lobbies which represent special interest groups. The League should respond to such proposals immediately, with vigor and in no uncertain terms. It should never give the impression as to the slightest doubt about where its overwhelming majority stands by delaying its response pending further study or discussion. Opposition should come immediately and automatically.

This was the point of my piece in the April issue. it had come to my attention that when the FCC first floated this code-free idea, vigorous League opposition did not ensue immediately. It was delayed, and I suspect that the delay was inspired by a certain tendency toward slavishness on the part of a few people who feel that we must kowtow to the Commission, hat in hand. Well, diplomacy is wonderful, but it doesn't do much good in a life-threatening situation. You can't reason with a guy who has a knife poised at your throat!

If K2AGZ has any axe to grind at all, it is simply that he believes we need to develop some militancy in our dealings with the FCC and with those in positions of power who are or may be in the hip pockets of forces which don't have the future of amateur radio in mind. That's my "axe," and I intend to keep right on grinding it!

NEW PRODUCTS

MACROTRONICS' MAILBOX RTTY SYSTEM

Macrotronics, Inc., has announced the development of a disk-based "mailbox" RTTY system into a sophisticated RTTY communications terminal. The system has been designed for simplicity yet contains many new features. Some of these are:

- Disk-based WRU with "mailbox" storage and retrieval of messages.
- Disk-based programmable messages.
- Disk-based storage and replay of received text.
- Transmission and reception of BASIC programs, assembly source listings, object code, and data files in INTEL Hex format with error-checking and direct-save on disk in executable form.
- Auto 10-minute ID timer.
- User-programmable end-of-file sequence.
- Word mode editing.
- On-line buffered ASCII printer-driver.
- Communications through the Macrotronics interface or the Radio Shack RS232C interface board.

it is expected that the system will particularly appeal to:

- Repeaters: Set up in the WRU mode, it lets repeater users leave or play back messages. Special announcements, W1AW bulletins, propagation forecasts, DX bulletins, etc., can be made available. These may be created from the keyboard, created "offline" using the "Electric Pencil" (a registered trademark of Michael Shrayer Software) or "SCRIPSIT" (a registered trademark of Tandy Corporation) or saved off the air (and edited later with the "Electric Pencil" or "SCRIPSIT" if desired).
- MARS/Traffic handlers: The operator can save a message off the air to disk, replay it anytime on command, transfer it to another station's "mailbox," and let him call it up later. With the "Electric Pencil" or "SCRIPSIT" disk program, he can edit the

received text to correct "hits," insert "misses," add new text, rearrange paragraphs, etc. If his net requires a special end-of-line character sequence, he can program his own. Traffic can be originated by using either keyboard entry or the word processing capabilities of the "Electric Pencil" or "SCRIPSIT" disk program to create text and save it to disk. It can be transmitted at any time under keyboard control or transferred to a mailbox for automatic call-up by the destination station. For hard copy of all traffic, the operator simply has to turn on a parallel ASCII printer connected to the Radio Shack parallel printer port, and all received as well as transmitted text is output to both video and the printer.

• Program swappers: Programs and/or data files can be exchanged direct, disk to disk. This includes BASIC, assembly source, and object code. Using INTEL Hex format, the user can communicate in either the Baudot or ASCII modes. A checksum gives automatic error-detection. Programs received in this way are directly executable from disk.

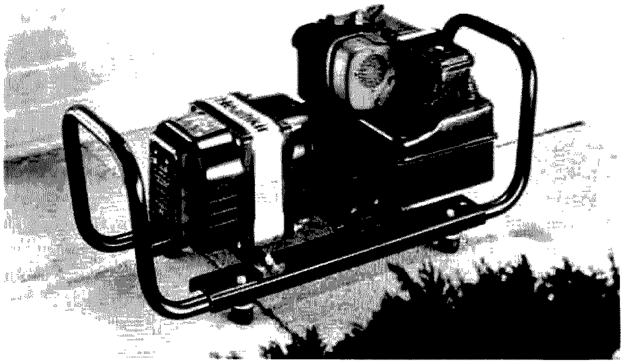
• High-speed ASCII buffs: The system allows communication through the Radio Shack RS232C interface board. The user can attach a conventional telephone modem and communicate over the air (or telephone) using Bell 103 tones and 300 baud. The system will communicate through the RS232C board at baud rates from 50 to 1200.

The M8000 disk-based RTTY system requires the Model I TRS-80 with at least 32K RAM and one Radio Shack disk drive, plus a Macrotronics ham interface (models M80, CM80, or TM80).

The M8300 disk-based system requires the Model III TRS-80 with at least 32K RAM and one Radio Shack disk drive, plus a Macrotronics ham interface (models M83, CM83, or TM83).

Both systems come complete with customized program on disk, extensive User Guide in three-ring binder, quick reference card, and conversion module.

For further information, contact Macrotronics, Inc., 1125 N. Golden State Blvd., Turlock CA 95380; (209)-667-2888. Reader Service number 480.



Heath's GU-1820 portable power system.

HEATH GU-1820 PORTABLE GENERATOR

Heath Company has announced its entry into the emergency/auxiliary/portable power market with the Heathkit GU-1820 portable power system. This lightweight alternator can produce up to 2200 Watts of 120-V ac, 60-Hz power—enough to operate a ham station, an electric chain saw, or a refrigerator-freezer during a blackout.

The GU-1820 is designed for ham radio clubs, home owners, civil defense, and police and fire departments. It can also provide on-location power for construction and logging crews, campers, hunters, woodcutters, and others.

Voltage is regulated to within ±5% and frequency variation is limited to ±4 Hz, from no load to full load at 3600 revolutions per minute (rpm). Radio-frequency interference is eliminated by a resistive spark plug. The 5-horsepower Briggs and Stratton gas engine can run up to 1¾ hours at half load on a tankful of regular gas, or gasohol. Noise is controlled by a low-tone muffler; to reduce sparking to a minimum, the optional GUA-1820-1 spark-arresting muffler (required in California) is available.

For more information on the GU-1820 portable power system, contact *Heath Company, Dept. 350-035, Benton Harbor MI 49022.* (In Canada, write *Heath Company, 1480 Dundas Street East, Mississauga, Ontario L4X 2R7.*) Reader Service number 478.

NEW PRODUCTS FROM TRAC

TRAC Electronics, Inc., has announced the introduction of two unique products for the CW enthusiast.

The TRAC*ONE CW Processor, Model TE-424, is an advanced CW audio processor which receives the audio from any rig, passes it through a phased-locked-loop tone decoder (removing all QRN and QRM), and reproduces a fully adjustable CW audio signal. Front-panel controls allow full adjustment of frequency, tone, delay, and gain. The frequency control is adjustable from 300 Hz to 2500 Hz, a match for any rig. While the CW signal is being decoded, a front-panel LED flashes in sync with the signal, establishing that the unit is locked onto the audio from the rig. The TRAC*ONE contains a built-in speaker, a headphone jack on the rear panel, and is operated on a 9-V dc battery or with an ac adapter. In the bypass position, the Model TE-424 may be left in line and the rig audio is passed through to the speaker.

The TRAC*ONE + Deluxe CMOS Keyer, Model TE-464, combines the full-featured TRAC*ONE with a deluxe state-of-the-art CMOS electronic keyer. The keyer contains self-completing dots and dashes, dot and dash memory, iambic keying with any squeeze paddle, 5-50 wpm, speed, volume, tune, and weight controls, sidetone and speaker, rear-panel switch for use with a bug or straight key, and quarter-inch jacks for keying and output. The Model TE-464 keys both grid-block and solid-state rigs and operates on one 9-V dc battery or a 9-V dc ac adapter.

For further information, contact *TRAC Electronics, 1106 Rand Bldg., Buffalo NY 14203.* Reader Service number 481.

New products from TRAC.

AMATEUR RADIO PROFILES

A new publication is now available to the amateur ranks in the form of a quarterly technical journal. *Amateur Radio Profiles*, a worldwide publication, contains factual reviews on amateur equipment performance, quality, and service. It is written by amateurs who have used, tested, and compared—and will "tell it like it is."

Equipment evaluations not only include the typical bench-test specifications, but the important on-the-air appraisal and how it compares to present state-of-the-art units. It's written in plain, easy-to-understand language by amateur enthusiasts who have actually done the testing, comparing, and rating.

Both old and new market introductions are evaluated, and *ARP* is designed so that it can

be retained and stored for future reference.

A unique feature of *ARP* is the "GBBU Equipment Ratings," in which the good, better, best, and ultimate dollar values versus performance are listed for study and comparison.

Amateur Radio Profiles, a new introduction for 1981, has already reviewed over 100 amateur products, including 61 HF and VHF antenna systems. Popular transceivers, receivers, amplifiers, and hand-held products have also been reviewed and rated!

With its unique style of equipment reporting, *ARP* should prove invaluable for the amateur as a source for product study.

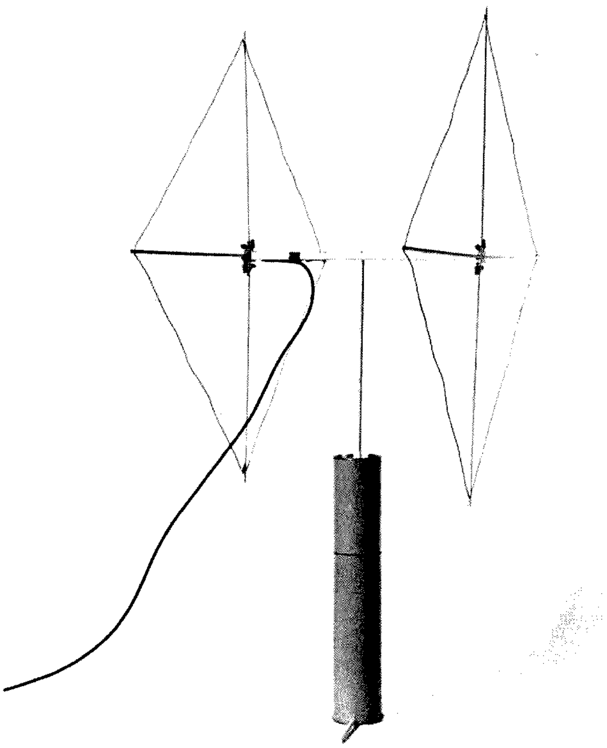
For further information, contact Amateur Radio Profiles, *Box 164, Cataula GA 31804.*

PORTABLE TWO-METER QUAD

A new collapsible antenna has been introduced by Palomar Engineers. It extends the range of low-power two-meter transceivers by providing the gain and front-to-back discrimination of a two-element quad. It is ideal for boating, backpacking, mountaintopping, and other portable applications since it gives the gain of a linear amplifier but does not require additional battery power.

The entire beam assembly is housed in an 18" carrying case hat will fit in a suitcase. For use, it unfolds to form a two element full-size quad complete ith stabilized mounting stand.

For further information, conact *Palomar Engineers, 1520-G ndustrial Avenue, Escondido A 92025.*



Palomar Engineers' portable two-meter quad.

BENJAMIN MICHAEL INDUSTRIES' MODEL 273 CLOCK

Benjamin Michael Industries, nc., has announced the addiion of the Model 273 to its line of 24-hour military-time-format clocks. The 273 is housed in a standard three-inch aircraft instrument case and is designed for mounting in the aircraft panel. The large, highly visible, LCD-type display provides the pilot with a direct readout of MT time and eliminates the need to convert from local time. The highly efficient four-digit liquid-crystal display remains visible in bright sunlight and internal, push-button-activated backlighting is provided for night viewing (though cabin or post lighting is usually sufficient).

Installation of the 273 is facilitated by the fact that the unit is powered entirely by an internal battery; connection to aircraft power is not required. The clock will operate for well over a year on a single 1.5-volt battery and the unit need not be removed for battery replacement. An identical 12-hour clock with AM and PM indicators is also available as the Model 272.

For further information, contact *Benjamin Michael Industries, Inc., 65 E. Palatine Road, Prospect Heights IL 60070.* Reader Service number 488.

Benjamin Michael Industries' Model 273 clock.

CATALOG ON TADIRAN LITHIUM BATTERIES PUBLISHED BY PLAINVIEW ELECTRONICS

Tadiran lithium thionyl chloride (inorganic electrolyte) batteries are prized for their high cell voltage, safety, long life, high energy density, and wide operating temperature, and are used as power sources for CMOS circuits, memories, and in high-reliability instrumentation. The new Plainview Electronics catalog describes 4 popular sizes—½AA, AA, C, and D—including complete operating specifications and applications hints. Each cell's nominal working voltage is 3.4 volts. At room temperature, shelf-life is greater than 10 years.

For further information, contact *Plainview Electronics Corp., 28 Cain Drive, Plainview NY 11803.* Reader Service number 479.

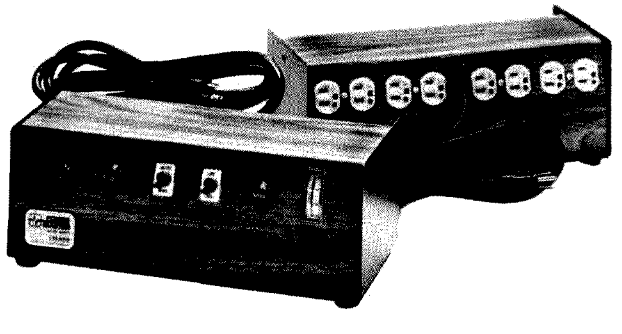
TRANS COM 401 TUNABLE CTCSS ENCODER

Trans Com, Inc., has introduced a new subaudible tone encoder. Measuring only 1.0" × .6" × .3", the 401 can be installed in radios in which similar encoders will not fit. Operating voltage is anywhere from 7 to 20 volts dc, with an average current consumption of only 4 mA. Tuning range is from 67 to 251 Hz, and frequency stability over a broad temperature range is claimed. Tone level is adjustable from 0 to 2 V p-p, with THD less than 1%. For more information, contact *Trans Com, Inc., 1104A Ridge Avenue, Lombard IL 60148.* Reader Service number 482.

OMNI-GAIN MOBILE ANTENNA

The "Omni-Gain" mobile antenna has been introduced by Valor Enterprises, Inc. The unique construction of the "Omni-Gain" omits the copper coil by combining a 17-7 stainless steel whip, a 6061-T6 electroplated aluminum coaxial matching section, and a chrome-plated brass 3/8-24 ferrule.

The "Omni-Gain" is rated at 200 Watts with 5/8-wavelength and 3-dB gain. It is field-tunable to a typical vswr of less than



SGL Waber Electric's Power Master™ line monitor power conditioner.

1.5:1 at resonance. The mobile antenna is available for the 2-meter and 220-MHz amateur bands.

For further information, contact *Valor Enterprises, Inc., West Milton OH 45383.* Reader Service number 485.

ECONO-PAK GL-25 RESISTOR KIT

The GL-25 resistor kit consists of a specially designed resistor organizer and 840 ¼-Watt 5% carbon film resistors. 20 each of 42 different values are supplied. Immediate delivery is available from *Century Electronics Corporation, 3511 North Cicero Avenue, Chicago IL 60641.* Reader Service number 483.

POWER MASTER™ LINE MONITOR POWER CONDITIONERS

SGL Waber Electric, a division of SGL Industries, Inc., has just introduced its new Power Master line monitor power conditioners. These power conditioners reduce "electrical pollution" coming through electrical power lines and branch circuits to solid-state electronic equipment which is sensitive to voltage spikes and electrical noise. A recent study showed that the average incident rate of harmful power line disturbances is over 128 times per month. Major causes of electrical pollution are the switching on and off of electrical motors; energizing transformers, relays and solenoids; power line overvoltages and undervoltages; lightning; fluorescent lights; radio frequency interferences; electromagnetic interferences; and electromagnetic pulses; and improper grounding of equipment.

Electrical pollution can have devastating effects and even destroy sensitive semiconductors in modern equipment. Noise interference can be interpreted as actual signals by microcomputer chips to produce false data input or output. The result can be equipment breakdown or the wiping out of valuable data or programs stored in the memory. Power Master line monitor power conditioners will safely and simply alleviate these problems.

Equipment protected by Power Master power conditioners includes minicomputers, word processors, electronic instruments, photocopiers, cash registers, personal computers, automatic bank tellers—any electronic equipment with semiconductors, all of which are sensitive to voltage spikes and electrical noise.

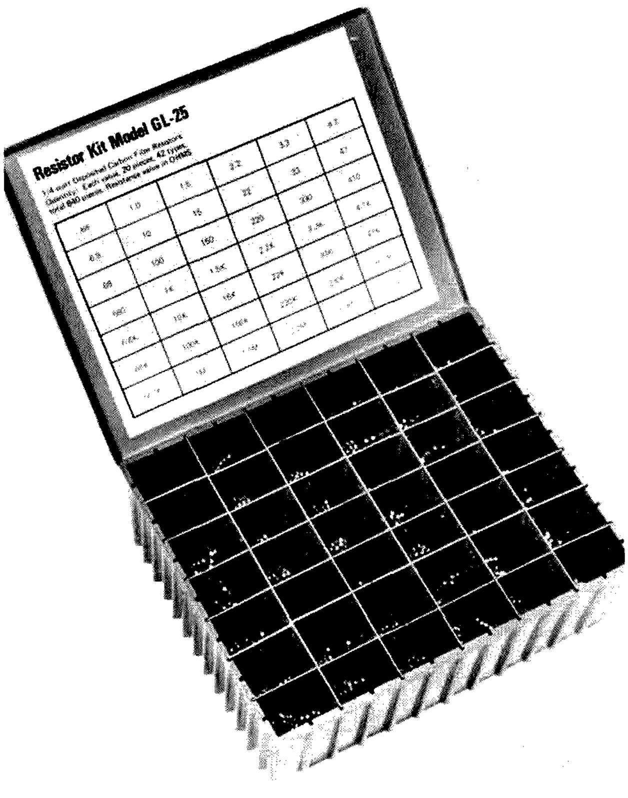
The product line consists of eight power conditioner models which vary in complexity from a wall plug-in unit to a very sophisticated console or rack-mounted unit. The simplest models contain varistors to clamp or reduce voltage spikes. The more sophisticated units include a multi-stage filter network which has spike suppression capability, transverse and common mode electrical noise filtration, as well as an undervoltage warning system, with indicator lights which are activated when the incoming electrical line voltage drops below a safe level. In addition, an ac voltmeter allows the operator to inspect the incoming ac power.

For further information, contact *SGL Waber Electric, 300 Harvard Avenue, Westville NJ 08093; (609)-456-5400.* Reader Service number 487.

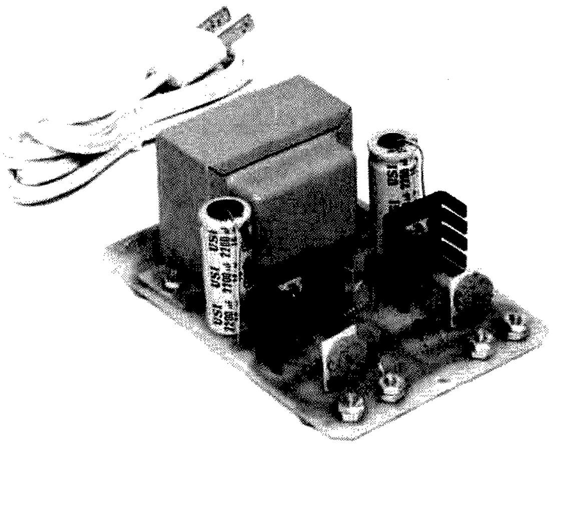
ADJUSTABLE DUAL POWER SUPPLY KIT

Recently announced by Jameco Electronics is the Model JE215 adjustable dual power supply kit. The supply provides independently adjustable positive and negative output voltages from 5 to 15 V dc regulated. Separate adjustment for each supply allows the user unlimited applications for integrated circuit requirements. Power output for each supply ranges from 5 V dc @ 500 mA to 15 V dc @ 175 mA; an onboard LED indicates power-on condition.

For further information, contact *Jameco Electronics, 1355 Shoreway Road, Belmont CA 94002.* Reader Service number 486.



Century Electronics' Econo-Pak GL-25 resistor kit.



Jameco's JE215 adjustable dual power supply kit.

FUN!

John Edwards KI2U
78-56 86th Street
Glendale NY 11385

ELECTRONIC AND RADIO THEORY

Okay, gang, time to shape up! So far we've been coddling you with puzzles on purely social and operating matters. Now we start the tough stuff—technical material. Remember technical material, all that funny junk the FCC asked you about on that test you took? Oh, you do remember. And you hated it? Well, no matter, everything can't be as much fun as repeater operating.

ELEMENT 1—CROSSWORD PUZZLE
(Illustration 1)

Across

1) A conveyance of electrical energy
9) Revolutions per minute (abbr.)
10) Oscillator type (abbr.)
11) Portable memory unit (abbr.)
12) Neon's symbol (abbr.)
14) The amateur's curse (abbr.)
15) The frequency synthesizer's friend (abbr.)
16) Engineering society (abbr.)
18) Query in Morse
19) Two parts of Ohm's Law
20) Millifarad (abbr.)
21) Crystal cut
23) A lie
25) Worldwide radio rulemakers (abbr.)
26) Connected circuit branches
27) Director, for instance (abbr.)
28) Input/output (abbr.)
29) Rural Electrification Administration (abbr.)
32) Absence of
33) Indefinitely long time
34) Symbol: pair of grid voltages
36) Charged electron or molecule
37) Opposite of off
38) Symbol: output resistance
39) Memory register (abbr.)
40) Alerting signal
41) Semiconductor devices (2 words)

Down

1) Propagation type (abbr.)
2) Symbol: plate resistance
3) Class A, B, C
4) Not a genuine emission
5) Metric ton (abbr.)
6) Process of 36 across
7) QRN or QRM
8) Din eradicator (2 words)
13) Degree suffix
17) Force and current (abbr.)
22) Elec______
24) D'Arsonval or 160
30) Symbol: output voltage
32) NOT-ORs (abbr.)
35) Silicone grease
36) Intermodulation distortion (abbr.)

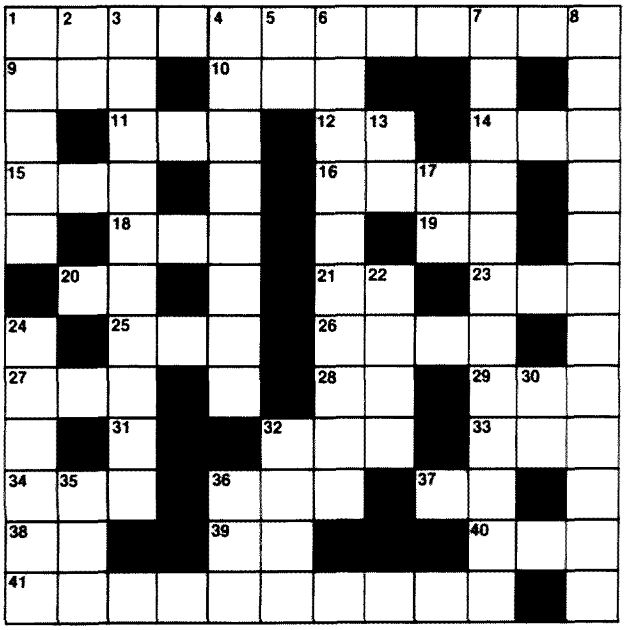


Illustration 1.

ELEMENT 2—ALPHABET GAME

Complete the nine words below by placing letters of the alphabet on every dash. Use each letter only once.

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z

1) _E_E_
2) _RE___EN_Y
3) _U_ERRE_ENER_TIVE
4) PERM_A_ILIT_
5) _I_O_AT_
6) SC_E_AT_C
7) _IP_LE
8) _O_
9) _OULE

ELEMENT 3—NAME THE EQUATION

Here are some common equations used in radio and electronics—name them.

1) $I = \frac{E}{R}$

2) $X_C = \frac{1}{2\pi fc}$

3) $P = EI$

4) $L(\mu H) = \frac{a^2 n^2}{9a + 10b}$

5) $\text{length} = \frac{492}{f}$

6) $\text{frequency observed} = \left(\frac{V + W - Vo}{V + W - Vs}\right)\left(\text{frequency of source}\right)$

7) $F = \frac{Q_1 Q_2}{d^2}$

8) $n = \sqrt{Zp/Zs}$

9) $X_L = 2\pi fL$

10) $Q = \frac{R}{X}$

ELEMENT 4—FILL IN THE BLANK

1) SSB receivers must use a __________ detector.
2) The more elements on a beam antenna, the greater its __________.
3) The two RTTY tones are called _______ and space.
4) A voltmeter should have _______ internal resistance.
5) Propagation ducts often form in the __________.
6) A "Clapp" is a type of __________.
7) "Hertzian waves" is the old term for __________ waves.
8) __________ is an alloy used in electronics to join metallic surfaces.
9) Electrical noise on a CRT is often called _______.
10) "Capture" is the term for a strong signal eliminating a weak signal in the _____ mode.

11) A two-element tube is a ________.
12) A ________ chart is a polar chart using circles to show resistance and reactance.
13) The process of adding known impurities to a semiconductor is called ________.
14) A V beam is ____-directional.
15) The unit of electrical charge is the ________.
16) Most long-distance (HF) radio communication is accomplished by reflecting signals off the ____-layer.
17) A device which passes or rejects a certain frequency while rejecting or passing others is known as a ________.
18) The siemens used to be the _____.
19) A valuable metal with low rf resistance is _______.
20) A "No. 47" is a common ________ light.

ELEMENT 5—MATCH THE TRANSISTOR

Match the transistor types listed below with the schematic symbols in Illustration 2.

1) Dual-gate MOSFET
2) Unijunction
3) MOSFET
4) Junction FET
5) Bipolar

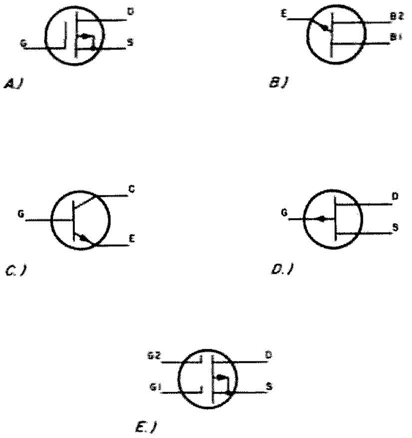


Illustration 2.

THE ANSWERS

Element 1:
See illustration 1A.

Element 2:
1—ZENER, 2—FREQUENCY, 3—SUPERREGENERATIVE, 4—PERMEABILITY, 5—KILOWATT, 6—SCHEMATIC, 7—DIPOLE, 8—VOX, 9—JOULE.

Element 3:
1—Ohm's Law, 2—Capacitive reactance, 3—Power formula, 4—Coil inductance, 5—Half-wave dipole length, 6—Doppler effect, 7—Coulomb's Law, 8—Impedance matching, 9—Inductive reactance, 10—Q of a parallel circuit.

Element 4:
1—product, 2—directivity, 3—mark, 4—high, 5—troposphere, 6—oscillator, 7—electromagnetic, 8—Solder, 9—snow, 10—FM, 11—diode, 12—Smith, 13—doping, 14—bi, 15—coulomb, 16—F, 17—filter, 18—mho, 19—gold, 20—pilot.

Element 5:
1—E, 2—B, 3—A, 4—D, 5—C.

SCORING

Element 1:
Twenty points for the completed puzzle, or 1/2 point for each question correctly answered.

Element 2:
Two points for each word deciphered. Two bonus points if you get all nine.

Element 3:
Two points for each equation named.

Element 4:
One point for each blank filled.

Element 5:
Four points for each transistor matched.

Rate yourself:
1-20 points—CBer
21-40 points—A passing interest in electronics
41-60 points—Junior Engineer
61-80 points—Engineer
81-100+ points—Senior Engineer

FUN! MAILBOX

Each month, as space permits, we'll try to print interesting letters from readers.

I've just gone through my February *73* and feel compelled to comment on your FUN! column. Specifically on Element 3, question 8 (I am an Advanced class ham so I am qualified to comment on Element 3—hi). The correct answer should be FALSE; KP2 is not THE new prefix for KV4 but A new prefix for KV4. NP2 and WP2 are also new, and issued, prefixes for KV4 (and people accuse the FCC of tricky exams).

Jim Lommen NP2AE
St. Croix, U.S. Virgin Islands

Pardon my article.—JE

Your interest in the ham fraternity is admirable. Too bad the guys at the ARRL don't have the same curiosity.

What we need is a second fraternity organization to formally represent ham radio. I will be a charter member.

Jim Owens W5JQE
Pottsboro TX

Thanks for the nice words, but I was never one for frats—the hazings are too rough.—JE

T	R	A	N	S	M	I	S	S	I	O	N
R	P	M	■	P	T	O	■	■	N	■	O
O	■	P	M	U	■	N	E	■	T	V	I
P	L	L	■	R	■	I	E	E	E	■	S
O	■	I	M	I	■	Z	■	I	R	■	E
■	M	F	■	O	■	A	T	■	F	I	B
M	■	I	T	U	■	T	R	E	E	■	L
E	L	E	■	S	■	I	O	■	R	E	A
T	■	R	■	■	N	O	N	■	E	O	N
E	G	S	■	I	O	N	■	O	N	■	K
R	O	■	■	M	R	■	■	■	C	U	E
S	O	L	I	D	S	T	A	T	E	■	R

Illustration 1A.

CORRECTIONS

Some changes have been made which affect my article, "Operating Overseas" (February, 1981), and I would like to bring things up to date. At the time I submitted the story, there were no guest licenses available in South Africa. In the meantime, new procedures were introduced and quite a few have since been issued.

The first one was issued by the Telecommunications Department in Pretoria to a visitor from the USA. Bob W2TK/ZS was the first amateur with a guest license: GL1. Bob visited the clubhouse of the Johannesburg Branch of the South African Radio League. Guest licenses have been issued also to two visitors from Japan.

I hope the introduction of guest licenses will get more amateurs to bring their rigs to South Africa or to operate the various club stations available. Regrettably, some visitors fail to understand that it is illegal for a person without a license to operate an amateur station. We have no third-party facilities in South Africa.

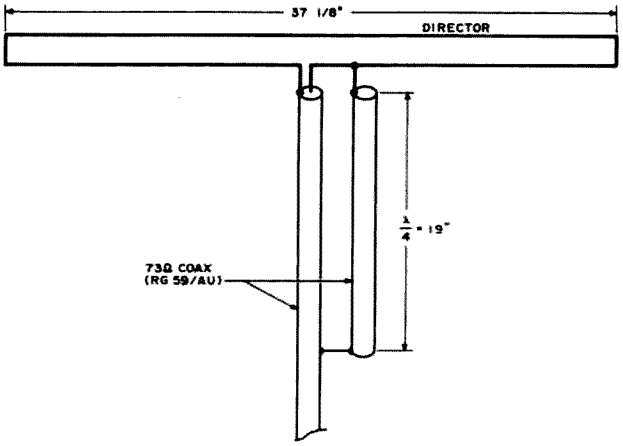
I hope this will clear any doubts.

Peter Strauss A2CPS
Gaborone, Botswana

In "The Earth Mover," on page 48 of the May, 1981, issue, in Fig. 2, (a) and (b) are reversed. The pattern at the top is that with the reflector open and the antenna 1/2 wavelength above ground. The one at the bottom is the pattern with the antenna 1/4 wavelength above the reflector.

In (a) the reflector is removed and in (b) the reflector is 1/4 wavelength below the dipole.

Jerrold A. Swank W8HXR
Washington Court House OH



Revised Fig. 3. Dimensions given for the 1-to-1 balun are for 146.5 MHz. For other frequencies, balun length in inches is calculated from 2942 × .95 ÷ MHz.

In my article, "The ZL/DF Special" (March, p. 40), I made an error in calculating the balun length; the velocity factor should have been .95. The revised Fig. 3 and caption are shown here.

My sincere apologies to *73* and its readers, and my thanks to W9PJF for bringing the mistake to my attention.

Jane Rice AD6Z
Oceanside CA

FCC

Reprinted from the Federal Register

Radio Service; Amendment of the Commission's Rules To Establish Procedures To Minimize Potential Interference to Radio Astronomy Operations

AGENCY: Federal Communications Commission.

ACTION: Final rule.

A. Part 95 of Chapter I of Title 47 of the Code of Federal Regulations is amended, as follows:

In § 95.17, a new paragraph (g) is added, as follows:

§ 95.17 Filing of applications.

* * * * *

(g) In order to minimize possible harmful interference at the National Radio Astronomy Observatory site located at Green Bank, Pocahontas County, West Virginia, and at the Naval Research Laboratory site at Sugar Grove, Pendleton County, West Virginia, any applicant for a license (other than mobile, temporary base, or temporary fixed) for a new station or for modification of an existing station in a manner which would change either the frequency, power, antenna height or directivity, or location of such a station within the area bounded by 39° 15' N. on the north, 78° 30' W. on the east, 37° 30' N. on the south, and 80° 30' W. on the west shall, at the time of filing such application with the Commission, simultaneously notify the Director, National Radio Astronomy Observatory, P.O. Box No. 2, Green Bank, West Virginia, 24944, in writing, of the technical particulars of the proposed station. Such notification shall include the geographical coordinates of the antenna, antenna height, antenna directivity, if any, proposed frequency, type of emission, and power. In addition, the applicant shall indicate in his application to the Commission the date notification was made to the Observatory. If an objection to the proposed operation is received, within 20 days of the receipt of the application, from the National Radio Astronomy Observatory for itself or on behalf of the Naval Research Laboratory, the Commission will consider all aspects of the problem and take whatever action is deemed appropriate.

B. Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended, as follows:

In § 97.85, a new paragraph (f) is added, as follows:

§ 97.85 Repeater operation.

* * * * *

(f) The licensee of an amateur radio station, before modifying an existing station in repeater operation in the National Radio Quiet Zone, or before placing his/her amateur station in repeater operation in the National Radio Quiet Zone, shall, after May 13, 1981, give written notification thereof to the Director, National Radio Astronomy Observatory, P.O. Box No. 2, Green Bank, West Virginia, 24944. Station modification is any change in frequency; power; antenna height or directivity; or the location of the station.

(1) The notification shall include the geographical coordinates of the antenna, antenna height, antenna directivity, if any, proposed frequency, type of emission, and power.

(2) The National Radio Quiet Zone is the area bounded by 39° 15' N. on the north, 78° 30' W. on the east, 37° 30' N. on the south, and 80° 30' W. on the west.

(3) If an objection to the proposed operation is received by the Commission from the National Radio Astronomy Observatory at Green Bank, Pocahontas County, West Virginia, for itself or on behalf of the Naval Research Laboratory at Sugar Grove, Pendleton County, West Virginia, within 20 days from the date of notification, the Commission will consider all aspects of the problem and take whatever action is deemed appropriate.

HAM HELP

I have been trying for several months to get in touch with a manufacturer of paging systems. I would like to communicate with a couple of them as soon as possible.

I need to supply a base system and about 100 units for use by volunteer firemen.

The specifics are: operation on 220/240 volts, coverage of a large area, and units which are nonselective.

Any help in this area would be greatly appreciated.

James E. Kowing
Serra E Mar
Apartado #167
Portimao, Algarue
Portugal

I need a manual on a Johnson Valiant transmitter and also instructions for converting it to single sideband operation.

I will be glad to pay a reasonable price for a copy of either or both sets of information or will copy and return if permissible.

W. E. George W4LHJ
1731 Country Club Drive
Tullahoma TN 37388

I am looking for any kind of SSTV monitoring equipment, used or brand new. I would appreciate any help.

Felipe Rojas HK3DJV
61 Preakness Plaza
Orange Park FL 32073

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
4006 Winlee Road
Randallstown MD 21133

It seems as though every July I have covered the topic of computer-based, or assisted, RTTY. Not wanting to trample on any traditions, this month will be no exception.

Most longtime readers are aware that my preference in computer systems is the 6800. While this stems from my years of experience(!) in owning and programming one, it is boosted by the many letters I receive from other 6800 owners who enjoy the ease with which such a system can be put on RTTY.

In the past, I have presented simple schemes to receive or transmit RTTY, using software timing and a PIA (parallel port) for interfacing. Several readers have expressed an interest in RS232 interfacing, and a general curiosity about the MP-C control interface exists, since it is a PIA used for serial interfacing with the MIKBUG ™ monitor.

Fig. 1 is a diagram of the MP-C interface. As can be seen, several input and output devices are tied to the PIA I/O lines. While MIKBUG requires a specific configuration of bit patterns in order to use the port, nothing prevents us from writing a software driver to accommodate ourselves. In doing so, we gain several things: We get to use a board that many of us have relegated to a back drawer, onboard RS232 or current-loop operation is possible, and since the MP-C is unbuffered, unlike the MP-LA, we can program individual PIA lines for input or output, if we need to.

For example, a 1 written to bit 0, the least-significant bit, of the A side (PA0) will output a mark level on both the RS232 and TTY outputs. Similarly, a 0 will output a space. Note that this is a bit different than with the MP-LA, where a 1 is output as a high state, which is space in RS232 and mark on TTY. Using the MP-C board interfacing greatly simplifies things.

With this in mind, look at Program 1. This is not a whole program, but an I/O driver segment and initialization routine. The initialization, of course, would be called once, at the beginning of the program. The assumption is made that the output routine is called with the character to be sent in the A accumulator, in five-level code, similarly to the programs presented here before. That is, the Baudot/Murray data is left justified within the eight-bit character. For this demonstration, Letters or Figures is not considered. Thus, an S, which is 1-0-1-0-0 in Baudot/Murray, would be represented as 10100000 in eight-level code. By the way, this is *not* ASCII, even though it is eight bits. ASCII defines a specific code, covered here several months ago, and just because a character is seven or eight bits long makes it no more ASCII than a frog.

The output routine works similarly to a straight PIA routine, but the output, taken from the appropriate MP-C output, is true RS232 or TTY level. Try it!

Along these lines comes a letter from Gary Fender W6SZX in Santee, California, who is looking for ways to interface his 6800 system with a 60-mA loop. Gary is using an old TT/L-2 terminal unit and is having problems interfacing it to the computer. You might try isolating the optoisolator normally used for 20-mA TTY output from the computer power supply and placing that in the loop. Alternatively, using the output of the MP-C board to drive another optoisolator may solve your problem. Let me know how it goes.

Interest in full programs to receive and/or transmit RTTY continues unabated. Leon Howe AH2AG, on Guam, is looking for the program we published some time back to transmit RTTY from the computer to the transmitter. Another request for the transmit and receive programs comes from Kurt Wenger, in Steinhausen, Switzerland. Copies of the programs are on their way to both and remain available for $1.00 each to cover expenses.

A 6800-based system that has received little coverage is the Heathkit ET-3400 trainer. Mike Clare WB3ILM, in Wyoming, Delaware, has an ET-3400 and a HAL ST-5000 demodulator. He wonders if it is possible to put the ET-3400 on RTTY. While I have little information about the ET-3400, I see no obvious reason why any 6800 system having one parallel line in and one line out could not be used on RTTY. The programs mentioned above do not use any features truly unique to SWTPC systems. The system clock frequency would have to be taken into consideration when setting up timing loops, but it should be a doable project. Any readers now using the ET-3400 on RTTY or who know of any problems with doing so are invited to write us with the details.

Along the lines of more established systems, Charles Plaisted WA1ZDA, of Rockland, Maine, has a problem. Charles has acquired bits and pieces of a 6800 system and is trying to assemble them into a workable system. He states that he has the MP-A2 CPU board, two MP-M 4K memory boards, and two MP-8M 8K memory boards. He is not sure what the monitor chip is and wants help in getting his bits and pieces assembled into a computer.

To begin with, you will need at least two more items to start on your way: a mother board and a power supply. Suitable mother boards for the SS-50 bus are available from a number of sources, including Thomas Instrumentation, 168 Eighth Street, Avalon NJ 08202, and GIMIX, Inc., 1337 West 37th Place, Chicago IL 60609. The mother-board configuration for the SS-50 bus includes 50-pin connectors for CPU, memory, and accessory cards, and 30-pin connectors for I/O cards. The power supply needs to supply +8 V dc, + 12 V dc, and − 12 V dc at enough current to supply all operating boards.

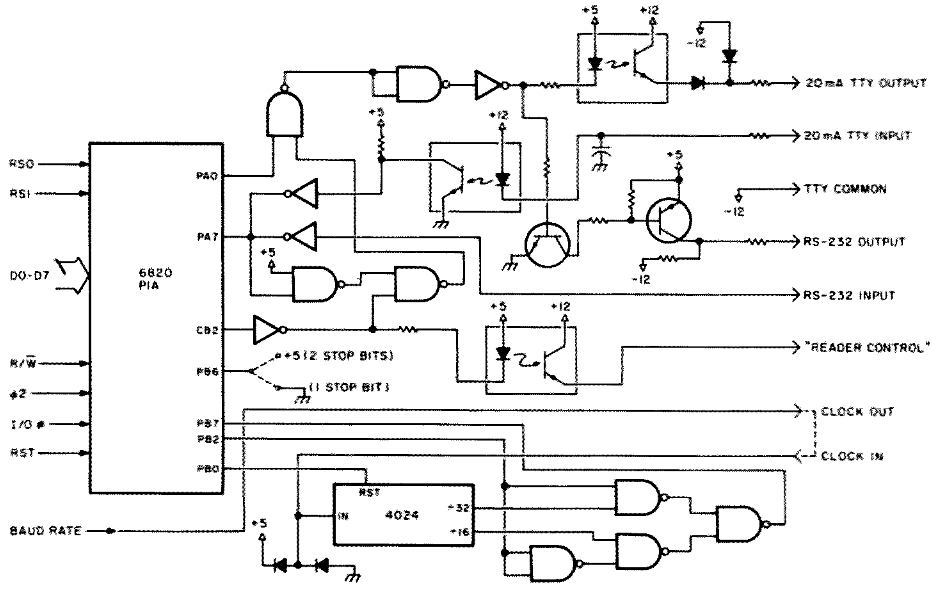


Fig. 1. Partial schematic of MP-C interface.

Now, about that monitor chip. If the top of the chip reads "MCM6830P8," then it is MIKBUG. The later monitor sold by Southwest Technical Products Corp., SWTBUG™, had the "SWTBUG" and version number on the top.

Input and output may be provided by an MP-C, such as diagrammed here, or by an ACIA board, available from the above sources. Another source of information is the series written on 6800 computers by Pete Stark, and others, carried in our sister publication, *Kilobaud Microcomputing*. Good luck, and let me know how you make out.

Interested in a full RTTY program for the 6800? So are many others. Ron Cohen K3ZKO, of Cheltenham, Pennsylvania, is putting his system up and looking for a program. So is Bob Wilson K8MPV, of Milford, Michigan. The 6809 evokes its share of interest with both of the above gentlemen, as well as Bob Sayler KB8DR and others mentioning the new Radio Shack 6809-based Color Computer. Well, to all of you, watch the pages of *73* carefully for a full transceive program for the 6800, which should be convertible to a 6809 with a minimum of effort.

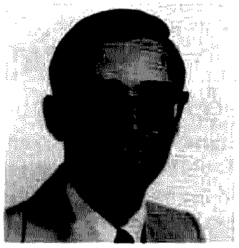
Other items to watch out for, by the way, include a newly revised edition of *73*'s *RTTY Handbook*, including material published since the last revision in 1977. New material on video RTTY and computers will also be included. We are also hoping to bring out a compilation of RTTY Loop covering the first few years of this column, for those of you who came in late. Watch for the announcement in the *73* Radio Bookshop section. While you're in the neighborhood, by the way, take a look at many of the fine offerings presented there. Some mighty fine material, don't 'cha know!

Speaking of reading material, next month will feature something to read and something to write! Interested? Don't miss next month's RTTY Loop.

```
                      NAM   MP-C DEMO
                      OPT   NOS
               *****************************************
               *  Demonstration Program for sending    *
               *  serial data out through MP-C card    *
               *  on Port 5. Output routine entered    *
               * with left-justified five level code   *
               *  in A accumulator.  Sent out at 60    *
               *  words per minute,  assuming a one    *
               *             MHz system clock.         *
               *---------------------------------------*
               *         RTTY Loop : July, 1981        *
               *          Marc I. Leavey, M.D.         *
               *****************************************
               * SYSTEM EQUATES
B014           PORT   EQU   $B014         Port 5
               *****************************************
               *        Initialization Routine         *
               *****************************************
0000 7F B015   INITAL CLR   PORT+1        Set up the PIA
0003 7F B014          CLR   PORT          for output on
0006 86 FF            LDA A #$FF          the A side
0008 B7 B014          STA A PORT
000B 86 04            LDA A #$04
000D B7 B015          STA A PORT+1
0010 39               RTS
               *****************************************
               *       Character Output Routine        *
               *****************************************
0011 C6 05     OUTPUT LDA B #$5           Set up five bit counter
0013 B7 004B          STA A STOREA        Store A for a bit
0016 86 00            LDA A #$00          0=space -> Start Bit
0018 B7 B014          STA A PORT          Send the Start
001B 8D 27            BSR   DELAY         Wait one bit length
001D 0C        OUTLUP CLC                 Clear the carry for apart
001E B6 004B          LDA A STOREA        Get the old A value
0021 48               ASL A               Shift out the left bit
0022 B7 004B          STA A STOREA        Save the new A value
0025 24 09            BCC   SEND0         If carry clear, send space
0027 86 01     SEND1  LDA A #$01          Load a Mark
0029 B7 B014          STA A PORT          Stick it in the port
002C 8D 16            BSR   DELAY         Never let it fade away
002E 20 07            BRA   ENDCHR        See if we are done
0030 86 00     SEND0  LDA A #$00          Load a Space
0032 B7 B014          STA A PORT          Again into the port
0035 8D 0D            BSR   DELAY         Linger a little longer
0037 5A        ENDCHR DEC B               Take one off the counter
0038 26 E3            BNE   OUTLUP        If it is not 0 we have more
003A 86 01            LDA A #$01          All done, send a stop
003C B7 B014          STA A PORT          by putting out mark for
003F 8D 03            BSR   DELAY         time after
0041 8D 01            BSR   DELAY         ... time (a bit long here!)
0043 39               RTS                 And go home, satisfied!
0044 CE 0C00   DELAY  LDX   #$0C00        This is an approximate value
0047 09        DLOOP  DEX                 for a 22 mSec delay.  I would fool
0048 26 FD            BNE   DLOOP         around before I'd trust it.
004A 39               RTS
004B           STOREA RMB   1             A place to put your A.
                      END
```

Program 1.

CONTESTS



Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

COLOMBIAN INDEPENDENCE DAY CONTEST

Starts: 1800 GMT July 18
Ends: 1800 GMT July 19

Entry classes include: A) single operator/single band; B) single operator/multi-band; C) multi-operator/multi-band/one rig; D) multi-operator/multi-band/multi-transmitter. Use all bands, 160 through 10 meters, on SSB and/or CW. Contest call is "CQ HK TEST." Only one contact per band with the same station. No crossband or crossmode contacts are allowed.

EXCHANGE:

Non-HK stations send RS(T) and three-digit serial number starting with 001. HK stations will send RS(T) and 171. The number 171 represents the years of commemorated independence.

SCORING:

QSO points for non-HK stations are as follows: 10 points for each HK station, 3 points per DX QSO, and 1 point for QSO with stations in the same country. QSO points for HK stations are 5 points for each DX QSO and 1 point for each HK station worked. In all cases, the multiplier is the number of DXCC countries worked on each band. Multiply the total QSO points by the sum of multipliers per band for the final score.

AWARDS:

Silver cup and plaques for world winner and first and second places in each operating category for both HK and non-HK stations. A minimum of 100 QSOs must be shown when applying for any award.

ENTRIES:

Keep a separate log sheet for each band. Enter the country only the first time worked. Show all times in GMT. Each entry must be accompanied by a summary sheet indicating scoring information. The logs not summarized according to the above mentioned instructions will be used only as check logs. Normal disqualification rules apply. Entries must be postmarked no later than August 30th and must be received before December 30th to be eligible for awards. Send all entries to: LCRA, Contest and Awards Manager, Apartado 584, Bogota, Colombia, South America.

SWOT QSO PARTY

Starts: 0000 GMT July 17
Ends: 2359 GMT July 23

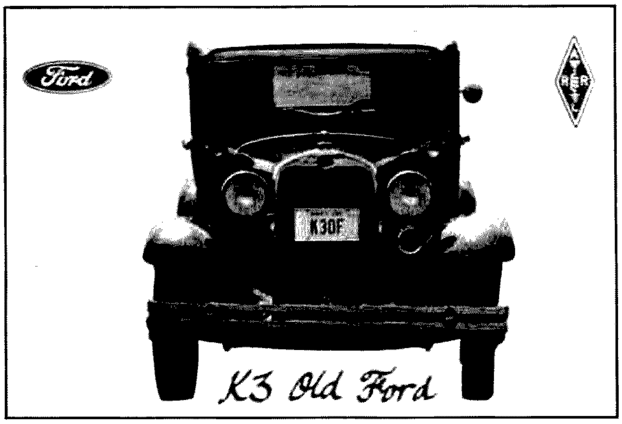
There are no restrictions on the number of hours devoted to the contest during the one-week contest period. All licensed amateurs with operating privileges on two meters are eligible to participate. All contacts must be made using CW or SSB only. Any station may be worked once on each mode for QSO score. Contacts must be made direct without the aid of satellites, repeaters, or retransmission of any kind. EME contacts may be counted if they meet all requirements. All contacts must be made from one geographic location. Portables or mobile stations operating in more than one geographic location may submit from the location where they obtained the highest score.

EXCHANGE:

To qualify for contact credit the following information must be exchanged: callsigns, geographic location (county and state, territory, or equivalent), SWOT numbers for SWOT members.

SCORING:

The SWOT member credit equals the total number of SWOT member QSOs times the number of geographic locations times two. The non-SWOT member credit equals the total number of non-SWOT QSOs multiplied by the number of geographic locations. The final score equals the sum of the above two totals.



QSL OF THE MONTH

Our QSL of the Month Contest's first winner is W.C. Cloninger, Jr., K3OF of Rockville, Maryland. Mr. Cloninger works for the Ford Motor Company and is a member of the Ford Amateur Radio League (also known as the Tin Lizzie Club). The vehicle pictured on his QSL is his unrestored 1930 Model A Town Sedan.

If you would like to enter the contest, put your QSL *in an envelope* and mail it along with your choice of a book from *73*'s Radio Bookshop to *73 Magazine*, Pine Street, Peterborough NH 03458, Attention: QSL of the Month. Entries which do not use an envelope (the Postal Service does *occasionally* damage cards) and do not specify book choice will not be considered. Sorry.

RESULTS

Results of the 1980 CALIFORNIA QSO PARTY
Sponsored by the Northern California Contest Club

Call	CW Qs	SSB Qs	Mult.	Score
California Single Ops				
N6BT (WA6VEF, Op)	373	1833	58	277,530
N6RZ (WB6SHD, Op)	98	2240	58	276,892
N6TR	181	2112	58	276,486
N6BV	555	1563	56	268,296
W6SZN	206	1733	57	232,788
W6OUL	304	997	57	165,642
N6RO	172	939	56	134,064
WA7LQO/6	176	868	53	119,356
WA6OYV	429	466	52	115,388
K6HNZ	0	884	55	97,240
California Multi-Single				
AA6KB	86	1457	56	177,632
K6YA	100	370	47	48,880
California Multi-Multi				
K6XO/6	349	1857	58	276,138
Out of State				
WAØAVL	98	574	54	77,868
K9BG	182	331	51	61,608
WDØEWD	120	392	50	57,200
N4BAA	90	266	46	36,892
K4LTA	133	207	45	36,585
WA5DTK	128	178	43	31,820
WB5KIA	53	261	45	30,645
W3HDH	130	140	45	30,150
W5WG	148	105	40	26,160
WA1FCN	82	155	43	23,908

AWARDS:

The highest final score will receive the 1981 SWOT trophy. Certificates will be awarded to the highest scorer in each ARRL section in which more than one entry is received. In the event of ties, the entry with the earliest postmark will be the winner. Winners will be announced in the *SWOT Bulletin* at the earliest possible date.

ENTRIES:

Logs should not be submitted unless requested. Send a summary postmarked not later than August 21st to: Dean Figgins WA7EPU, PO Box 1141, Carefree AZ 85377. Include your name, callsign, address (with county and ARRL section), SWOT number (if member), and all necessary scoring information.

CW COUNTY HUNTERS CONTEST

Starts: 0000 GMT July 25
Ends: 0200 GMT July 27

The CW County Hunters Net invites all amateurs to participate in this year's contest. All mobile and portable operation in less active counties is welcomed and encouraged. Stations may be worked once on each band and again if the station has changed counties. Portable or mobile stations changing counties during the contest may repeat contacts for QSO points.

EXCHANGE:

QSO number; category (P for portable, M for mobile); RST; state, province, or country; and US county. Stations on county lines give and receive only one QSO number, but each county is valid for a multiplier.

FREQUENCIES:

3575, 7055, 14070, 21070, and 28070. It is strongly requested that only P or M category stations call CQ or QRZ on 40 meters below 7055 and on 20 meters below 14070, with all other stations spreading out above those frequencies.

SCORING:

QSOs with fixed stations are 1 point; QSOs with portable or mobile stations are 3 points. Multiply the number of QSO points times the number of US counties worked. Mobiles and portables calculate with their score on the basis of total contacts within a state for the state certificate, and calculate their score on all operation if they operated from more than one state in competition for the High Portable or High Mobile Trophy.

AWARDS:

Certificates will be awarded in three categories:

1) Highest fixed or fixed portable station in each state, province, and country with 1,000 or more points.

2) Highest station in each state operating portable from a county which is not his normal point of operation with 1,000 or more points.

3) Highest station in each state operating mobile from 3 or more counties with a minimum of 10 QSOs in at least each of 3 counties.

Trophies will be awarded to the highest single-operator station in the US in categories P and M. The Awards Committee will issue additional awards where deemed appropriate.

ENTRIES:

Logs must show category, date/time in GMT, station worked, band, exchanges, QSO points, location, and claimed score. All entries with 100 or more QSOs *must include a check sheet of counties worked or be disqualified from receiving awards.* Enclose a large SASE if results are desired. Logs must be postmarked by September 1st and sent to: CW County Hunters Net, c/o Jeffrey P. Bechner W9MSE, 673 Bruce Street, Fond du Lac WI 54935.

EUROPEAN DX CONTEST—CW

Starts: 0000 GMT August 8
Ends: 2400 GMT August 9

Sponsored by the Deutscher Amateur Radio Club (DARC). Only 36 hours of operation out of the 48-hour period are permitted for single-operator stations. The 12 hours of non-operation may be taken in one but not more than three periods at any time during the contest. Operating classes include single-operator, allband and multi-operator, single transmitter. Multi-operator, single-transmitter stations are only allowed to change band one time within a 15-minute period, except for making a new multiplier. Use all amateur bands from 3.5 through 28 MHz. A contest QSO can only be established between a non-European and a European station. Each station can be worked only once per band.

EXCHANGE:

Exchange the usual six-digit number consisting of RST and progressive QSO number starting with 001.

SCORING:

Each QSO counts 1 point. Each QTC (given or received) counts 1 point. The multiplier for non-European stations is determined by the number of European countries worked on each band. Europeans will use the last ARRL countries list. In addition, each call area in the following countries will be considered a multiplier: JA, PY, VE, VO, VK, W/K, ZL, ZS, and UA9/UAØ. The multiplier on 3.5 MHz may be multiplied by 4, on 7 MHz by 3, and on 14 through 28 MHz by 2. The final score is the total QSO points plus QTC points multiplied by the sum total multipliers.

QTC TRAFFIC:

Additional point credit can be realized by making use of the QTC traffic feature. A QTC is a report of a confirmed QSO that has taken place earlier in the contest and later sent back to a European station. It can only be sent from a non-European station to a European station. The general idea is that after a number of European stations have been worked, a list of these stations can be reported back during a QSO with another station. An additional 1 point credit can be claimed for each station reported.

A QTC contains the time, call, and QSO number of the station being reported, i.e., 1300/DA1AA/134. This means that at 1300 GMT you worked DA1AA and received number 134. A QSO can be reported only once and not back to the originating station. Only a maximum of 10 QTCs to a station are permitted. You may work that same station several times to complete this quota, but only the original contact has QSO point value. Keep a uniform list of QTCs sent. QTC 3/7 indicates that this is the 3rd series of QTCs sent and that 7 QSOs are reported. Europeans may keep the list of the received QTCs on a separate sheet if they clearly indicate the station who sent the QTCs.

AWARDS:

Certificates to the highest scorer in each classification in each country, reasonable score provided. Continental leaders will be honored with plaques. Certificates will also be given to stations with at least half the score of the continental leader or with at least 250,000 points. The minimum requirements for a certificate or a trophy are 100 QSOs or 10,000 points.

ENTRIES:

Violation of the rules, unsportsmanlike conduct, or taking credit for excessive duplicate contacts will be deemed sufficient cause for disqualification. The decisions of the Contest Committee are final. It is suggested that the log sheets of the DARC or equivalent be used. Send a large SASE to get the wanted number of logs and summary sheets (40 QSOs or QTCs per sheet). SWLs apply the rules accordingly. Entries should be sent no later than September 15th. North American residents may send their applications and logs to: Hartwin E. Weiss W3OG, PO Box 440, Halifax PA 17032 USA.

EUROPEAN COUNTRY LIST:

C31, CT1, CT2, DL, DM, EA, EA6, EI, F, FC, G, GC (Guer), GC (Jer), GD, GI, GM, GM (Shetland), GW, HA, HB9, HBØ, HV, I, IS, IT, JW (Bear), JW, JX, LA, LX, LZ, M1, OE, OH, OHØ, OJØ, OK, ON, OY, OZ, PA, SM, S, SV, SV (Crete), SV (Rhodes), SV (Athos), TA1, UA1346, UA2, UB5, UC2, UN1, UO5, UP2, UQ2, UR2, UA Franz Josef Land, YO, YU, ZA, AB2, 3A, 4U1, 9H1.

CALENDAR

* Jul 1	**CARF Canada Contest**
Jul 17-23	**SWOT QSO Party**
Jul 18-19	**Colombian Independence Day Contest**
Jul 25-27	**CW County Hunters Contest**
Aug 8-8	**European DX Contest—CW**
Aug 15-16	**SARTG Worldwide RTTY Contest**
Aug 15-17	**Rhode Island QSO Party**
Aug 15-17	**New Jersey QSO Party**
Aug 22-23	**Ohio QSO Party**
Aug 29-30	**Occupation Contest**
Sep 12-13	**European DX Contest—Phone**
Sep 12-13	**Q-QRP Club CW Activity Weekend**
Sep 12-14	**Washington State QSO Party**
Sep 26	**DARC Corona—10-Meter RTTY**
Oct 3-4	**California QSO Party**
Oct 24-25	**CQ Worldwide DX Contest—Phone**
Nov 8	**DARC Corona—10 Meter RTTY**
Nov 8	**OK DX Contest**
Nov 14-15	**European DX Contest—RTTY**
Nov 28-29	**CQ Worldwide DX Contest—CW**
Dec 26-31	**G-QRP Club Winter Sports**

*** = see last issue**

HAM HELP

I have acquired a DuMont model 208-B oscilloscope, serial number 10237, for which I am looking for information, schematic, manual, etc. Willing to pay for copying or will copy and return original.

H. L. Church WØKXP/9
309 W. St. Louis St.
Lebanon IL 62254
(618)-537-4498 or 537-6666

I acquired an old radio some time ago. I do not have any idea as to what tube it requires or what voltage is necessary to operate same.

The radio was manufactured in 1925, by Kutzen Radio Mfg. Co., Racine WI. It is serial #019690, Model #SM-1. On the top lid of the radio there is another ID plate with "Radio Receiver #1371, build by W. F. Main Radio Co., Cedar Rapids, Iowa." I believe this to be the case manufacturer.

I would appreciate any and all information anyone can supply about this unit.

Edmund L. Ogle
109 Sumac St.
Greybull WY 82426

I need schematics, manuals, or any available information on the following items: Ray Jefferson model 914 transceiver; T-195(B)/GRC-19 transmitter; MI² model 101 TWX Data Unit; CV-278/GR FSK demodulator; MD-203/GR FSK modulator; and a set of manuals for my 33ASR.

I would like to hear from anyone who has converted an RT-594/ARC38A SSB transceiver for normal ham service—also need manual or diagram. I will gladly pay all postage and other costs. Thanks.

Tommy Norris KA4RKT
Route #1, Box 412
Auburn KY 42206
(502)-542-6343, after 0000UTC

I need a schematic for a 10-Ampere power supply, filtered, highly stable, variable, and regulated. On hand I have the following parts, which I hope to use in the supply:

- Transformer—117-ac input, 19-ac output under no load
- Full-wave bridge rectifier rated at 25 Amperes
- 25000 uF filter capacitor rated at 100 volts dc
- PNP power transistor no. 2N1653
- Motorola regulator no. LM317K
- Heat sink to mount the power transistor and regulator on

Can anyone help?

Clinton E. Pratt WB4MXI
3509 Ballylinn Ct.
Virginia Beach VA 23464

I will pay for technical help on a part-time basis. I need help in designing oscillators, multipliers and amplifiers up through UHF—all solid-state breadboarding.

D. W. Straham
9625 Catlett
La Porte TX 77571
(713)-479-1614

LETTERS

RE NO CLICKEE

In regard to J. Olsen's "A New Proposal" letter and Wayne's reply, May, 1981, "Olsen...no clickee, no tickee" seems a hard-line reply as Olsen's ideas were interesting and may have some merit.

My own objection would be that people like my XYM, with his first-class commercial ticket and a ham ticket sans code (as Olsen proposes), could not legally operate commercially-available equipment they may have already purchased. My XYM also has found the code difficult to corral and would welcome a ticket sans code. But not with restrictions as spelled out by Olsen, because we do own "store-bought" rigs which I then could operate and he could not (even though we would then *both* have our ham tickets).

E. Nadine Hardy KA5GRH
Tijeras NM

PLENTY OF SPACE

Perhaps my previous letter (December, 1980) was not clear and Wayne's comment at the end seemed to lend flavor to the fact that I was for a "code-free, theory-free" license. This is far from the truth.

I have never advocated a code-free license nor do I advocate a theory-free test. What I am against is the necessity of the depth of the theory involved. The FCC should place greater emphasis on rules of the road and proper operating procedure. Basic understanding of some electronics is necessary but do we have to know "What speed characteristics does TTL have as compared to 4000 CMOS?" or "Determine the Boolean equation for the circuit shown"? Who cares? Does knowing this make anyone a better or worse ham? I think not. These are just a few of the absurd questions on the test.

If we are going to go this far, why don't we just make it a requirement to have a degree in electronic engineering. Then we can really have an elitist group. Just how far do you want to go?

We, as a group, need a greater influx of hams to have a greater voice in Congress and with the FCC. Stop worrying about overcrowding on the bands. There is plenty of space available. Maybe if we had a few fewer contests and nets (I like both) there would be more space. Do we really need so many contests and nets, though?

For those who wrote and called in support of me—thank you. For those that indulge in hate letters—you call yourselves hams? Ha! Constructive dialogue is what is needed. Bickering and name calling only serves to divide, and we all lose.

Alan G. Davis KB7HM
Salt Lake City UT

INSPIRATION

In reference to the letter from J. Olsen in the May issue, I find I must reply. If Mr. Olsen wanted an amateur license, he could get one anytime. After all, "code recognition" is not that hard. My nine-year-old son learned the letters of the alphabet in one week.

Mr. Olsen is 31 years old. So what? I was 28 when I got my Novice ticket and I got my Extra last year. A friend of mine (WB5IIR) was 67 when he got his Novice. He is also an Extra now.

Mr. Olsen's attitude is like a six-year-old saying, "I don't want to learn to read. So why should everyone else have to?" I really don't think Mr. Olsen *can* learn the code, at least not as long as he persists in not wanting to. I hope this letter inspires him to get off his lazy tail and get to work. I'm sure some ham in his area would be glad to help him.

Mike Kilgore KG5F
Richardson TX

MAYDAY

I really enjoyed listening to an emergency net going on 27.425—that's right 27.425. From what I can figure out, a boat left Antigua for someplace or another. Well, this fellow, Whiskey Jack 6605, got into trouble and .425 was in an uproar. (Let me say before I go on that this fellow had his marine radio out for repairs and his compass also was on the fritz.)

Ok, on with the story. Poor 6605 is out there floating around and the frequency lights up with help. You name it, sandbaggers, Whiskey Jacks, HF Charlies, April club, and Whiskey Whiskeys come flying out of the woodwork to help. All I could get from all this was mass confusion and one station telling another station to get off the Mayday channel.

At one point, somebody asked if poor 6605 had tried to get in touch with an amateur station since he did have a ham rig. "Oh, no," came the answer. "You know how those hams are. They just sit and listen but wouldn't answer anybody but one of their own."

Now the Coast Guard is said to be waiting for a call from anybody who could tell them where soggy 6605 may be; call collect, of course. Oh, oh! The phone number given out is the wrong number says someone, that number is the Puerto Rican Coast Guard, not the Martinique one. Now we're back on the track; numbers squared away and we're off with flares.

One fine gent comes up with the idea of shooting off flares every 30 minutes. Old soggy (by now) 6605 was to shoot one and all the islands were to shoot one, a different color for each island. Well, the response was overwhelming. Texas got a couple off, Canada for luck, and Florida, being that they where pretty close. At 2325 UTC, i was in the frenzy of the search. What am I to do—no flare gun?

Wait! A road flare thrown from the top of my tower might do the trick. What the hell. If the Coast Guard, Navy, and the whole of 10½ meters couldn't help old soggy bottom, I'm going to try. But what do you think happened? A lavender flare lights up the sky from Dover, New Jersey—skunked again.

Poor 6605 is still out there floating around and I'm going to sit and see what happens. I'll let you know what happens soon. Can the Whiskey Jacks pull off the 10½ meter rescue before the Coast Guard or the Navy ruins their chance to make the pages of *QST*? Stay tuned for the next installment.

Name withheld by request

TRIBUTE

You are the only one getting this letter from me. I am spending my last few hours with my beloved Heath SB-102, which is probably the best transceiver that company ever made. For several years, I have thrilled over the way it could pull a signal from the back of the band and put it front and center for a rock-solid QSO. For several years, I have enjoyed compliments from the other end on how clean my signal was.

I paid for the rig, like all of us, with income left over from family expenses, food, rent, etc.

For several years now I have felt great pride every time I tuned up and logged in. Tomorrow that ends. I'm selling my rig tomorrow so that I can pay my income tax. It's the only way. My 1980 income is the same as 1979 income. My 1980 deductions were higher than in '79. In '79, I got a forty-dollar refund from the IRS. This year I have to pay, pay, pay. I'm sick of paying those creeps in Washington who sleep with lobbyists, pay off criminals, and lie to the rest of us.

I don't want any sympathy from the world. I want concern. I bet I'm not the only one in this country selling a prized possession so the bums in Washington can continue their screwball activities. Thank God I didn't have to sell my car. Thank God I have health and love and ditto for my family.

This country doesn't need sugar, pomp, or rampant liberalism. We need hell raised and hell to be paid.

Larry Myers KA2DDX
E. Amherst NY

THE ONLY GAME

I appreciate your printing of my communication on the "ARRL swindle."

However, I am *not* the Secretary/Treasurer of the Indiana Radio Club Council. This fine organization is made up of various radio clubs around the state. I am a member of the Indianapolis Repeater Association.

We all would like to be members of the ARRL, but we

want them to clean up their act.

As Wayne says, "it's the only game in town." It could use competition.

T. James Barnes K9TFI
Greenwood IN

TS-830 REVISITED

In his review of the new Kenwood TS-830 transceiver, WB8BTH didn't give the TS-830 credit for all its capabilities, and didn't recognize its heritage.

He stated that the TS-830 maintains the dual-conversion scheme of the TS-820. The TS-820 is a single-conversion rig, and with the exception of the i-f shift, there is no similarity between the TS-830 receiver and the TS-820 receiver. The TS-830 receiver is very similar to the R-820 receiver sans the 50-kHz third i-f.

Points of interest missed by the author of the TS-830 review include:

1) The crystal filter in the 8.83-mHz i-f and the ceramic filter in the 455-kHz i-f combine to give the rig a shape factor of 1.5 (−6-dB and −60-dB points), and ultimate rejection matched by few other rigs.

2) The combined shape factor of the two i-fs is degraded when the VBT is used to narrow the passband, but nevertheless, the impact on QRM is incredible.

3) Kenwood has provided an incredible array of CW filter options that should make this rig the dream of most CW operators. (Unfortunately, QSK operation was not included.) The filter options boil down to the following (in order of increasing performance and cost): a) Use rig without additional CW filters. Combined shape factor just over 5 (i.e., about 500 Hz wide at −6 dB and about 2550 Hz wide at −60 dB). b) Install 500-Hz optional filter in 8.83-MHz i-f; shape factor of 3. c) Install 500-Hz optional filter in 455-kHz i-f; shape factor of 1.6. d) Install 270-Hz optional filter in 8.83-MHz i-f; shape factor of 4. e) Install 250-Hz optional filter in 455-kHz i-f; shape factor of 2. f) Install 500-Hz optional filters in both i-fs; combined shape factor is about 1.3 with VBT not in use. g) Install 270-Hz optional filter in 8.83-MHz i-f and 250-Hz optional filter in 455-kHz i-f. Combined shape factor is about 1.3 with VBT not in use.

The VBT circuit is useful with whatever combination of filters is installed, but really performs magic only if matched filters are installed in both i-fs (i.e., a pair of 500-Hz filters or the 250- and 270-Hz filters).

The author erroneously indicates that the rf clipper has two stages, one in the VBT circuit and one in the i-f circuit. Actually, there are three stages, all in the 455-kHz i-f. The quality of the TS-830 audio even under heavy clipping is largely due to the fact that the 455-kHz ceramic filter precedes the clipper, and the 8.83-MHz crystal filter follows the clipper.

Harrison Clark KA2R
Clifton Park NY

Thanks to KA2R for his corrections and additions to my review of the TS-830S. Based on his comments, I am eager to install CW filters in our 830.

By the way, the equipment reviews in 73 are purposely kept less technical and more subjective than the reviews found in some other publications. We find that parameters such as shape factor and 3rd-order IMD simply do not mean very much to the average ham. Since these technical aspects are well covered in other magazines, we tend toward reviews which emphasize actual on-the-air impressions.—WB8BTH.

COMPARISON TESTS

Hats off to Bob Glorioso W1IS for his surprising and highly informative article (May, 1981) on 2-meter antennas! Bob's comparison test provided this amateur with plenty of concrete detail on how to improve his 2-meter station, especially as I look up at the 5/8-wave ground plane presently on my roof.

More direct comparisons in *73* would be much more appreciated than the typical reports on individual products. Maybe W1IS will start such a trend?

Bill Dryer WB2CQP
Rutherford NJ

PACKET'S PROGRESS

The Vancouver Amateur Digital Communications Group (VADCG) is devoted to creating a packet switching network via amateur radio, and is experimenting with high-speed HDLC protocol transmissions. Current efforts include a smart terminal node controller board which interfaces any parallel or asynchronous serial device to the network, an S-100 card to provide the centralized station node network control, and a 1200-baud modem card for mike-jack connection to VHF transceivers. Some public domain software is available and more will be provided as it is developed. A practical continent-wide network protocol is under development and geosynch satellite experiments will probably begin this year. Our newsletter subscription is $10.

D.A. Oliver VE7AOG
Secretary-Treasurer, VADCG
818 Rondeau St.
Coquitlam BC, Canada
V3J 5Z3

NETS

Anyone who worked anywhere at any time at a land-based tributary or relay station (government, military, commercial, or whatever) that handled message traffic by means of cable, wire, wireless, or radio, using a hand key or teleprinter or cable or wireless perforator, IBM Radiotype, radioteletype, or any other device, please send dates, locations, office calls, callsigns, and routing indicators, to me.

I am compiling histories of the old War Department Radio Net, the Alaskan Communications System, and the Army Airways Communications System that existed before World War II. I also am compiling histories of the same and for all other networks (wherever) that were in existence during World War II.

I ask that you send me a stamped envelope with your return address printed legibly on it. For this, you will receive a copy of these histories. Those who send significant contributions will be mentioned. Those who send material and wish to have it sent back to them please say so.

Arnold J. Madlol
436 Orchard Ave.
Grand Haven MI

FIRST?

Thank you for the December, 1980, article, "Who Really Invented Radio" and the related letter from Mr. Troy Cory Stubblefield printed in the April, 1981, issue of *73*.

Agreement may never be reached about who actually "invented radio" but it is most certainly possible to credit the men who first transmitted their voices electromagnetically, without the use of connecting wires.

This honor goes to Mr. Alexander Graham Bell and his laboratory assistant, Mr. Sumner Tainter, whose voice was transmitted over a beam of modulated sunlight in early 1880, more than 101 years ago.

This marvelous event was reported in *Scientific American* (see "50 and 100 Years Ago" in the October, 1980, issue) and in the excellent book, *Light Beam Communications* by Forest M. Mims III, Howard W. Sams and Company, Indianapolis, 1975.

I hope you find this information as interesting as it has been for me.

John N. Henning
Miami FL

HAM HELP

Wanted: schematic and/or manual for a Lafayette KT-340 general-coverage shortwave receiver. Usual offer for copies. Thank you.

Lawrence Joy KB9C
1932 Lawndale Drive
Fort Wayne IN 46805

Has anyone synthesized the Kenwood TR-2200A two-meter portable transceiver? I would appreciate receiving any information on designing or constructing such a circuit.

Lloyd Gosa WB8TNC
1423 Upland Dr.
Kalamazoo MI 49001

I need an operator's manual for the Heathscope O-7. I will pay copying and mailing costs.

John P. Iorio WD4MWH
5228 Longview Dr.
New Port Richey FL 33552

OSCAR ORBITS

Courtesy of AMSAT

The OSCAR satellites are subject to atmospheric drag, of course, and the present period of intense solar activity has accentuated the problem. During this period, our sun has been expelling huge numbers of charged particles, some of which find their way into the Earth's upper atmosphere, increasing the density (and thus the drag) there. It is through this region that the OSCARs must pass. OSCAR 8, in a lower orbit than OSCAR 7, is the more seriously affected of the two.

If the drag factor is not considered when OSCAR calculations are performed, long-range orbital projections will be in error. For example, by the end of 1979, OSCAR 8 was more than 20 minutes ahead of some published schedules. The nature of orbital mechanics is such that extra drag on a satellite causes it to move into a lower orbit, resulting in a shorter orbital period. Thus, the satellite arrives above a given Earthbound location earlier than predicted.

Using data supplied to us by Dr. Thomas A. Clark W3IWI of AMSAT, the equatorial crossing tables shown here were generated with the aid of a TRS-80™ microcomputer. The tables take into account the effects of atmospheric drag and should be in error by a few seconds at most.

The listed data tells you the time and place that OSCAR 7 and OSCAR 8 cross the equator in an ascending orbit for the first time each day. To calculate successive OSCAR 7 orbits, make a list of the first orbit number and the next twelve orbits for that day. List the time of the first orbit. Each successive orbit is 115 minutes later (two hours less five minutes). The chart gives the longitude of the day's first ascending (northbound) equatorial crossing. Add 29° for each succeeding orbit. When OSCAR is ascending on the other side of the world from you, it will descend over you. To find the equatorial descending longitude, subtract 166° from the ascending longitude. To find the time OSCAR 7 passes the North Pole, add 29 minutes to the time it passes the equator. You should be able to hear OSCAR 7 when it is within 45 degrees of you. The easiest way to determine if OSCAR is above the horizon (and thus within range) at your location is to take a globe and draw a circle with a radius of 2450 miles (4000 kilometers) from your QTH. If OSCAR passes above that circle, you should be able to hear it. If it passes right overhead, you should hear it for about 24 minutes total. OSCAR 7 will pass an imaginary line drawn from San Francisco to Norfolk about 12 minutes after passing the equator. Add about a minute for each 200 miles that you live north of this line. If OSCAR passes 15° east or west of you, add another minute; at 30°, three minutes; at 45°, ten minutes. Mode A: 145.85-.95 MHz uplink, 29.4-29.5 MHz downlink, beacon at 29.502 MHz. Mode B: 432.125-.175 MHz uplink, 145.975-.925 MHz downlink, beacon at 145.972 MHz.

At press time, OSCAR 7 was scheduled to be in Mode A on odd numbered days of the year and in Mode B on even numbered days. Monday is QRP day on OSCAR 7, while Wednesdays are set aside for experiments and are not available for use.

OSCAR 8 calculations are similar to those for OSCAR 7, with some important exceptions. Instead of making 13 orbits each day, OSCAR 8 makes 14 orbits during each 24-hour period. The orbital period of OSCAR 8 is therefore somewhat shorter: 103 minutes.

To calculate successive OSCAR 8 orbits, make a list of the first orbit number (from the OSCAR 8 chart) and the next thirteen orbits for that day. List the time of the first orbit. Each successive orbit is then 103 minutes later. The chart gives the longitude of the day's first ascending equatorial crossing. Add 26° for each succeeding orbit. To find the time OSCAR 8 passes the North Pole, add 26 minutes to the time it crosses the equator. OSCAR 8 will cross the imaginary San Francisco-to-Norfolk line about 11 minutes after crossing the equator. Mode A: 145.85-.95 MHz uplink, 29.4-29.50 MHz downlink, beacon at 29.40 MHz. Mode J: 145.90-146.00 MHz uplink, 435.20-435.10 MHz downlink, beacon on 435.090 MHz.

OSCAR 8 is in Mode A on Mondays and Thursdays, Mode J on Saturdays and Sundays, and both modes simultaneously on Tuesdays and Fridays. As with OSCAR 7, Wednesdays are reserved for experiments.

OSCAR 7 ORBITAL INFORMATION FOR JULY

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
30309	1	0025:04	85.9
30322	2	0119:19	99.5
30334	3	0018:37	84.4
30347	4	0112:51	98.0
30359	5	0012:09	82.8
30372	6	0106:24	96.4
30384	7	0005:42	81.2
30397	8	0059:56	94.8
30410	9	0154:11	108.4
30422	10	0053:29	93.3
30435	11	0147:43	106.8
30447	12	0047:01	91.7
30460	13	0141:15	105.3
30472	14	0040:33	90.1
30485	15	0134:48	103.7
30497	16	0034:06	88.5
30510	17	0128:20	102.1
30522	18	0027:38	87.0
30535	19	0121:52	100.6
30547	20	0021:10	85.4
30560	21	0115:25	99.0
30572	22	0014:43	83.8
30585	23	0108:57	97.4
30597	24	0008:15	82.3
30610	25	0102:29	95.9
30622	26	0001:47	80.7
30635	27	0056:02	94.3
30648	28	0150:16	107.9
30660	29	0049:34	92.7
30673	30	0143:48	106.3
30685	31	0043:06	91.2

OSCAR 8 ORBITAL INFORMATION FOR JULY

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
16928	1	0131:22	84.1
16942	2	0136:02	85.3
16956	3	0140:42	86.5
16969	4	0002:11	61.9
16983	5	0006:50	63.1
16997	6	0011:30	64.2
17011	7	0016:10	65.4
17025	8	0020:50	66.6
17039	9	0025:29	67.8
17053	10	0030:09	69.0
17067	11	0034:49	70.2
17081	12	0039:28	71.4
17095	13	0044:08	72.6
17109	14	0048:47	73.8
17123	15	0053:27	74.9
17137	16	0058:06	76.1
17151	17	0102:46	77.3
17165	18	0107:25	78.5
17179	19	0112:05	79.7
17193	20	0116:44	80.9
17207	21	0121:24	82.1
17221	22	0126:03	83.3
17235	23	0130:42	84.5
17249	24	0135:21	85.6
17263	25	0140:01	86.8
17276	26	0001:28	62.2
17290	27	0006:08	63.4
17304	28	0010:47	64.6
17318	29	0015:26	65.8
17332	30	0020:05	67.0
17346	31	0024:44	68.1

OSCAR 7 ORBITAL INFORMATION FOR AUGUST

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
30698	1	0137:21	104.7
30710	2	0036:39	89.6
30723	3	0130:53	103.2
30735	4	0030:11	88.0
30748	5	0124:25	101.6
30760	6	0023:43	86.4
30773	7	0117:58	100.0
30785	8	0017:15	84.9
30798	9	0111:30	98.5
30810	10	0010:48	83.3
30823	11	0105:02	96.9
30835	12	0004:20	81.7
30848	13	0058:34	95.3
30861	14	0152:49	108.9
30873	15	0052:07	93.8
30886	16	0146:21	107.3
30898	17	0045:39	92.2
30911	18	0139:53	105.8
30923	19	0039:11	90.6
30936	20	0133:26	104.2
30948	21	0032:44	89.0
30961	22	0126:58	102.6
30973	23	0026:16	87.5
30986	24	0120:30	101.1
30998	25	0019:48	85.9
31011	26	0114:02	99.5
31023	27	0013:20	84.3
31036	28	0107:35	97.9
31048	29	0006:52	82.8
31061	30	0101:07	96.4
31073	31	0000:25	81.2

OSCAR 8 ORBITAL INFORMATION FOR AUGUST

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
17360	1	0029:23	69.3
17374	2	0034:02	70.5
17388	3	0038:41	71.7
17402	4	0043:20	72.9
17416	5	0047:59	74.1
17430	6	0052:38	75.3
17444	7	0057:16	76.5
17458	8	0101:55	77.6
17472	9	0106:34	78.8
17486	10	0111:13	80.0
17500	11	0115:52	81.2
17514	12	0120:30	82.4
17528	13	0125:09	83.6
17542	14	0129:48	84.7
17556	15	0134:26	85.9
17570	16	0139:05	87.1
17583	17	0000:32	62.5
17597	18	0005:10	63.7
17611	19	0009:49	64.9
17625	20	0014:27	66.1
17639	21	0019:06	67.2
17653	22	0023:44	68.4
17667	23	0028:23	69.6
17681	24	0033:01	70.8
17695	25	0037:39	72.0
17709	26	0042:18	73.2
17723	27	0046:56	74.3
17737	28	0051:34	75.5
17751	29	0056:12	76.7
17765	30	0100:50	77.9
17779	31	0105:29	79.1

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Your company name and message can contain up to 25 words for as little as $150 yearly (prepaid), or $15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the September issue must be in our hands by July 1st. Mail to 73 Magazine, Peterborough NH 03458. ATTN: Nancy Ciampa.

PROPAGATION

J. H. Nelson
4 Plymouth Dr.
Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7	14	14	14	14
ARGENTINA	21	21	14	14	7	7	14	14	21A	21A	21A	21
AUSTRALIA	21	14	14	14	7B	7B	7B	7	7	7B	14	21
CANAL ZONE	21	14	14	7	7	7	14	14	21	21A	21A	21
ENGLAND	14	14	7	7	7	7A	14	14A	21	21	21	14
HAWAII	21	14	14	7A	7B	7B	7	14	14	14A	21	21
INDIA	14	14	7A	7B	7B	7B	7A	14	14	14	14	14A
JAPAN	21	14	7A	7B	7B	7B	7B	7B	14	14	14	14A
MEXICO	21	14	14	7	7	7	7	14	14	14	21	21
PHILIPPINES	14	14	14	7B	7B	7B	7B	14	14	14	14	14
PUERTO RICO	14	14	14	7	7	7	7A	14	14	14	21	21
SOUTH AFRICA	7B	7B	7B	7A	14	14	21	21	21A	21A	14	14
U. S. S. R.	14	7A	7	7	7	7A	14	14	14	14A	14	14
WEST COAST	21	14	14	7A	7	7	7A	14	14	21	21	21

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	14	14	14	14
ARGENTINA	21	21	14	14	7	7	14	14	21	21A	21A	21A
AUSTRALIA	21	14	14	14	7B	7B	7B	7	7	7B	14	21
CANAL ZONE	21	14	14	7	7	7	14	14	21	21A	21A	21
ENGLAND	14	14	7	7	7	7	14	14	14	14A	21	14A
HAWAII	21	14A	14	14	7	7	7	14	14	14A	21	21
INDIA	14	14	7A	7B	7B	7B	7B	14	14	14	14	14
JAPAN	21	14	14	7B	7B	7B	7B	7B	14	14	14	14A
MEXICO	14	7A	7	7	7	7	7	14	14	14	14	14
PHILIPPINES	14	14	14	7B	7B	7B	7B	14	14	14	14	14
PUERTO RICO	21	14	14	7A	7	7	14	14	14	14	21	21
SOUTH AFRICA	7B	7B	7B	7B	7B	14B	14	14	21	21	14	14
U. S. S. R.	14	7A	7	7	7	7	7A	14	14	14	14	14

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7	14	14	14	14
ARGENTINA	21A	21	14	14	7	7	7	14	14	21	21A	21A
AUSTRALIA	21	21A	21A	21	14	14	14	7	7	7B	14	21
CANAL ZONE	21	14	14	7A	7	7	14	14	21	21	21A	21A
ENGLAND	14	14	7	7	7	7	7	14	14	14	14A	14
HAWAII	21A	21	14A	14	14	7	7	14	14	21	21	21
INDIA	14	14	14	7A	7B	7B	7B	7B	14	14	14	14
JAPAN	21	14	14	14	14	7	7B	7B	14	14	14	14A
MEXICO	14	14	7	7	7	7	7	14	14	14A	14A	14A
PHILIPPINES	14A	14	14	14	7A	7B	7B	14	14	14	14A	14A
PUERTO RICO	21	14	14	7	7	7	14	14	14	14	21	21
SOUTH AFRICA	7B	7B	7B	7B	7B	7B	14	14	14A	14A	14	14
U. S. S. R.	14	7A	7	7	7	7	7	14	14	14	14	14
EAST COAST	21	14	14	7A	7	7	7A	14	14	21	21	21

First letter = day waves Second = night waves
A = Next higher frequency may also be useful
B = Difficult circuit this period F = Fair
G = Good P = Poor * = Chance of solar flares

JULY

SUN	MON	TUE	WED	THU	FRI	SAT
			1 G/F	2 G/G	3 G/G	4 G/G
5 F/F	6 G/G	7 G/G	8 G/G	9 G/G	10 G/G	11 G/G
12 G/F	13 G/F	14 G/G	15 G/G	16 F/P*	17 F/F*	18 G/G
19 G/G	20 G/F	21 G/F	22 F/F*	23 F/F*	24 G/G	25 G/G
26 G/F*	27 G/G	28 G/G	29 G/F	30 G/F	31 G/F	

August 1981 $2.95

73 MAGAZINE FOR RADIO AMATEURS

INFO

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Contributions in the form of manuscripts with drawings and/or photographs are welcome and will be considered for possible publication. We can assume no responsibility for loss or damage to any material. Please enclose a stamped, self-addressed envelope with each submission. Payment for the use of any unsolicited material will be made upon acceptance. All contributions should be directed to the 73 editorial offices. "How to Write for 73" guidelines are available upon request.

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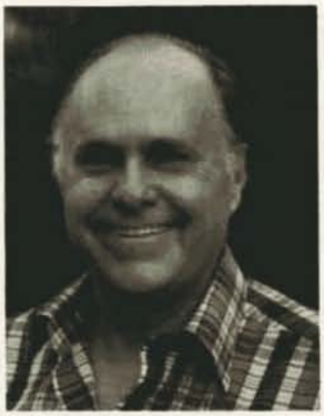
73 MAGAZINE aug. 81

Cover: AEA's Mike Lamb and daughter Julie go bicycle marine mobile with the Isopole™ 144. Photo by Audris Skuja.

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green



ROCHESTER HAMFEST CLOSED DOWN BY TAX OFFICIALS

New York tax officials descended on the Rochester Hamfest and closed down the ARRL booth, threatening president Harry Dannals with an arrest warrant if he continued to hawk his books and magazines. It was at the height of the hamfest just before noon on Saturday, with an estimated 3,000 people milling around the flea market and the handful of exhibitor booths, when the tax officials and police arrived.

The police cars drove up and down the aisles of the flea market, demanding that everyone pack up and leave immediately. Inside the exhibits building, the tax officials demanded proof of a tax certificate, which few exhibitors could produce. The exhibits were then forced to close down. The *73* booth was permitted to continue without interruption, though the *QST* booth was closed.

This all got started about two years ago when several ham dealers collected the New York state taxes on sales, but then did not turn them into the tax department. Out-of-state ham dealers who just ignored the tax did not cause problems, but the collecting of the tax without the payment of it was too much. A New York ham dealer complained through his state congressman and the heat was on.

Last year, a tax official turned up to investigate and made it clear that this sort of thing would have to stop. He told all exhibitors to be sure to get state tax certificates, collect the tax, and pay it. Again, some of the dealers collected the tax. . . and didn't pay it. The New York ham dealer, feeling that this gave his competitors an undue advantage. . . the tax collections being pure profit. . . complained again through his congressman.

When the tax people and the police showed up at the peak of the hamfest, the committee went into hiding and offered no help or advice. The only statement, issued hours later, was to the effect that the committee had no position on the tax one way or the other. The situation was one of total confusion.

The media got the word, and television teams soon arrived, causing a fast exit by the police and tax people. The threats of arrest warrants were apparently just scare tactics. . . and of questionable legality. Exhibitors would have done best, it turned out, to just keep on selling. Losses in sales have been estimated at about a quarter of a million dollars.

Just to make things even worse, security at Rochester was poor and many exhibitors found themselves made miserable by thieves. Some were working in teams to distract dealers while an accomplice grabbed equipment. One dealer lost three HTs. . . from the *back* of his exhibit booth!

PLAIN LANGUAGE DEADLINE EXTENDED

A last-minute effort by *73 Magazine*, the ARRL, and others has resulted in a 60-day extension of the deadline for filing comments on the Plain Language Rules docket. You now have until August 21 to contribute your thoughts about PR 80-729.

We urge every club and repeater association to take a close look at the docket and then submit specific, constructive comments. If you would like to be a formal participant in the comment process, file an original and five copies. If you file an original and 11 copies, every Commissioner will see your remarks. Of course, the FCC will consider all comments, regardless of the number of copies submitted. The important thing is to speak out before the August 21 deadline.

Until October 21, the FCC permits you to file *replies* to comments received by August 21. The difficulty lies in obtaining copies of the many comments the Commission has received. One good way to obtain these comments is to contact the individuals who filed them. For more details about the FCC's activities, call the Office of Consumer Assistance at (202)-632-7000.

W2NSD ON-THE-AIR SCHEDULE AUGUST, 1981 8:00-11:00 PM EDT

4	15m-20m RTTY
11	20m-40m Phone
18	15m-20m CW
25	15m-20m Phone

Look for us in the first 25 kHz of the General portion of each band. We'll be on the higher frequency band first.

MILLER HASSLE WON'T QUIT

The dumping of Miller as a director of the ARRL and the naming of his opponent, Metzger, without the benefit of even counting the votes, has upset hams in Indiana considerably. We published some letters on the subject and I'm told by some of the *73* team which was at Dayton (nine of us were there) that a chap claiming to be a lawyer for Metzger came by the booth yelling and threatening to sue us over the letters. He apparently came across loud and obnoxious.

If this chap is representative of Metzger, the division is in for a most interesting time. I don't envy them. More information has been promised on the details, but from everything I've heard it is a clear-cut case of the ARRL wanting to get rid of a director who was asking too many questions. The smear of Miller is continuing. Insignificant things are being blown up out of all proportion to try to justify the character assassination of Miller. Pity.

DAMNED GOVERNMENT

Many of us expect to see the federal government react about the same as the states to a reduction in funds: Cut the most important and visible services first, protecting the bureaucrats to the last. It is nice that Reagan has put out a call for the public to blow the whistle on government waste, bad management practices, and fraud. If you've run into any such, you might send word to Howard Messner, Office of Management and Budget, Room 10208, New Executive Office Building, Washington DC 20503.

It appears as if there is going to be a try at getting the government out of the large-scale printing business, too. That'll be a relief.

PETERBOROUGH DAYS

"Our Town," as Peterborough is called as a result of being used as the role model for the play of that name many years ago, is having an all-out bash on August 6-7-8th, and you're invited.

To do our part in the celebration, we're going to have a wide selection of back issues of *73* available for the taking. . . plus ham gear and parts collected by me over the last 40 years. We have to make room for a new magazine and that means I've lost my ham equipment storage rights. Pick 'em over and watch my stifled sobs as you walk off with my treasures.

The town will be having a lot of special events, including a circus on the 6th, a muster on the 8th, a relatively short marathon race, sports tournaments in tennis, swimming, softball, and volleyball, a book sale, square dancing, a bluegrass band, kite flying, an antique show. . . there's no end to it.

Add to this your chance to visit (and perhaps operate from) the W2NSD ham shack, the growing *73* publishing offices, Instant Software, etc. You may not believe what resources and people it takes to bring you this magazine every month.

Our Town is one of the most beautiful in New England and it is situated in one of the most remarkable little valleys in the country. One visit and you'll see why New Hampshire is one of the fastest growing states in the country. Remember that we have no sales taxes, so when you shop you pay the actual retail price for everything.

If you can arrange for a few days in New Hampshire, you should include a visit to the White Mountains, about 100 miles north of Peterborough. You may want to stop off in Warren and see the Morse Museum. From there you are a short drive to Franconia Notch and the amazing Flume, the Foot Basin, and the first North American tramway on Cannon Mountain.

If you have some time and like to climb around, you might want to visit Lost River, right near Franconia Notch. Or you might want to join the multitudes who have climbed Mt. Washington. . . or at least take the cog railway to the top. The last time I climbed the mountain I took the train back down.

So, if you and your family are within driving distance of lower New Hampshire, you might plan on getting up here in early August to see us. . . and to get in on some of the fun of Peterborough Days. We monitor 147.54 when you're in the area.

This is a mecca for famous writers and artists, so you may be bumping elbows with people who stay at our MacDowell colony, such as Leonard Bernstein, or some of the well-known local residents, such as Ed Land. You never know who you are going to see in the A&P.

One of the highest mountains in southern New Hampshire is in Peterborough, complete with a road to the top. Bring a good HT or mobile rig and see how many repeaters you can kerchunk from there. I've often gotten up there in the early mornings and made contacts all the way down to Washington DC. Long Island is a snap. This is where the big-effort VHF contesters gather.

Well. . . I Can Dream, Can't I?

by Bandel Linn K4PP

"Honey, I know you're talking to DX. . . I've put dinner on hold. . . just tell me when you're ready to eat!"

Wild Turkeys 1, FBI 0

—another foul-up from the feds

Editor's Note: Some portions of the FBI reports in this article may appear to our readers to be confusing, incomplete, and/or disjointed. They appear that way to us, too.

Photo A. The jamming transmitter in the sagebrush, enclosed in a black-painted first-aid box. Wires lead to the plastic-wrapped, buried batteries.

J. J. Howard WA7UDO
3119 Smith
Boise ID 83703

What do the FCC, FBI, jamming transmitters, and coyote hunters have to do with each other? Read on and you will soon come to know.

On December 2, 1979, a low-power jamming transmitter (less than 0.1 Watt) was placed in a remote area near Boise, Idaho. The transmitter consisted of a VHF Engineering transmitter strip with a quarter-wave antenna attached to sagebrush. The transmitter was located in such a way that detection in the Boise Valley was made difficult.

The transmitter output was set on the input of our local club repeater (146.22-146.82) located on a high mountain peak just north of Boise. Since the repeater was located around other commercial radio and TV transmitters, I assumed, as others did, that a birdie was locking the repeater up and timing it out, rendering it useless.

Since I am a pilot, I thought one way to locate a signal on the input to the club repeater would be to jump into the airplane and do some looking with han-

During the period from December 6, 1979, through January 11, 1980, a survey was conducted by Special Agents of the Federal Bureau of Investigation at all known outlets in the Boise, Idaho, area, in an effort to determine if any purchase was made of a radio crystal operating on the frequency of 146.82 megacycles with negative results. A similar survey was conducted at all known outlets in the Boise, Idaho, area of Ray-O-Vac multiple ignition batteries to détermine if the identities of any persons purchasing such batteries during the pertinent period could be identified. This survey also met with negative results.

The evidence obtained from the Blacks Creek Summit, including the first-aid kit housing the transmitter, along with the batteries, wire, wire antennas and plastic sheet protecting the battery, were submitted to the Federal Bureau of Investigation Laboratory by communication dated January 8, 1980.

By communication dated June 13, 1980, the Latent Fingerprint Section of the Federal Bureau of Investigation, Identification Division, advised that there were no latent prints of value present or developed on any of the specimens submitted. On the same date, the Federal Bureau of Investigation Laboratory report advised that tool mark examinations on the submitted items bore very limited tool marks, which were not sufficiently characteristic to determine the tool type and were of no value for identification purposes.

By Federal Bureau of Investigation Laboratory report dated April 11, 1980, the Federal Bureau of Investigation Laboratory advised that the ends of the white nylon string attached to the transmitter submitted to the Federal Bureau of Investigation Laboratory for examination were not suitable for matching purposes. The report also stated that the black paint utilized to cover the JOHNSON AND JOHNSON first-aid kit housing the transmitter could not be specifically identified with a particular source.

By Federal Bureau of Investigation Laboratory report dated May 21, 1980, the Federal Bureau of Investigation Laboratory advised that the transmitter submitted to the Federal Bureau of Investigation Laboratory for examination was apparently a factory made circuit board and various electronic components, which function as a transmitter. The device appeared to have been modified to some extent before being installed in a JOHNSON AND JOHNSON first-aid kit with a bare wire antenna and COAX wire power cord. When the transmitter was connected to the two Ray-O-Vac multiple ignition batteries in series, the transmitter transmitted a frequency of approximately 146.22 megahertz. The report went on to advise that the crystal in the transmitter was marked in part "146.22" and bore the manufacturer's name, "ICOM." No type or Serial Number were noted on the crystal, circuit board or other components of the device. The Federal Bureau of Investigation Laboratory advised that ICOM was believed to be the name of a Japanese manufacturer, whose parts are carried by many dealers.

The Federal Bureau of Investigation Laboratory report went on to advise that the two six volt multiple ignition batteries were both tested to be functioning and applied adequate voltage to operate the transmitter.

On June 25, 1980, the facts of this case were discussed with Assistant U. S. Attorney [redacted] District of Idaho, Boise, Idaho, and he advised that this matter was not suitable for prosecution in U. S. District Court. He stated that the violation was at best a technical violation, and the statute to be applied to this violation was designed to protect the Civil Defense Communications Network from acts of espionage to subvert their defense capabilities, and since this matter appeared to have involved a dispute between two different amateur radio clubs and particular individuals, he did not feel this matter was suitable for prosecution in U. S. District Court. For this reason, he recommended that this violation be referred to the Federal Communications System for whatever administrative action they would deem appropriate.

Fig. 1. Summary report of FBI actions.

FEDERAL BUREAU OF INVESTIGATION

- 1 - Date of transcription 1/24/80

SA [redacted] accompanied [redacted] JIM HOWARD, and [redacted] to the vicinity of Blacks Creek Summit in Ada County, Idaho. The purpose of the trip was to attempt to locate the transmitting device jamming the receiver operated by the Boise County Amateur Radio Club, of which [redacted] HOWARD, and [redacted] were members. The trip was made to a parking lot located near the Summit of the Blacks Creek Road in a four-wheel drive vehicle owned [redacted] b7c

From there, utilizing a hand-held direction finder and two snowmobiles, the transmitting signal was traced from the parking lot to an area located near the Arrow Rock Dam Access Road. This access road is located down the hill a short distance from the Summit on the north side of the Summit. The access road to the Arrow Rock Dam leaves the Blacks Creek Road in a westerly direction. From there, it winds around through the sagebrush hills and according to a sign just off the Blacks Creek Road, this access road dead ends at the Arrow Rock Dam.

Utilizing the snowmobiles, the group traveled to a high point on the road where the direction finder pointed to an area on a knoll from which a strong radio signal was originating. Subsequent examination of that area located a transmitter tied to a sagebrush and attached by a wire to two Ray-O-Vac six-volt multiple ignition batteries buried in the ground. The transmitter was housed in a Johnson and Johnson auto travel first aid kit box, which was painted black and sealed from the weather. The Ray-O-Vac six-volt batteries were protected by a piece of plastic and covered with dirt.

At the time this transmitter was located, JIM HOWARD had in his possession a walkie-talkie radio set at the frequency for the jammed transmitter. When the batteries were removed from the transmitter, the receiver immediately came on the air.

The transmitter, the antenna, the string used to hang the transmitter, the wire attached to the batteries, and the batteries, were secured as evidence and removed from the hill.

Investigation on 12/5/79 at Boise, Idaho File # BT #52-5826

by b6 SA [redacted] b7c Date dictated 12/10/79

This document contains neither recommendations nor conclusions of the FBI. It is the property of the FBI and is loaned to your agency; it and its contents are not to be distributed outside your agency.

Fig. 2. Special Agent's investigation report of actions on December 5.

die-talkies. So, on December 4, another radio amateur and I departed Boise in search of the signal which was locking up our club repeater. I was confident that the signal was emanating from the hill where the repeater was located—probably among those commercial transmitters with thousands of Watts of power.

Wrong. The signal increased as we flew in a southeasterly direction, reaching its full strength about 20 air miles southeast of the repeater site.

That evening, in darkness, I and two other members of the club returned to the site and made a ground search with just a handie-talkie. The lack of passable roads, snow, and darkness made our efforts in locating the transmitter unsuccessful, but the following evening, with the aid of snowmobiles, better DF equipment, and with others, including a local agent of the FBI, we returned to the site. Within about 20 minutes the transmitter was located, and it was taken off the air by the FBI agent. He said the transmitter and batteries would be sent to Washington DC for a thorough evaluation.

Unknown to us, the FBI staked the site out the following day and apprehended two local radio amateurs apparently returning from the site where the transmitter had been hidden. It was reported by the agents that their tracks led directly to the sagebrush in which the transmitter was hung. The two hams denied having any knowledge of the hidden transmitter and said they were only coyote hunting.

The wheels of bureaucracy began to turn. We waited and waited for reports from the FBI on materials sent to the lab. The FBI was unable to link the evidence recovered to those persons apprehended at the site.

On June 25, 1980, the FBI discussed the case with the Assistant US Attorney, District of Idaho. He recommended that this violation be referred to the Federal Communications Commission for whatever administrative action that they deemed appropriate. After we heard this news, I made an attempt to obtain a copy of the FBI report under the Freedom of Information Act. After the exchange of several letters and a long wait, I got copies of FBI reports on September 15, 1980. The entire matter was now in the hands of the real Paper Tiger—the Federal

Fig. 3. Special Agents' report of actions on December 6.

FEDERAL BUREAU OF INVESTIGATION

- 1 - Date of transcription 1/25/80

SAs [redacted] and [redacted] established an observation point near a knoll a short distance from the Blacks Creek Summit where the radio transmitter had been located on the previous day. The purpose of this observation was to determine if the individuals who were responsible for placing this transmitter device would return to that location when the radio discontinued transmitting on December 5, 1979. b7c

This observation was maintained from 8:00 a.m., until 3:00 p.m., on December 6, 1979. The site of the observation point enabled the Agents to observe the north slope of Blacks Creek Summit and any vehicle traffic passing over that Summit could be readily observed.

At approximately 11:00 a.m., an older model pickup was observed traveling down the icy Summit Road in a northerly direction. The vehicle continued on out of sight and was not again observed until approximately 1:00 p.m. This was the only vehicle observed in the area during the time of the observation and the observation was discontinued at 3:00 p.m., in order for the Agents to return to their vehicle at the Summit of Blacks Creek Road and continue the observation.

Both Agents walked from the observation point down the access road to the Arrow Rock Dam to the Blacks Creek Road. While walking up the north slope of the Blacks Creek Road toward the Summit, a GMC pickup with a camper was observed traveling down the slope toward the Agents. The time of the observation was 3:30 p.m. Observed on the vehicle was Idaho License [redacted] which was designated as an amateur radio license. The vehicle was occupied by two white males. b7c

The driver of the vehicle, who was wearing a beard, stopped the vehicle and asked the interviewing Agents if they needed assistance. They were informed that the Agents' vehicle was at the top of the Summit and no assistance was required.

Investigation on 12/6/79 at Ada County, Idaho File # BT #52-5826

by SA [redacted] SA [redacted] b7c Date dictated 12/10/79

The Agents immediately returned to their vehicle and proceeded down the slope to the junction of the Black Creeks Road and the access road to the Arrow Rock Reservoir. Observed parked approximately 140 feet in front of this access road was the vehicle earlier observed. Observation of that area located two sets of footprints in the snow that went directly from the pickup to the gate to the access road to the Arrow Rock Dam.

The Agents followed these tracks up the path on the access road to a point where the tracks were lost. Due to the time involved in realizing that the two individuals had probably already reached the site where the transmitter had been recovered, the Agents returned down the path to where the tracks had earlier been lost and determined that the two individuals had taken a shortcut over the top of a knoll.

The interviewing Agents then continued down the access road and positioned themselves at a point approximately 100 yards from where the access road joined the Blacks Creek Road. While waiting for the two individuals to return, the Agents heard the engine in the pickup truck start and heard the truck drive away. The Agents immediately returned to their vehicle and upon examining the tracks left by the vehicle, it was determined it had proceeded on north down the Blacks Creek Road toward the area of Prairie, Idaho. The Agents followed these tracks and at approximately 4:35 p.m., the pickup truck was observed and stopped by the Agents. At that time, the occupants of the vehicle were identified. The driver of the vehicle presented his Idaho driver's license and identified himself as [redacted], Idaho. The description obtained from his driver's license is as follows:

Race	White
Sex	Male
Date of Birth	[redacted]
Height	5' 11"
Weight	155 pounds
Hair	Brown
Eyes	Brown
Social Security Account	[redacted]
Driver's License	[redacted]

b7c

The occupant of the vehicle was identified by driver's license and by oral statements as [redacted], Boise, Idaho. His driver's license described him as follows:

Race	White
Sex	Male
Height	6'
Weight	185 pounds
Hair	Brown
Eyes	Brown
Date of Birth	[redacted]
Selective Service Number and Idaho Driver's License Number	[redacted]

b7c

The driver of the vehicle, [redacted], acknowledged that the vehicle belonged to him and he gave both Agents permission to look in the cab of the pickup and in the camper ~~area of the~~ pickup. At that time it was determined that MEISSNER had a radio in his pickup which was set at the frequency of 6.820 megacycles. b7c

NAME NOT Omitted

Observed in the camper area of the pickup was a Super 48 Preco wet battery, which had been installed on a battery charger and was in the process of being charged.

After the identification was made, the Agents returned to the scene where the pickup had been parked and at that time the footprints were back tracked from the pickup to a point north of where the vehicle had been parked over a large bank and up the hill toward the sight where the transmitter had been located on the previous day. The Agents followed these tracks which were the only tracks observed in the snow in that area. The tracks went together for a short period and separated. One pair of tracks was north of the other and went over several deep slopes and continued on to the exact location where

the transmitter had been located on the previous day. The other set of tracks were followed to a point where they joined the access road to the Arrow Rock Dam and continued on where they met the other pair of tracks and continued to the spot where the transmitter had been located.

Both of these pairs of tracks made a distinct pattern in the snow and in the mud, making them easy to follow. A rough sketch was made of the track design, which matched the design on the soles of the boots worn by [redacted] and [redacted] at the time they were identified. b7c

Copies of the sketches of the two footprints are attached.

Communications Commission.

I called the Portland Office of the FCC and they said there wasn't much they could do with this case. I was told that if I wasn't satisfied with their actions I should contact my Congressman or the head of the FCC Investigations Division in Washington DC. After many, many calls to the FCC in Washington, they finally informed me that the evidence that was presented to them in FBI reports was extremely weighty but circumstantial. A staff member of the Investigations Division informed me that the FBI probably had apprehended those individuals responsible for the act.

In essence, the FCC suggested that they could not take actions against the individuals since it was not illegal to be apprehended at the site of the jamming transmitter. I asked what circumstances might enable them to prosecute. They informed me that if the individuals had picked up the transmitter, that would have been sufficient evidence. In other words, had the FBI left the transmitter and the individuals had picked it up, then that might have been sufficient evidence.

I wonder.

Had those individuals

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allegations. It was determined that [redacted] b7c selling this equipment purchased at surplus properties for a profit. Once the allegations had been confirmed, the organization was completely disbanded by the Governor. [redacted] had no idea the Governor would take such drastic action, but assumed that he would only stop members from that organization from buying this surplus property and selling it at a profit. At the time this club was disbanded by the Governor, he was severely criticized by the membership and did make several enemies at that time.

[redacted] explained the jamming of their repeater being experienced at this time as follows: b7c

On December 2, 1979, the repeater located on Chaeffer Butte stopped functioning at approximately 11:00 a.m. At that time he was listening to his radio and heard the signal come on and run three minutes. After three minutes, the signal dropped off because that was the time of the setting of the timeout timer. [redacted] that this meant the repeater was either stuck or was being jammed. b7c

On Monday, December 3, 1979, he went up to Deer Point with three other members of his club, [redacted] and [redacted] On arrival at the site, he reset the timer and the signal came back on the repeater. The signal stayed on for three minutes and again timed out. [redacted] that meant there was a signal input into the receiver and lacking a directional finder to locate this signal input, he returned to Boise, Idaho. b7

The following day, December 4, 1979, at approximately 2:00 p.m., he and JIM HOWARD rented a plane at GEN AIRLINES and flew over the site with a direction finder and found the transmitting signal was coming from Blacks Creek Summit, approximately 17 miles from the transmitter. They over flew the Summit and the meter on the receiver pinned straight down, confirming the general location of the transmitter on the Summit. From the air, he could see snowmobile tracks in the area.

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Later that night, he returned to the area of the Blacks Creek Summit with [redacted] and JIM HOWARD. They walked to the Summit with a direction finder and again located the general site of the transmitter, which was north by east of the Blacks Creek Summit. They were receiving ten signal strength units on their direction finder, which was the maximum reading indicating a very strong signal. This direction finder and the strength of the signal would place the proximity of the transmitter very close. b7

[redacted] stated that from the strength of the signal, it would indicate to him that the transmitter should have a large storage battery. He also believed the transmitter would have an 11-foot beam antenna. b7c

[redacted] said that their radio equipment transmitted at 146.82 megacycles and received at 146.82 megacycles. b

[redacted] also explained that if he and JIM HOWARD had not rented the aircraft to try to locate the transmitting device, he did not believe the equipment they had available to them would have allowed them to find the location because of the lack of access to any of the land between where the transmitter was located by the aircraft and the location of the repeater. It would have involved an almost impossible task of walking through the area between Blacks Creek Summit and the site of the receiver with a direction finder, a distance of 17 miles. For this reason, he did not believe that the persons who installed the transmitter believed that it could ever be found. b7

He also said that the transmitter was placed in a location where it could not be detected from the Boise Valley because the signal was originating from an area over a hill, which blocked out the possibility of it being transmitted into the valley. For this reason, the frequency utilized by their club was blocked out without any detectable signal coming in on the radio. It was only after they went up over Blacks Creek Summit that they were able to pick up any signal on that frequency and under normal circumstances, and without the use of the airplane, they would have assumed the transmitting device jamming their receiver would have been located somewhere near Chaeffer Butte.

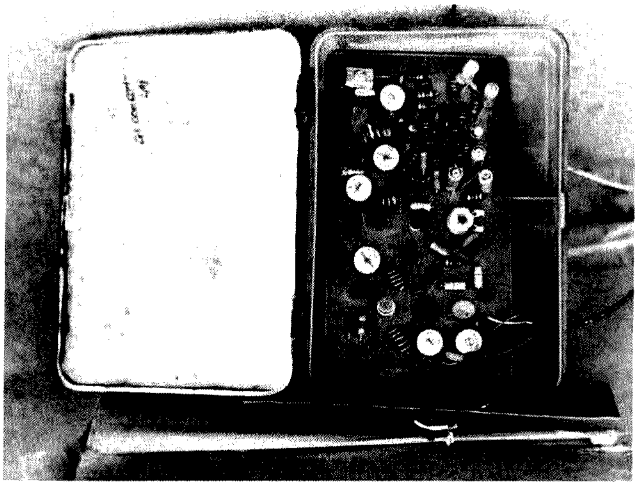

Photo B. The transmitter in the first-aid box.

FEDERAL BUREAU OF INVESTIGATION

- 1 - Date of transcription 1/25/80

[redacted], driver of a GMC pickup bearing Idaho license [redacted] who was stopped by the interviewing Agents on the Blacks Creek Road, was advised of the identity of the interviewing Agents and the nature of the inquiry. b7c

[redacted] furnished the following information: b7c

He advised that he was in that area with [redacted] to look for a place to hunt. When asked what sort of game he was interested in, he stated that they were going coyote hunting. b7c

[redacted] denied having any knowledge at all about an illegal transmitting device that had been placed on a hill near the Blacks Creek Summit and in explanation for the reason why he was observed on a hill at the exact location where this illegal transmitter had been removed on the previous day, he commented that he was just following a lot of tracks, and he wanted to see what had been going on. He continued to say that he knew nothing about the illegal transmitter. b7c

[redacted] stated that the GMC pickup and camper driven by him was owned by him and the Idaho State motor vehicle license, [redacted], were his call letters since he was a licensed amateur radio operator. b7c

[redacted] gave the interviewing Agents permission to look into the cab of his truck and into the camper area and when the Agents found a Super 48 Preco battery in the camper area of his truck, he stated that he had always carried the battery in a cabinet area of the camper and it needed charging. b7c

At the conclusion of the interview, [redacted] was asked his destination, and he stated that he planned to go on to Prairie, Idaho, area and back through Mountain Home. b7c

Investigation on 12/6/79 at Ada County, Idaho File # BT #52-5826

by SA [redacted] SA b7c Date dictated 12/10/79

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BT #52-5826 - 2 -

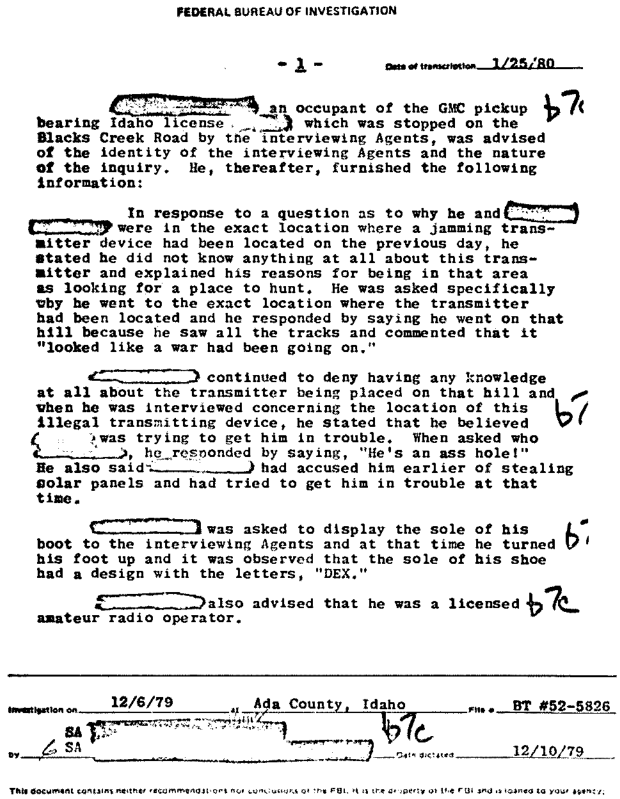
[redacted] was also asked to display the soles of his boots and upon observation of the design on the sole, it appeared to be the same design on the tracks earlier observed by the interviewing Agents, along the access road to the Arrow Rock Dam. b7c

Fig. 4. Report on FBI interview with first coyote hunter.

been apprehended with the transmitter in hand at the site, the story could have been very, very similar: "We were only coyote hunting and found this device tied to the sagebrush." And as the scenario unfolded, I could perhaps have expected a similar reply from the Federal Communications Commission: "It is not unlawful to be apprehended at the site of a jamming transmitter while coyote hunting and stumbling across a device of unknown nature."

In conclusion, I believe that the Federal Communications Commission, in another classic case, has shown its unwillingness to do its job. After a year of investigation and several hundred dollars spent by local radio amateurs, and probably thousands of dollars spent by the government (FBI, FCC, etc.), the efforts of many were brought to an end by the FCC and their do-nothing attitude.

All reports and observations should end with a


FEDERAL BUREAU OF INVESTIGATION

- 1 - Date of transcription 1/25/80

[redacted] an occupant of the GMC pickup bearing Idaho license [redacted] which was stopped on the Blacks Creek Road by the interviewing Agents, was advised of the identity of the interviewing Agents and the nature of the inquiry. He, thereafter, furnished the following information: b7c

In response to a question as to why he and [redacted] were in the exact location where a jamming transmitter device had been located on the previous day, he stated he did not know anything at all about this transmitter and explained his reasons for being in that area as looking for a place to hunt. He was asked specifically why he went to the exact location where the transmitter had been located and he responded by saying he went on that hill because he saw all the tracks and commented that it "looked like a war had been going on."

[redacted] continued to deny having any knowledge at all about the transmitter being placed on that hill and when he was interviewed concerning the location of this illegal transmitting device, he stated that he believed [redacted] was trying to get him in trouble. When asked who [redacted], he responded by saying, "He's an ass hole!" He also said [redacted] had accused him earlier of stealing solar panels and had tried to get him in trouble at that time. b7c

[redacted] was asked to display the sole of his boot to the interviewing Agents and at that time he turned his foot up and it was observed that the sole of his shoe had a design with the letters, "DEX." b7c

[redacted] also advised that he was a licensed amateur radio operator. b7c

Investigation on 12/6/79 at Ada County, Idaho File # BT #52-5826

by SA [redacted] SA [redacted] b7c Date dictated 12/10/79

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Fig. 5. Report on FBI interview with second coyote hunter.

Photo C. The batteries for the transmitter.

recommendation, and I have mine. In light of what I have seen as inaction and a do-nothing attitude on the part of the FCC, and to join with the efforts of many to bring about a streamlining of our government to reduce its overall cost, I summarily advocate Congressional action to eliminate the Federal Communications Commission from among the many branches of our government. If not, then at least the elimination of the enforcement division within that agency because, by its own admission, it prosecutes very, very few of the cases brought before it.■

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Sailplanes on Six

—these thermal-hunting hams have an edge on the competition

What, besides a hamfest, would get a ham out of bed at the crack of dawn to drive a hundred miles to stand around in dew-soaked grass with eighty or ninety other people? An R/C (radio control) sailplane contest, that's what! One contest in particular draws a very large turnout of these types to Faustown Park just outside York, Pennsylvania. It's the Lancaster Area Soaring Society's annual two-day meet which is held the first weekend after the Fourth of July.

The pilots' meeting begins at nine sharp as the Contest Director outlines the flying task for the day. The "task" is the routine which each contestant and his plane will perform. This day, they will launch, drop the towline, and then fly the plane for exactly ten minutes before landing it inside a twenty-five-foot-diameter circle, right-side up and with no parts shed. Sound easy?

The aircraft are separated into four classes. Scale ships are miniature replicas of full-size planes, right down to the pilot figure and instrument panel. Planes of less than 100-inch wingspan have two classes, one for ships with just rudder and elevator controls and the other for ships using spoilers—which are like air brakes. The fourth group is called "Unlimited" because any plane with any number of controls and a wingspan of over 100 inches may compete in it.

After the pilots' meeting, the contestants break up and return to their planes to check them over before being called up to fly. Usually, a group of hams will gather to chat about the weather conditions, which repeater they used while driving to the Park, or the new FM R/C radio that one of them will be using. Hams usually make up about ten percent of all of the contestants, yet they manage to wind up near the top of the heap when the scores are

Jeff Carr WB3CXC launches his Pierce Paragon sailplane at the 1980 League of Silent Flight Regionals. At age 16 his score was second highest overall and tops in Junior class. (The tow line is too fine to see.)

With the US Air Force Museum in the background, Peter Carr WB3BQO holds his 12-foot-wingspan Craftaire Sailaire sailplane at the 1980 A.M.A. Nationals Contest.

Bill Melske, a ham who hails from the New York area, launches his Craftaire Viking of 3-meter wingspan.

Don Goodwin WA2FRO puts his 100-inch-span Aquila on the tow line. The plane carries a Thermic Sniffler and is guided by an R/C rig on 53.3 MHz.

counted. This is because they are better prepared.

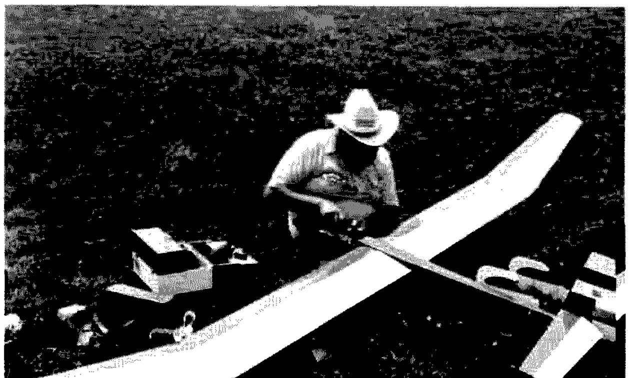
As each ham is called to the launch area to fly, he collects his transmitter from the Impound Table. (All transmitters remain impounded except when in use in the contest, avoiding jamming through accidental use.) It carries two colored streamers on its antenna; one color is black, denoting a six-meter operating band, and the other color shows which frequency it uses in that band. Also, most hams use a Thermic Sniffler, a telemetry system which senses temperature changes (indicating thermal currents) and radios them to the pilot. This rig operates in the low end of the two-meter band. The use of the six-meter uplink and two-meter downlink is restricted to hams with a Technician or higher-class license.

At the launch area, the ham connects his plane to the towline by a hook mounted on the bottom of the fuselage. He then moves up to the winch unit and steps on a foot switch. This engages a motor and drum assembly which winds in the towline and tows the plane into the air. At "top of the launch," about five- to six-hundred feet up, the line is dropped by radio command and the line falls to earth for the next launch. Meanwhile, the plane banks away to begin its search for lift.

Without finding a thermal, most sailplanes will fly no longer than about three and a half minutes. Finding these thermals is the basis of the contest, and the pilot's ability to locate and gain maximum height from each thermal is what the game is all about. A thermal is an invisible column of rising air which originates just above the earth.

A dark area such as a parking lot, farm field, highway, or the roof of a building absorbs more heat than its surroundings. This heat is passed to the air just above it and the air begins to rise. As this bubble of warm air rises, cooler air is drawn in to replace it and to

Joe Bertin WD8PRG operates a winch-line retrieval system which returns the towline to the launch area for another launch.



Dave Burt of Indiana, Pennsylvania, adjusts the controls of his original design "Penn-Fli" 12-foot-span sailplane.

be heated itself. This results in a column of air which leans over and drifts downwind while going up.

Since all this is invisible, the only way a pilot can tell if his plane is near one is to watch its movements. A sudden change of direction or wobbling of the wings means that the plane has entered the turbulent air around the thermal. If the plane is some distance from the pilot, identifying and staying with the thermal can be difficult. Hams have a better way. Their Thermic-Sniffler rigs send an audio tone of about 850 Hz, which indicates steady flight. When the plane enters a thermal, the tone rises—at a rate determined by the degree of the change in altitude. All else being equal, the higher the tone, the faster the plane will go up. If the plane hits a downdraft (colder air), a much lower tone alerts the pilot to steer away toward better air. By listening to the tone, the pilot can find a thermal, center the plane in it, and keep it centered as the thermal drifts downwind. This is obviously far more efficient than guessing from a thousand yards away.

Having worked the thermal for the required time, the sailplane is then flown back to the landing area. This part of the flight is very important and can add ten to fifteen percent to the pilot's total score. The landing circle has a length of tape nailed down at its center point, and scores are marked on it from 100 in the center to zero at the end. The plane must land as close to the center of the circle as possible, and the score is read where the tape touches the plane's nose.

Each pilot will fly four flights like this during the day. Because there are only seven R/C frequencies for non-hams, there is a long wait between rounds for those without an amateur ticket. Hams, on the other hand, have five R/C frequencies in the top of the six-meter band, and since there are fewer hams, this makes the wait between rounds much shorter for them. As the best lifts occur between 10:00 am and 2:00 pm, being able to choose when to fly is an added advantage for the ham.

At a large contest such as the one at York, the flying isn't completed until late afternoon, at which time the awards and trophies are passed out. It should be no surprise that hams take home a large share of the hardware. By using their electrical and mechanical skills to prepare the aircraft and their license privileges to operate them with confidence in the uplink control and efficiently through telemetry, they are well prepared, and scores show it. They also have the satisfaction of knowing all about their radios as well as their aircraft; they haven't just assembled store-bought items and made them work together in harmony.

The road home is made shorter by the chatter on the area repeater about missed landings, new model designs, better radios, and the feeling that win or lose, you have enjoyed the companionship of a great bunch of people. ■

Gene Shelkey from Scottdale, Pennsylvania, gets some help to launch his scale-model Schweitzer sailplane. It is an 11-foot span, 6½-pound flying weight craft complete with pilot figure and full interior.

Gerry Zeigenfuse from Eastern Pennsylvania flies his Pierce Paragon on six meters at the 1980 contest at York.

The Supernova Station Organizer

—in this project, four into one will go!

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Rockville MD 20853

It was on Roanoke Island, located near the Outer Banks of North Carolina, where I first met Dick Schultes WB2PEF from Cherry Valley, New York. Dick had brought his HW-8 plus tuner and bridge with a box of coaxial cable and antennas for a week of ham camping on the island.

Being thoroughly satisfied with the simplicity of operating the HW-8, I purchased one for my own camping usage. However, instead of WB2PEF's multiple-box station, I wanted just one additional box having as many conveniences as possible.

Thus, the Supernova was created. This device has four functions which enhance the operation of my QRP station. It contains an ac power supply, keyer, transmatch, and swr bridge.

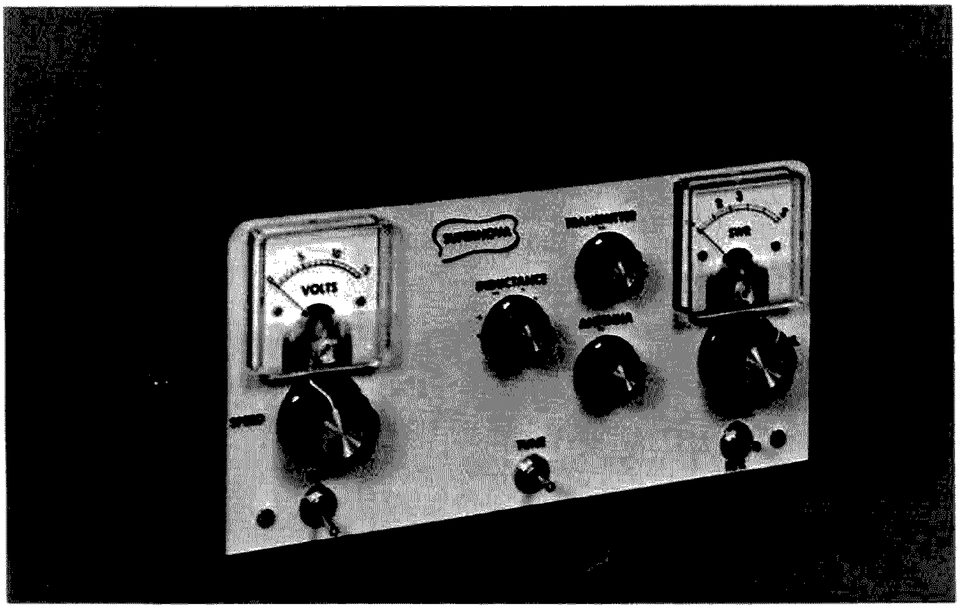


Photo A. The completed Supernova.

The keyer circuit uses the Curtis 8044 chip which is suitable for portable operation and readily adapts to a set of paddles.

The rf department was planned for use with a 40-meter half-wave dipole, center-fed with 50-Ohm coaxial cable. Multiband operation on 20 and 15 meters is aided by a built-in transmatch combined with a unique swr bridge.

Front-panel controls include a speed control for the keyer and a spring-return toggle switch for keying the rig during tune up. The FWD and REV selector and sensitivity controls are located under the swr indicator. The opposite side of the panel contains the voltmeter and power ON control, giving a well-balanced professional appearance to the panel.

The cabinet for the project was retrieved from my junk box and measures 8" × 4-1/2" × 4". The front panel and inner chassis were fabricated from scrap sheet aluminum. The transmatch and swr bridge were

shielded within a 3" × 4" × 5" minibox provided with a removable top section. The bottom section attaches to the inner chassis using sheet-metal screws. Rf input and output connectors plus a wing-nut ground terminal are mounted to the side of the bottom section. This bottom half of the minibox was modified by removing the front side to provide panel clearance for the transmatch and swr components.

The inner chassis was constructed with a rear-apron dimension of 7/8", which is sufficient to accommodate the various rear-mounted parts. These included: two 1/4" phone jacks for the keyer input and output, a twisted pair of #16 AWG wires 24" long with battery clips, fed through a 3/8" grommet for storage-battery operation, a DPDT toggle switch wired in parallel for selecting either battery or ac operation, and another twisted pair of the same size and length terminated with the HW-8 power connector. Next in line are the two fuses, one for protecting the battery circuit and the other the ac circuit. Finally, the input ac wires enter the apron through another 3/8" grommet. It was a tight fit, but I felt that all of these inputs and outputs plus other components were important to maintain complete control and flexibility from my QRP station.

For travel purposes, the three power cords can be coiled and stuffed into the back of the unit between rf box and the power transformer. In addition, the XYL contributed to the effort with a set of custom-made covers using some old towels. A close color match to the HW-8 was obtained by spraying the cabinet with #204 Ford-green engine enamel and the front panel with DS-GM #283 pastel green. These

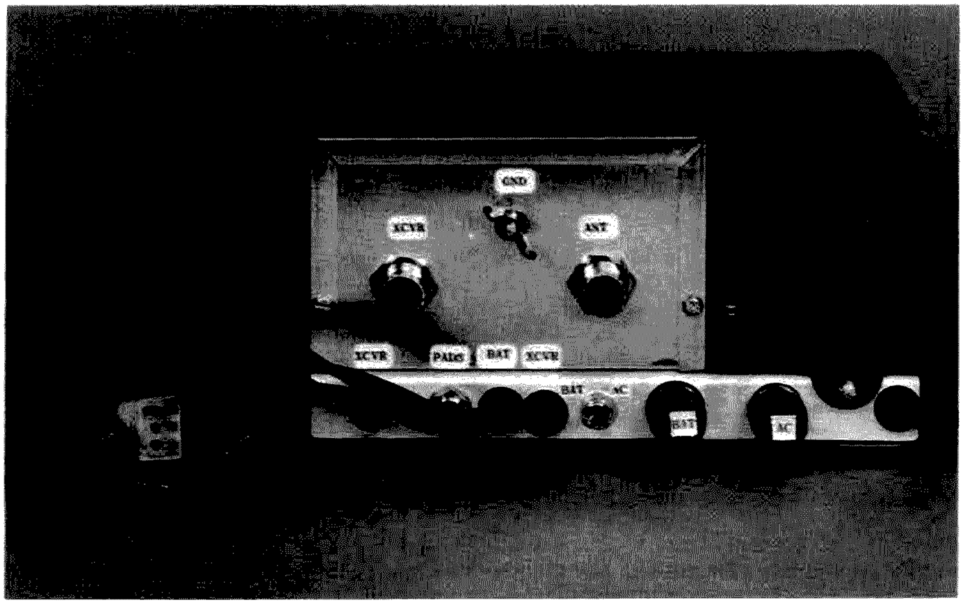


Photo B. Rear view of the Supernova.

paints are available from your local automotive-parts outlet.

Power Supply

The ac power supply is a standard circuit using a 12.6-V ac at 1.5-A transformer and a full-wave rectifier. With the capacitor-input filter, the input voltage to the LM340-15 regulator is about 17.6 V dc, giving a voltage differential of 2.5 V dc across the regulator. During keying periods, the voltmeter shows a steady indication very near 15 V dc. For good regulation and minimum ripple, a large amount of capacity was required, as shown in the circuit diagram.

The plus 15-V dc regulated voltage is connected to the rear-panel selector switch. Notice that the voltmeter is wired to the arm of the switch. This allows monitoring of either the ac-supplied 15 V dc or the storage-battery voltage.

Keyer

I'm accustomed to using a set of paddles in my shack, so I made this a requirement for my QRP rig. I chose the Curtis 8044 chip because of its compactness and low operating power. See Fig. 1.

Since the HW-8 has its own sidetone generator, there was no need to use the 8044's generator circuit. Therefore, pins 11, 12, and 13 were not used. The supplied data sheet showed Vdd max to be 10 V dc. This presented a small problem since I would be using either 12 or 15 V dc. A one-Watt, 8.2-V dc zener and a series resistor provided a simple solution.

The output of the 8044

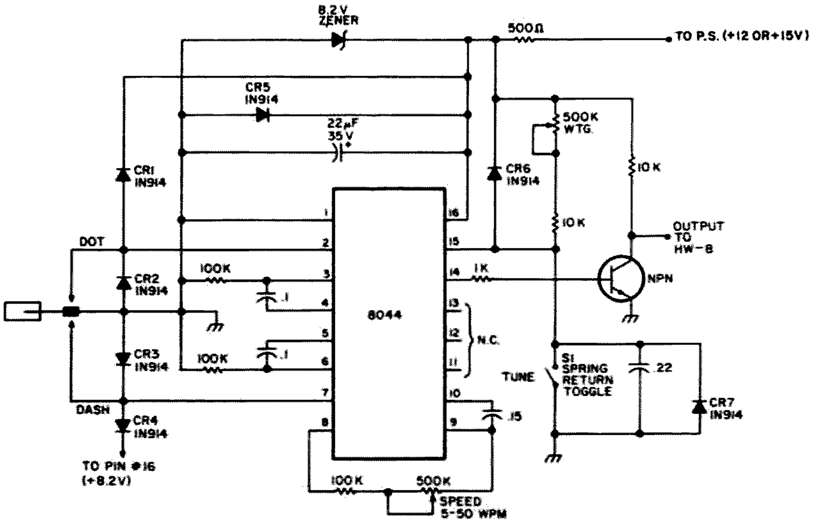


Fig. 1. Keyer circuit.

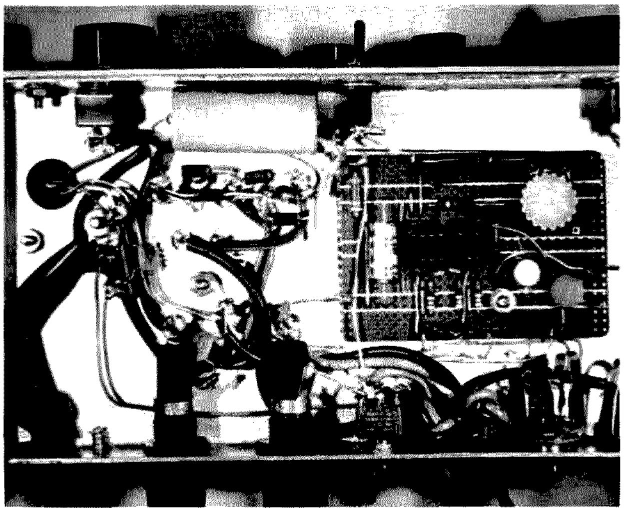


Photo C. This bottom view of Supernova shows the power supply components on the left and the keyer parts on the right. Across the bottom are the various inputs and outputs.

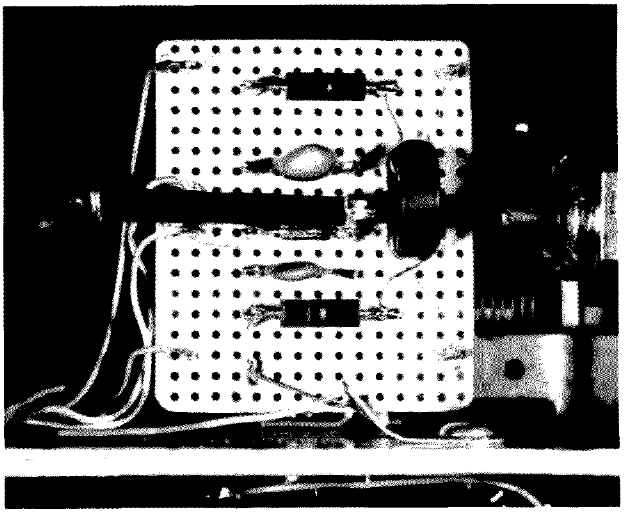


Photo D. This view of the swr bridge shows the main rf wire covered with black insulation. Notice the wire reversal on the lower winding.

drives an ordinary NPN transistor on the keying line. When either the dot or dash paddle is active, the collector of this transistor will transfer from 8.2 V dc to near ground potential thereby turning on the transmitter. Notice that only one keying wire is required to the HW-8. The other connection is supplied by the power ground wire.

The circuit for the keyer shows several diodes. *Do not* omit these diodes—they have a definite purpose. As stated in the Curtis data sheet,[1] this chip uses CMOS technology; and although not stated in the data sheet, the device could be susceptible to electrostatic discharge (ESD). Admittedly, the level of zapping voltage may be higher than for an unprotected MOS device, but you nevertheless should exercise caution during handling.

I recommend that the entire keyer circuit be fabricated using all the diodes called for, and with all wiring to jacks and power supply completed, prior to inserting the 8044 into its socket. Photo C shows the parts layout which I used. The weight control is board-mounted and adjustable through a hole in the case bottom.

When you are ready to install the chip, place the palms of both hands on the chassis. This will discharge any accumulated body charge and place you at the same potential as the chassis. Remember that after removing the chip from its black conductive foam, it becomes vulnerable to ESD damage.

Next, grasp the chip on its bare sides (*never* the lead sides) and install it into the socket. These are relatively simple precautions that could save your device from damage. Personally, I'd rather use a little caution than mail another sixteen bucks to Curtis Electro.

Swr Bridge

The swr-bridge circuitry is a modification of a circuit which I've used in the past on some CB equipment.[2] All components are attached to a piece of perfboard mounted in the rf box. The main rf conductor, a #12 AWG wire, is secured to the board and serves as the board mount when soldered into the rf connector. See Photo D for details.

This circuit requires two 3-turn windings on a toroid core to form a transformer with the main rf conductor. Once the windings are phased properly, a SPDT toggle is used to transfer the indicator circuit from FWD to REV. Both windings are wound on the core in the same direction using #28 enamel-covered wire.

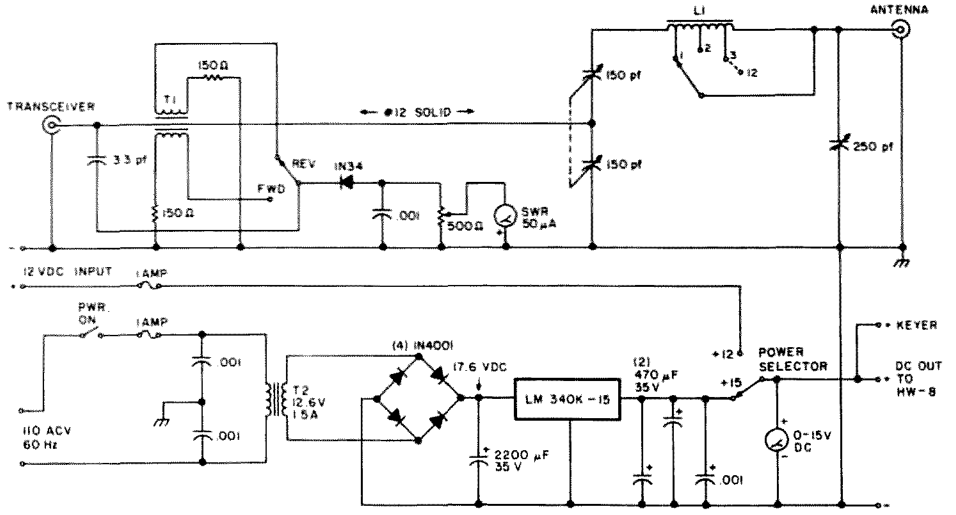


Fig. 2. Power supply, swr bridge, and transmatch. T1 uses two three-turn windings of #28 enamel on a Fair-Rite Products #638MT-L core. Windings are laid on in the same direction. L1 consists of 30 turns of #18 enamel on an Amidon #T-106-2 core.

Phasing is done by reversing the two wires for the REV winding. The bridge components were arranged in an orderly fashion with no great concern given to bridge symmetry. The bridge has been checked against my commercial swr bridge with no difference detected at QRP levels.

Transmatch

This circuit is a basic transmatch configuration[3] using a broadcast transistor transistor-radio dual capacitor, a standard single-gang capacitor, and a core inductor. See Fig. 2. The inductor was constructed using 30 turns of #18 enamel-covered wire with 12 taps, spaced about every two turns. An air inductor could be used, but it would occupy considerably more space. The diameter of the completed core inductor approximated the size of the ceramic wafer on the rotary switch. This proved to be beneficial because after bending the switch solder lugs parallel with the wafer, wires from the 12 taps slipped into the lugs. See (Photo E) for details.

Operation

The Supernova is simple to operate and, when combined with the HW-8, the two units become inseparable. Whether in my home shack or in some remote location, I have experienced a satisfaction that only a QRP operator could appreciate.

When placing my station on the air, I have found that time is saved by first tuning up the HW-8 into a dummy load on the band of my choice. With the swr bridge set to read reflected power, adjust the transmatch for a minimum indication. Use the sensitivity control to maintain meter deflection near midscale for these initial adjustments. For maximum transfer of rf power, use the least amount of inductance while tuning for a 1:1 match.

When you have obtained the best possible match, switch to FWD and set the meter to full scale. While the transmitter is still keyed readjust the loading control on the HW-8. The power meter on the rig will peak, with simultaneous peaking of the swr meter, indicating proper rf coupling to the antenna. The sensitivity control may now have to be reduced somewhat to maintain the full-scale reading. The correct swr ratio can now be read when the switch is placed in the REV position.

The Supernova has performed better then expected. The transmatch loads the 40-meter dipole with near 1:1 ratios on 40, 20, and 15 meters. In the evenings when 20 and 15 are open, I can work from coast-to-coast with respectable signal reports. I have operated the two units from my 12-V dc storage battery or commercial power. The ability to transfer between power sources proved very convenient during unscheduled power outages.

I designed the Supernova to enhance my HW-8 while keeping component cost at a minimum and operation simple. I believe these goals were satisfied, and hope I've contributed in a small way to the big thrill of QRP communication. ■

References

1. 8044 Keyer Data Sheet, Curtis Electro Devices, Inc., revised February 23, 1979.
2. "High Sensitivity Swr Meter," *Popular Electronics*, October, 1979.
3. "The Super Transmatch," *73 Magazine*, July, 1976.

Component Sources

T1—#638MT-L, Fair-Rite Products, available for $1 and an SASE from William Vancura, 4115 35th Ave., Moline IL 61265.

L1—#T-106-2, Amidon Associates, available for $1.50 plus $1.50 shipping. Amidon Associates, 12033 Otsego St., North Hollywood CA 91607.

Keyer-On-A-Chip—#8044, Curtis Electro Devices, Inc., available for $14.95 plus $1.75 shipping direct from the factory: Box 4090, Mountain View CA 94040.

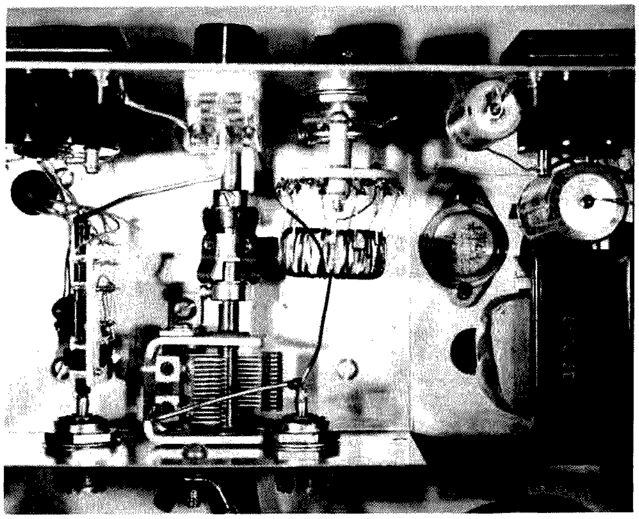


Photo E. This top view shows the swr bridge on the left in the same box with the transmatch. The ac power supply parts are on the right side with two of the large filters.

Jeff DeTray WB8BTH
Tim Daniel N8RK
73 Magazine Staff

Kenwood's TR-9000

—the multi-mode 2-meter rig that's making SSBers out of VHFers

If we had to choose one word to describe Kenwood's TR-9000, a multimode two-meter transceiver, that word would be *flexible*. In two months of use, we have put this rig to the test as an FM station at home, made it a mobile traveling companion, and used it to enjoy the fun of SSB mountaintopping. All this flexibility comes in a box that is no bigger than most conventional FM-only units.

Tuning, Scanning, And Searching

Each TR-9000 user will discover a favorite way to select operating frequencies. You can use the main tuning dial, stepping across the band in 100-Hz, 5-kHz, or 10-kHz steps. The same thing can be accomplished with the up and down switches on the microphone. If operating is confined to a handful of frequencies, then the memory channels may be preferred. There is even a special oddball channel that allows you to use nonstandard repeater splits.

Three types of searching and scanning can be used. "Autoscan" is an FM-only means of scanning the entire band. If a signal is present, the scanning stops and then restarts when the signal drops. Pushing either the hold switch or the PTT switch returns the rig to normal operation. The second kind of scanning is "free scan," in which the band is swept without stopping. Another version of free scan gives the user "search" capability in the SSB and CW modes. A 10-kHz segment is repeatedly searched in 100-Hz steps. That way you will be aware if there is any activity on what might otherwise be a dead band.

The ten front-panel controls devoted to frequency selection take some getting used to, but the remaining seven knobs are self-explanatory. They give you RIT, volume control, squelch, etc.

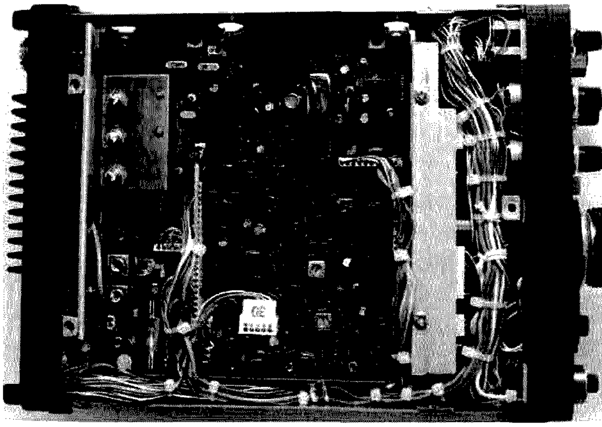
Looking Inside

Before giving the details of what we liked and disliked about the TR-9000, it might be worthwhile to look at the rig's innards. There are eight circuit boards, filling almost every available square inch of space. The frequency selection and control blocks fill three of the boards. The majority of the remaining circuitry is found on the transmitter and receiver cards. Three smaller boards hold the transmitter power amplifier, carrier oscillator for SSB/CW, and sidetone oscillator.

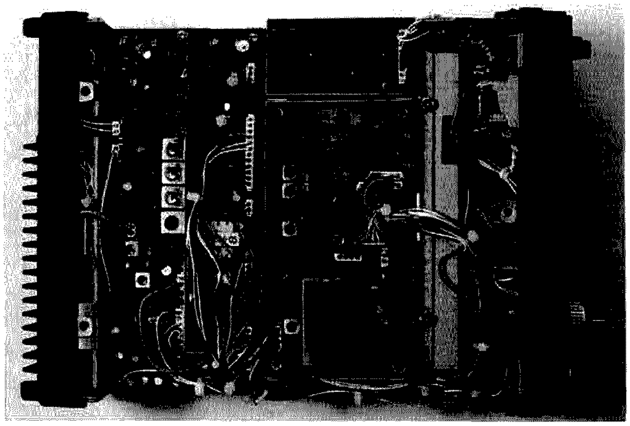
The TR-9000's flexible frequency selection stems from the use of a 6500-based microprocessor system. The magic takes place in one chip that contains the memory, central processor, and much of the support circuitry. The microprocessor has sixteen data lines that drive the phase-locked-loop unit where the frequency synthesis takes place.

The contents of the microprocessor's memory are lost if the power is disconnected, requiring the user to reprogram his favorite frequencies. If the rig is

Kenwood's TR-9000.



Bottom view of the TR-9000.



Top view of the TR-9000.

connected directly to a battery, the TR-9000's computer will keep operating even if the power switch is in the off position. This backup function consumes about 2.5 mA, so the rig can be left in the car for several weeks without causing appreciable battery drain. Since the computer is always on, it is important that the radio be disconnected before the vehicle is jump-started or an external battery charger is used.

A close examination of the TR-9000's schematic revealed that cost-cutting measures had been held to a minimum when the rig was designed. Unlike some of the earlier all-mode two-meter rigs, Kenwood's latest whiz-bang box has separate filters for SSB and FM. The dual-conversion receiver for FM offers one level of selectivity, while the single conversion SSB/CW circuit has a narrower bandwidth. This allows you to have your cake and eat it, too.

CW operation is enhanced by a "fast" agc that automatically returns to a slow constant when the rig is switched to SSB. A noise blanker is available for SSB or CW receiving and helps to reduce the plague of impulse ignition noise. Another SSB/CW-only feature is the RIT, which offers as much as 1 kHz of plus and minus offset. Transmitting on CW can be awkward since the T-R switching must be done with the microphone's push-to-talk switch or with a "standby" switch of your own devising. Accommodations for full or semi-break-in CW operation are not to be found.

The TR-9000's transmitter circuitry features a preset microphone gain for SSB operation. The alc and mike gain circuits are factory aligned for a "normal" voice and may need some tweaking by the operator who whispers or shouts into the microphone. Unfortunately, the instruction manual only shows where the controls are located—not how to adjust them. A rear-panel connector is provided for FM operators who desire to use a touchtone™ pad. An 8-volt supply is available at this connector when the rig is in the FM mode.

The TR-9000's final power transistors provide 10 Watts of output in the high-power FM and CW modes and approximately 10 Watts PEP out for SSB. The energy-saving low-power position reduces the output to slightly more than a Watt. Our tests showed these power levels to be consistent from 143.3 to 148.7 MHz, allowing MARS and CAP coverage.

Like other radios using solid-state finals, the TR-9000 employs a protective circuit that reduces the transmitter's output power when the antenna is something other than a nominal 50-Ohm load. Our tests showed that no appreciable power reduction occurred until the swr exceeded 2:1.

The instruction manual that accompanies the TR-9000 is in keeping with the tradition of providing basic operational instructions and little else. The six methods of frequency selection and searching are described with moderate clarity, but it takes several minutes of study and experimenting to get the hang of things. The manual's text is supported by a number of drawings that show the do's and don'ts of installing the rig. Information about servicing is nonexistent except for warnings not to play with the radio's insides. A service manual is available, however.

We previously noted that operating the TR-9000 involves some compromises, especially in the SSB and CW modes. Perhaps an explanation is in order. Until recently, multi-mode two-meter rigs were scarce and expensive. VHF diehards relied on receiver and transmitter converters. This meant tying up an HF station and dealing with cabling and switching hassles. The benefits of this approach include a more sophisticated receiver and the opportunity to have VOX, variable mike gain, and similar goodies. Which approach is better? That depends on your needs.

For *73 Magazine* staffers who have a drive-up mountain ten minutes away, the all-mode radio was the answer. Most of the time it resides in a mobile setup, being used on the local repeaters. When the two-meter SSB bug hits, we toss a small beam into the car and head for the mountain. In no time flat, we are having a blast talking to SSB ops up and down the eastern seaboard. Future plans call for the TR-9000 to be pressed into service as part of an OSCAR satellite station. We can't vouch for the rig's applications in weak-signal work like moonbounce or scatter, but it does do a good job of meeting our FM and mountaintopping needs.

Odds and Ends

Several matching accessories can accompany your TR-9000. The PS-20 is a 12-volt power supply, good for 4.5 Amperes. A matching external speaker, the SP-120, is a nice addition for fixed station operation, as is the system base, B0-9. It has a memory backup power

Continued on page 101

Paul Grupp KA1LR
73 Magazine Staff

Butternut's HF5V-III Vertical

— this one really does work equally well in all directions

The trap vertical antenna is an oft-maligned radiator of rf, but, in truth, it has a few things going for it. It is ideal for the beginner who wants to sample the activity on all the bands without making his backyard look like the high-wire act at the circus or spending a lot of money. Properly installed, the vertical can even be reasonably effective! Truly, the trap vertical is not just for beginners. A roof-mounted vertical is often the only answer for hams with a shortage of real estate who crave 160-, 80-, and 40-meter operation. The low angle of radiation of a vertical has better DX-catching potential than a dipole, and contesters have found the vertical to be excellent for checking activity off the back and sides of a directional array. Many a long-path DX opening has been missed because a station did not do this sort of checking! I frequently use a vertical to make sure that my beam is headed in the right direction. Flip back and forth between the beam and the vertical—if the other station is stronger on the vertical, you are pointing the beam in the wrong direction.


The Butternut HF5V-III vertical antenna.

Once you have a vertical, you'll think of lots of ways to use it. As the sunspot cycle plunges 10 meters into oblivion, you might want to consider taking down that tribander, replacing it with four- or five-element monobanders for 15 and 20 meters. On the rare occasion when 10 is open in the bottom of the sunspot cycle, the vertical will allow you to sample the action. Meanwhile, you'll be enjoying the superior characteristics of the large monobanders on 15 and 20, assured that you aren't missing much on torpid ten!

Some time ago, I installed Butternut HF5V-III vertical antennas in two separate locations—one roof-mounted at the *73 Magazine* ham shack for contest spotting and Novice use and the other ground-mounted at home to serve as my main antenna system until I amass the fortune necessary for a tower and beam.

Why the Butternut?

I chose the Butternut antenna for two reasons. Trap vertical antennas have relatively narrow bandwidth on 80 and 40 meters and must be set for lowest swr in the most often used portion of the band. This is a reasonable compromise, unless you operate in both CW and phone bands, as I do. With many verticals, retuning for different portions of the band is annoying at

Continued on page 131

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The Meterless Ohmmeter

—an audible continuity tester

The subject of this article is an audible low-voltage, low-current, and low-cost continuity tester. The tester is also small enough to put in your shirt pocket because it uses a 35mm film container for an enclosure. Originally I had a need for such a tester during a project that was wire-wrapped and I needed to check a lot of connections in as short a time as possible. The tester will give you an audible indication of resistance up to around 2000 Ohms. You can test semiconductor junctions with it and the tester will let you tell the difference between just a few Ohms of resistance because different tones will be heard when testing different values of resistance. Since this continuity tester will let you measure small values of resistance, it is nice for testing any sort of wiring or semiconductor components.

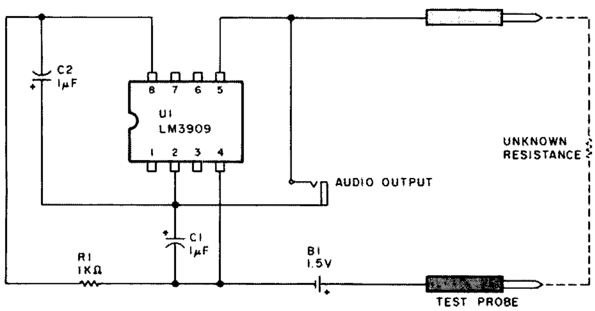

Fig. 1. Continuity tester schematic.

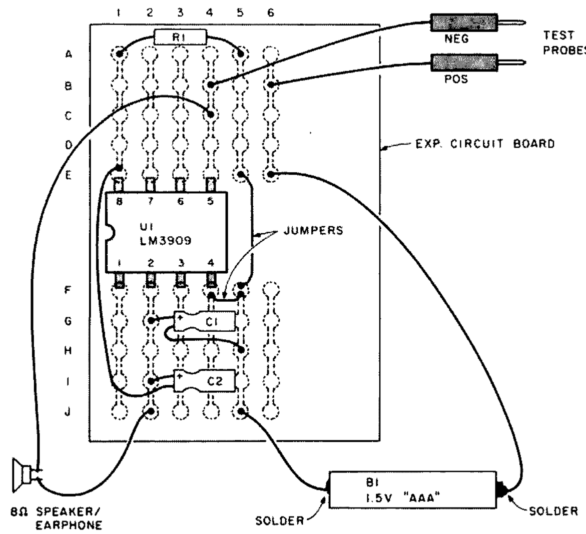

Fig. 2. View from top of circuit board.

The LM3909 used in this tester is almost indestructible provided it isn't fed with more than 1.5 volts. I use an AAA-size 1.5-volt battery in my tester and it has lasted almost a year now. The tester provides enough voltage to turn on transistor and diode junctions and it does so at low current levels. Maximum current levels are obtained when the component being measured has close to zero Ohms of resistance. If you use a 1000-Ohm earphone with the tester, the current will be approximately 2 mA. If you use an 8-Ohm speaker, the current will be around 13 mA. If you're not measuring zero Ohms, the current through the component or wire being tested will be in fractions of a milliampere. The enclosure used for my continuity tester was an empty film container and it is just the right size to put in your pocket and get ahold of when you need it. If you don't have a 35mm camera, ask one of your friends that does to give you an empty film container.

Construction of this continuity tester will only take an hour or so if you have all the parts ready. You can buy all the parts at a Radio Shack store. Depending upon what you have in spare parts and your junk box, the total cost will be from five to ten bucks.

The electrical design of the continuity tester is shown in Fig. 1. If you look at Fig. 2, you can see how the parts are placed on the piece of experimenter circuit board. A completed continuity tester is shown in Fig. 3. Looking at Fig. 1, you should notice that the earphone or speaker has to be connected for the tester to operate. If you don't use an earphone and jack as I did, you might want to install an on-off switch to turn the tester off in case the test

Fig. 3.

leads touch together while it is waiting to be used.

Before you solder the parts in place on the circuit board, trim it down enough to fit into the film case. Then drill two holes in the lid of the film case and pass the test leads through it. Fig. 5 is an example of my trimmed down circuit board. The capacitors used in my tester were electrolytics rated at 50 volts, but any rating small enough to fit on the circuit board and into the film case would work just as well. The voltage rating needs to be only a few volts, so tantalum capacitors would work nicely, too. After you have soldered the components to the circuit board, drill a hole in the center of the film container top for the earphone jack (if you use one) and install it. Finally, solder the leads going to the battery and touch the test leads together. You should hear a tone coming from the earphone or speaker, depending on which you used. At this point, your continuity tester should look like Fig. 4.

If you have some low values of resistance handy, try the tester on them and listen to the different tones generated by different values of resistance. When you're sure that the tester is working correctly and all the wires are soldered, wrap the circuit board and the battery with electrical tape to prevent things from shorting out once you put everything into the film case. Take a look at Fig. 6—you can see what my tester looks like before stuffing everything into the film case. Now that you've got the audible continuity tester put together, you can use it to check wires and semiconductors. By connecting it to a telegraph key, you've got a code practice oscillator. If you replace the earphone or speaker with the correct value of resistor (between 10 and 2000 Ohms) and take an output from across it, you have an audio signal generator, the output frequency depending upon the resistance that you use. ■

Reference

National Semiconductor Corp.
Linear Applications Vol. 2
AN-154
Santa Clara CA 95051

Parts Suppliers:

Global Specialties Corp.
70 Fulton Terrace
PO Box 1942
New Haven CT 06509

Jameco Electronics
1355 Shoreway Road
Belmont CA 94002

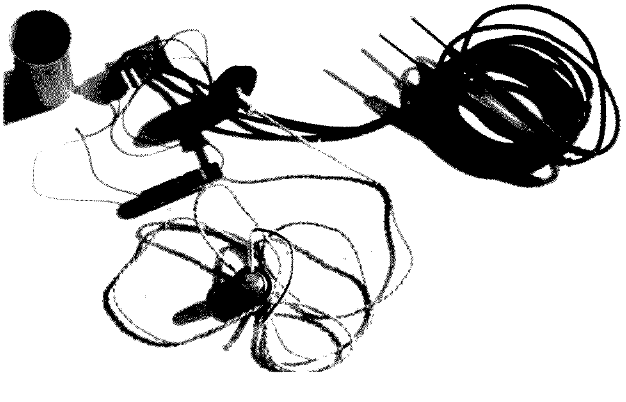

Fig. 4.

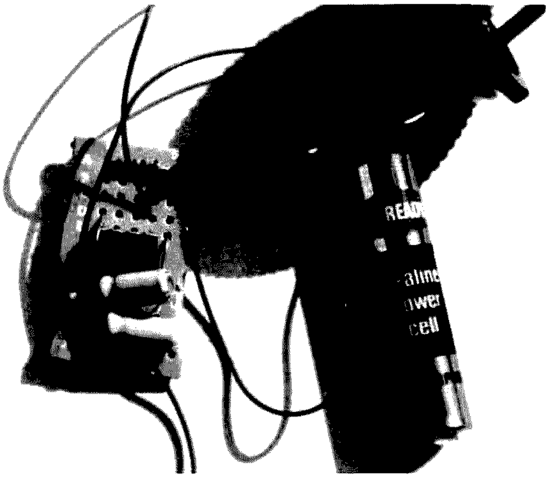

Fig. 5.

Fig. 6.

Parts List

C1 and C2	1-uF/15-volt electrolytic capacitors
R1	1000-Ohm, 1/4-W resistor
U1	LM3909 flasher oscillator
B1	1.5-volt AAA-size battery

Miscellaneous:
Circuit board (Radio Shack 276-170, Global Specialties Corp. EXP-300), Test probes, 35mm film container, speaker or earphone and jack, wire, solder.

QRM-Free Antenna Tuning

—with this inexpensive noise bridge

One definition of the word "relaxed" is "being at rest or at ease." The way to achieve that state when working with antenna tuning problems is definitely to use a noise bridge. Compared to the anxiety and frustration which usually develop when feeding power into a tuning system for protracted periods, you can experiment for hours

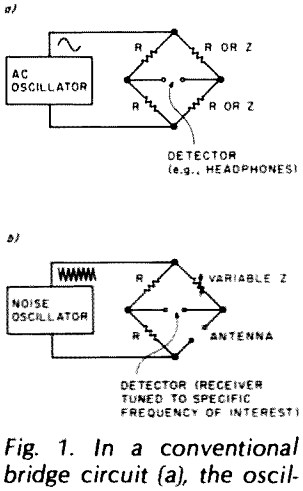

Fig. 1. In a conventional bridge circuit (a), the oscillator generates a specific frequency which is detected for a null when the bridge is balanced. In a noise bridge (b), multiple frequencies are generated and the detector provides selectivity so the bridge can be balanced for a null at the frequency of interest.

using a noise bridge and not worry about components heating up or having to vary the power level back and forth to get an swr meter to read properly as tuning conditions change.

Besides, you also do the rest of the amateur fraternity a favor by not radiating a lot of needless QRM. Any amateur who does not have such a permanently established antenna and antenna tuning system that operation is merely a matter of always presetting tuning controls on each band might well consider the noise-bridge idea.

The noise bridge is a versatile device and can be used for various functions involving impedance measurement as well as antenna tuning. However, it is probably most useful for antenna tuning work, so just that aspect of its application will be emphasized. The basic idea of the noise bridge is just like that of most bridges. That is, as shown in simplified form in Fig. 1(a), when the arms of the bridge are balanced, the detector will not have any output.

Usually, the detector used is not frequency selective: The ac oscillator used, be it in the af or rf range, generates a specific frequency and the detector is a broadband device (like a pair of headphones) which responds to any oscillator frequency being used. As shown in Fig. 1(b), the noise-bridge idea just exchanges this scheme—the oscillator becomes a broadband frequency-generating device, and a frequency-selective detector is used.

In the noise-bridge scheme, the noise generator generates rf noise (a voltage which is a random function of time) over the HF range and a communications receiver tuned to the frequency of interest becomes the detector. When the arm marked "variable Z" in Fig. 1(b) has the same value as that connected to the terminals marked "antenna" at a specific frequency, the noise level (as heard in a receiver tuned to the same frequency) would theoretically be zero. In reality, because of leakage and imperfect components, the received noise is not zero, but it dips to a distinct null as the "variable Z" arm is varied in value around that of the impedance connected to the "antenna" terminals.

The circuit of the noise bridge is shown in Fig. 2. A 6.3-volt zener is used as a noise source and its noise output is amplified by a simple three-stage amplifier. There is nothing particularly critical about the components used. The only item that requires a bit of care in construction, although it is hardly difficult to do, is the output transformer. Care must be taken to obtain good balance between the windings.

The transformer is wound on an Indiana General CF 102, 3/8" ferrite core or on an Amidon T-50-2 core. These items were formerly a bit difficult to obtain but are now readily available from a number of mail-order sources. In fact, Amidon will sell direct and accepts small orders (Amidon Associates, 12033 Otsego Street, North Hollywood CA 91607).

A slightly larger or smaller core also can be used as long as the core is made of a ferrite "mix" intended for the HF range. Four 5" lengths of #28 enameled wire (or any near gauge) are first twisted together along their entire length. One neat way to do this is to insert each wire in a hole on perforated board stock

leaving just enough wire exposed to grip the ends. Then, twist the board and gradually pull the wires back out of the board.

It doesn't cost much to practice this technique a few times and extremely neat results will be obtained. The "quadrifilar" winding on the core is then produced by simply taking the twisted wire bunch and winding it on the core to produce 4 to 5 turns. Space the turns evenly around the core and hold them in place with a bit of clear glue or coil dope. The ends can be marked before winding the transformer or located after using an ohmmeter.

Connect any two windings together to form the primary and the other two together to form the secondary. Take care, of course, to get the windings polarized correctly as shown by the dots next to the windings in Fig. 2.

The circuitry can be assembled on any small PC board using point-to-point or isolated-pad-type wiring. I assembled the circuity on a 2-1/4" × 1-1/2" board. My usual technique in assembling a circuit of this sort where short lead lengths are desired and where really no complex circuitry is involved is just to follow the schematic during construction. That is, components are soldered in place one by one as compactly as they can be placed following the schematic from left to right.

A PC board larger than required is used and, after assembly is finished, the PC board is trimmed to size with a fine handsaw. I also mounted a small trimmer-type capacitor and potentiometer on the board. This was only done for test purposes. In practice, you would normally want to have these components (the 100-Ohm potentiometer and series 140-pF capacitor shown in Fig. 2 which constitute the variable impedance arm of the bridge) as panel-mounted controls.

The circuitry can be mounted in any small enclosure which can contain the circuitry, a battery, and two coaxial connectors for the antenna and receiver terminals. A shielded one is preferable but not absolutely necessary.

The panel-mounted variable capacitor and potentiometer deserve a word of mention. If an air-variable capacitor is available it can be used, but experience has shown that even the cheap transistor radio variables are quite satisfactory and very inexpensive. The same is true of the potentiometer which has to be a linear-taper, carbon-composition type.

An unshielded type is desirable to avoid stray capacitance. In some cases, the metal back cover on a potentiometer can be removed. One can find PC-mount trim potentiometers which are completely unshielded and which can be turned into a panel control by means of a nylon extension shaft. They are very inexpensive but ideal for this type of application.

If you want to use the noise bridge as a calibrated instrument, first connect a 50-Ohm composition resistor to the "antenna" terminals and use a communications receiver tuned to 10 or 15 meters as a detector. As the capacitor and potentiometer are varied, a noise null should occur around the midpoint of their shaft rotations.

Different value resistors above and below 50 Ohms can then be used to calibrate the resistance potentiometer. Various value capacitors below 68 pF and in series with a 50-Ohm resistor are used to calibrate the capacitor rotation. The capacitor rotation on one side of its noise null (as es-

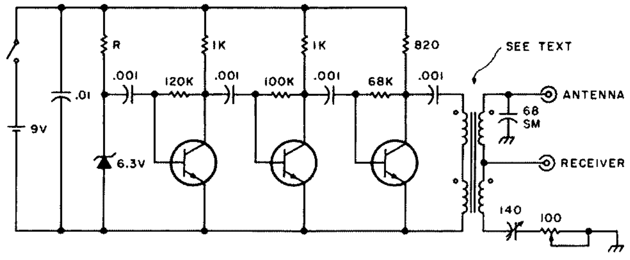

Fig. 2. Complete basic noise bridge. The resistor, R, is chosen for maximum noise output using any given 6.3 volt zener. Start with a value of about 1K Ohm. If the variable RC components on the output have their rotation calibrated, the bridge can be used to directly measure complex impedances over the range of 160-6 meters. Transistors are 2N5129 or HEP or Radio Shack equivalents.

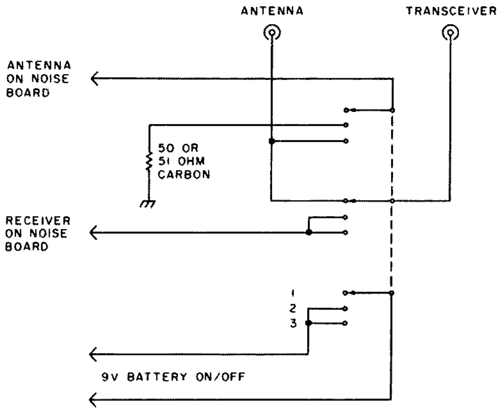

Fig. 3. Some additional switching circuitry makes the noise bridge more versatile and easier to use if you are primarily interested in only 50-Ohm load adjustments. Switch positions are: 1—off (bypass); 2—test (calibrate); 3—on (operate).

tablished with just a 50-Ohm resistor as a load) will indicate capacitive reactance while the other side will indicate inductive reactance.

Using various value capacitors and calculating X_C for each value capacitor (using the frequency the receiver is tuned to) calibrates the X_C side. You could calibrate the X_L side using various value inductors but it is generally accurate enough to just mark the X_L side as a mirror image of the X_C side.

Following the above procedure, you can develop a nicely calibrated test instrument to measure complex impedances. I have had such an instrument in use for several years with very good results. However, most amateurs really don't measure complex impedances very often.

The main advantage to a noise bridge for most amateurs is that it allows the leisurely setting of antenna tuners or other matching devices to provide a 50-Ohm load to a transceiver. In such cases, by adding an extra switch and resistor to the basic noise bridge one can develop a simple, self-calibrating noise bridge. The switching arrangement shown in Fig. 3 allows the noise bridge to be bypassed (with the battery switched off), switched to a 50-Ohm "calibrate" position, or switched into operation.

I assembled my 50-Ohm noise bridge in a 4" × 2" × 1-1/2" enclosure.

The PC board is just held in place by stiff wiring to the side-mounted variable capacitor and potentiometer. The battery is held in place by back-to-back adhesive tape, although a proper holder is recommended. The 3P3T switch is at the top of the enclosure between the two coaxial connectors.

Rather than using two SO-239 female connectors, one connector was made from a UHF-type male connector. So, this arrangement saves having to use an adapter when inserting the bridge.

The male connector is mounted by means of a reducing adapter (for either RG-58 or RG-59) which fits the UHF male connector. A lock washer is threaded on the adapter which is too small to pass over the end flange of the adapter. The hole in the enclosure is made just large enough to pass the threaded diameter of the adapter. With the adapter inserted from the inside of the enclosure, the male connector is screwed on to it from the outside.

In operation, the noise bridge is first calibrated by switching to the 50-Ohm "test" (calibrate) position and adjusting the side controls (which are unmarked) for a noise null. Then you can switch to the "on" (operate) position for hours of leisurely testing (well, at least up to 7 or 8 before the battery will give up).

The side controls are, of course, not touched, and whatever device is being tested or adjusted is varied until the same noise null is obtained as with the 50-Ohm calibrating resistor. The "off"—or bypass—position is useful when you want to apply power to check that a 50-Ohm load has indeed been achieved for a transceiver.■

Phil Salas AD5X
707 Auburn Drive
Richardson TX 75087

IC-2A Accessories the Cheap Way

—build 'em yourself and save!

The Icom IC-2A has been on the market only a short period of time, yet it is already starting to look like it is going to be one of the most popular handie-talkies to hit the market. This article details a few easily built or acquired accessories which will further enhance the flexibility of this fine rig.

Remote Microphone

For mobile and belt-carrying use, an external microphone is a real nicety. You can easily fabricate a lightweight microphone with push-to-talk that fits the hand perfectly. First, accumulate the following parts:

- A single-conductor shielded guitar cord, coiled, available from Radio Shack (RS 42-978), which sells for $5. There's easily enough cord for two microphones, so split this with a friend.
- An electret condenser microphone element available from either Radio Shack ($3.00) or Bullet Electronics ($2.00).
- An SPST momentary contact miniature push-button switch. Radio Shack sells 5 for $2.50.
- A 24k-Ohm ¼-Watt resistor.
- A Polaroid "Print Coater" case. This is the small plastic case that the print-coating applicator supplied with Polaroid film comes in.

First, clean out the Print Coater case with soap and water. You can throw away the cap, as this won't be used. Now, punch a hole in the bottom of the case to take the coil cord, and cut a slot in the side of the case one inch long which has a width equal to the diameter of the shank of the push-button switch you are using. Don't mount the switch at this time. Pull one end of the coil cord through the Print Coater case and wire the coil cord, switch, resistor, and microphone element as shown in Fig. 1.

Note that only the power and shield connections to the microphone element are used. The audio output center conductor is taped up and not connected to anything. The audio feeds into the IC-2A through the power line of the condenser element.

With everything wired up, slide the push-button switch down the slot and fix in place with its locknut. Push the microphone element into the end of the case and secure in place with Silastic compound

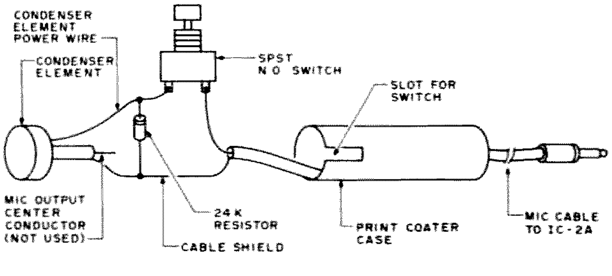

Fig. 1. PTT microphone details.

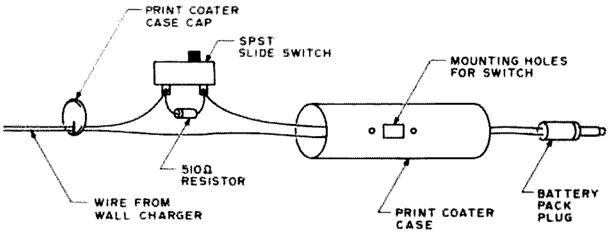

Fig. 2. Wall charger trickle adapter.

(available at any hardware or drug store). Also, fill in any extra gap in the case with the Silastic compound.

Finally, mount the subminiature microphone connector supplied with the IC-2A on the free end of the guitar cable. Voila! You now have a great remote microphone. Pushing the PTT switch both completes the microphone circuit and causes the IC-2A to switch to transmit. This is accomplished by a clever bias circuit within the IC-2A which permits a remote microphone with push-to-talk using just a center conductor and ground. This remote microphone sure makes mobile operation easier and the price is right!

Trickle Charger

The wall charger that comes with your IC-2A charges the batteries at a 50-milliamp/hour rate. However, like any nicad battery, battery damage can occur if you overcharge the batteries. The recommended charge time is 16 hours for a completely discharged battery. It is also recommended that you discharge the batteries completely each time since nicads can develop a memory based on less than full discharges. Since minor things like work and sleep sometimes keep me from being around at the end of a 16-hour period, I felt that it would be beneficial to be able to trickle-charge the batteries during these times. Since trickle-charging will not harm a nicad, you can leave an extra battery pack on a constant trickle-charge to ensure a fully-charged battery pack when you need it. The recommended trickle-charging rate is approximately one percent of the battery Ampere-hour capacity. For the standard 250 mAh IC-2A nicad pack, this will be 2.5 milliamps. Your IC-2A wall charger can be converted to a switchable trickle/normal charger for less than one dollar. You will need the following: one 510-Ohm ¼- or ½-Watt resistor, a miniature SPST slide switch (Radio Shack sells two for 79 cents), and a Polaroid Print Coater case (remember this?).

First, wash out the Print Coater case with soap and water. Next, cut a cross in the bottom of the case and push through the wall charger connecter. Pull about a foot or so of cord through the case. Now notch the case cap so as to pass the cord. The mounting holes for the miniature slide switch are now cut in the side of the Print Coater case. The switch will mount from the inside of the case, but don't mount it yet. First cut one of the wires of the charging cable. Now wire the 510-Ohm resistor, SPST switch, and charging cable as shown in Fig. 2. Slide the SPST switch into the Print Coater case and snap the case cap in place. The SPST switch now either shorts out the 510-Ohm resistor for normal charging or permits the 510-Ohm resistor to stay in the line for a 3-milliamp trickle-charge rate. The LED charging indicator in the 250-mAh battery pack will not light with the 3-milliamp trickle-charge rate, so I use the status of this indicator to tell me if the charge switch is set to the normal or trickle state. I think that you will find this to be a very worthwhile modification to the wall charger. The total time required for this modification is less than ½ hour.

12 V dc Power Cord

An inexpensive 12 V dc charging cord which includes a cigarette lighter plug on one end and the same plug which mates with the IC-2A battery pack on the other end is available from Radio Shack. It is an RS 270-1533 and sells for $2.99. A useful addition to this cord is the trickle/normal switch modification just described. This permits you to keep a battery pack trickle-charging in the car all the time.

K-Mart Karrying Kase

Finally, I found an Instamatic camera carrying case at K-Mart which fits the IC-2A almost perfectly. The only size problem had to do with the camera case being three-fourths of an inch too long. I compensated for this with a ¾-inch wood spacer. The beauty of this is that the IC-BP4 450-mAh battery pack will extend the length of the IC-2A by exactly ¾" permitting this case to be used with either battery pack. A little care with an X-acto® knife over a period of about one hour will leave you with a very professional looking case complete with all cutouts. In addition, I also sewed a couple of leather loops to the side of the case to hold both the flex antenna and a collapsible 19-inch antenna purchased separately. The PTT switch is easily pressed by squeezing the case. Incidentally, the price of this case was $3.67!

I've described several inexpensive accessories for the IC-2A. I am sure that you can continue along this line with others. For example, a real speaker/mike complete with touch-tone™ pad built into an old CB microphone is in the planning stages. I'm also working on an inexpensive remote speaker/amplifier box for mobile operation. I'll have more on these at a later date. I think that you will find that with a little work, you can easily build many of the desired accessories for your IC-2A. ■

See List of Advertisers on page 114

Louis Berman K6BW
1020 Laguna Avenue
Burlingame CA 94010

Solar-Powered Alignment Tool

—using Old Sol to find true North

Two common methods of calibrating the direction of a beam antenna with respect to true north (or south) are: to align the boom in the direction of the polestar, or to apply the variation correction to the magnetic north (or south) reading of a compass. Unfortunately, there is no accommodating star at the south celestial pole for observers in the Southern Hemisphere. The variation correction depends upon one's latitude and longitude.

The method I shall describe here is simpler; it is based upon the sun's meridian passage at any locality in the world. All one needs to know is one's approximate longitude obtained from a world map and the local mean time (LMT) of the sun's meridian transit. At this moment, the sun is at its maximum altitude and is on a north-south line. Table 1 lists the LMT of the sun's meridian passage on the first, tenth, and twentieth of each month. These values do not vary by more than about one minute from year to year.

Since our clocks are based on standard or zone time and not on local time, it is necessary to apply a longitude correction, converted to time units. Table 2 allows this, to the nearest standard meridian. The standard meridians theoretically are spaced 15° apart to the east or west of the Greenwich prime meridian. If the station longitude is east of the standard meridian, subtract the difference in longitude in time units between your station and the nearest standard meridian from the LMT; if the station longitude is west of the standard meridian, add the longitude difference in time units to the LMT. Thus, standard or zone time = LMT plus or minus the difference. Because the time zones have ragged boundaries, it may be necessary to add or subtract one hour, and, in some instances, one-half hour, as the custom dictates.

To demonstrate the simplicity of the solar method, two examples are chosen.

(1) What is the standard time of meridian passage of the sun at longitude 114° 20′ W on October 15? From Table 1 we interpolate a value of 1145 LMT. The nearest standard meridian is 120° W. The difference in longitude between the station and the nearest standard meridian is 5° 40′. From Table 2, this amounts to 23 minutes. Since the station is *east* of the standard meridian, the Pacific standard time of the sun's meridian passage is 1145 − 0023 = 1122 PST.

(2) What is the standard time of meridian passage of the sun at longitude 25° 40′ E on March 25? From Table 1, LMT = 1205. The difference in longitude between the station and the nearest standard meridian of 30° E is 4° 20′, which from Table 2 is equivalent to 17 minutes. Since the station is *west* of the standard meridian, the standard time of the sun's meridian passage is 1205 + 0017 = 1222.

At the standard time the sun is on the meridian, that is, due north or south, depending on your latitude, line up the antenna boom with the sun or parallel to any shadow cast by a vertical structure (pole, tower, etc.). An error of 4 minutes in time amounts to a change in the direction of the sun of only 1°. Set the direction indicator of your rotator to 0°. Make certain that the radiating element of the antenna is on the correct side of the boom—otherwise you could be 180° off. That's all there is to it! ■

Arc	Time (minutes)
0° 00'	0
0° 15'	1
0° 30'	2
0° 45'	3
1° 00'	4
1° 15'	5
1° 30'	6
1° 45'	7
2° 00'	8
2° 15'	9
2° 30'	10
2° 45'	11
3° 00'	12
3° 15'	13
3° 30'	14
3° 45'	15
4° 00'	16
4° 15'	17
4° 30'	18
4° 45'	19
5° 00'	20
5° 15'	21
5° 30'	22
5° 45'	23
6° 00'	24
6° 15'	25
6° 30'	26
6° 45'	27
7° 00'	28
7° 15'	29
7° 30'	30

Table 2. Difference of longitude conversion.

Date	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
1	1202	1213	1211	1203	1156	1157	1203	1205	1159	1149	1143	1148
10	1207	1213	1209	1200	1155	1159	1204	1204	1156	1146	1143	1152
20	1210	1213	1207	1158	1156	1201	1205	1202	1153	1144	1145	1157

Table 1. LMTs of sun's meridian passage. These times basically correspond to the sun's transit over the Greenwich meridian, taken from the American Ephemeris and Nautical Almanac. *Because the sun's apparent eastward daily motion is of the order of 1° or less, the slight difference between the Greenwich and the local mean time of the sun's meridian transit may be neglected.*

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The DX Primer

—low power plus low antennas plus good technique equals 300 countries

One of the things that many amateurs look forward to the most when they upgrade is the prospect of being able to work some DX with their new privileges. Novices especially look forward to being able to operate on better DX frequencies and on 20 meters. However, many of these would-be DXers are discouraged right from the start.

Because they have heard that 20 is the best DX band, they listen to the stations in the "kilowatt alley" on that band from about 14.200-250 MHz. These stations all seem to be running a full kilowatt (at least) and a four- or five-element beam at about 70 feet or more. They are always giving out 59+20-dB reports to DX stations which the newcomer can't even hear with his modest transceiver and dipole at 25 feet. The newcomer listens for awhile, decides that DXing is a game for wealthy fanatics, and heads for two meters or for a rag-chew on 75 SSB.

He has been too hasty, though, for it is quite easy to work DX with that 100-Watt transceiver and a low-slung dipole. It takes some patience and some special techniques, but it can be done. I worked my first 100 countries with 20- and 15-meter dipoles 10 feet high and a barefoot transceiver. I worked 262 countries before I got an amplifier and worked 310 countries before any of my antennas were higher than 29 feet.

In many European countries, amateurs are limited to about 200 Watts of power, and yet stations from those countries constantly show up on the honor roll. So, it is possible.

Equipment

Before discussing some of the techniques for low-power DX chasing, at least a little should be said about equipment and antennas. The most important parts of your station when it comes to working DX are, in order: antenna, receiver, transmitter. The antenna is by far the most important factor in determining how successful you will be at DXing. It does not matter how expensive or marvelous your receiver is, it can't receive signals that aren't fed into it, and it is the job of the antenna to pick those signals up and to send them to the receiver. Likewise, it doesn't matter how much power your transmitter runs and how clean and pure your signal is; if your antenna won't radiate that signal out of your backyard, then you aren't going to work any DX.

So, you should put up the best antenna you possibly can. We are already assuming here that you cannot get an antenna up very high. If that is so, then what antenna is best? There is no single answer to that question, and this is not meant to be an article on antennas. I do have some general advice, however. If at all possible,

put up a gain antenna, and put it up as high as you possibly can. I worked my first 310 countries on dipoles and a three-element 20m yagi that I bought for $27 and put up on a TV tower at 29 feet. Look through the antenna books and the magazines and find articles on gain antennas you can construct. If necessary, use a fixed wire antenna, but get some gain if you can. For 10, you can pick up "retired" CB antennas for a song and recut them so they'll work on 10. In most cases, that involves cutting a few inches off the elements until you get the antenna resonant on 28 MHz.

Many old-timers will tell you that if you can't get an antenna up high, you should use a vertical because it has a lower angle of radiation and is, therefore, better for DX work. While this may hold true on 40 and on 80, where a dipole a half-wavelength high has to be 60 or 120 feet, respectively, it is not true on 20, 15, and 10. On 10, a dipole one-half wavelength high has to be only about 15 feet up. I had a good friend in Texas who worked the world on 10 with a little four-element yagi eight feet off the ground. My advice for the "higher" bands is that you put up a gain antenna if at all possible, and if not, put up a dipole as high and as clear as you can. Verticals will work fine on these bands for DX, sometimes better than a dipole, but they have two main disadvantages: 1) they are susceptible to QRM from all directions, and 2) they are considerably more susceptible to man-made noise—line noise, auto ignition, your neighbor's hair dryer, etc. I like verticals for 160, 80, and 40, but on the higher bands, dipoles seem to do the job as well or better.

Regardless of what type of antenna you put up, it should be carefully tuned so that it is resonant on the frequency you will be using most often. Also, it should be put together carefully. Wire connections and coax connectors should be soldered, tubing and pipes should be scraped and bonded together, etc. In short, anywhere where metal joins metal, the connection should be clean and solid. If you are going to use an antenna at a low height, you must ensure that it radiates and receives every Watt possible, rather than losing that precious power in bad connections, leaks to ground, faulty coax, etc.

Once you have your antennas in good shape outside, you should then concentrate on the gear you have inside. Even the most modest equipment is capable of working DX, but not if it is out of alignment or full of "soft" tubes. Unless you are sure that your gear, especially the receiver, is in perfect alignment, realign it yourself (the manual should tell you how), have a friend do it, or return it to the factory.

If you have tube-type equipment, replace at least the most critical tubes for receiving: the rf amplifier tube and the i-f stage tubes. Even though your receiver may sound like it's working OK, you might be surprised at how much "hotter" it becomes with new tubes. Save the old ones for spares.

Make sure that all of the contacts and interconnections in your shack are clean and well-soldered, especially those having to do with antenna and ground connections. An oxidized antenna connector might let rf through when you transmit and, thus, not show up on your swr meter, but it can seriously degrade receiver sensitivity, especially with weak DX signals.

There are several station accessories that you should consider if you want to chase DX. One is a good pair of headphones. Not only will they help ensure domestic tranquility, they will also help you hear weak signals under poor conditions better than you can through a speaker. You can get a good pair of 8-Ohm stereo headphones fairly inexpensively these days.

If you hear a lot of hum and hiss when you plug them into your receiver, you probably have an impedance mismatch. Many receivers have headphone jacks with impedances in the 500-2000-Ohm range. To match these to 8-Ohm headphones, you can buy an audio transformer at Radio Shack for a buck or two. Put it in the audio line so the 8-Ohm side goes to the phones and the higher impedance side goes into your headphone jack (you can even wire the transformer internally onto the jack). This should eliminate the mismatch-induced noise and will make headphone reception much more pleasant.

While we're on the subject of audio, you should also consider an audio filter for reception. Audio filters are available for as low as $30, and they can greatly improve the performance of a receiver, especially an inexpensive or moderately priced one. If you contemplate using mostly CW, you can get one of the CW-only filters; if you're going to work SSB, too, then you should consider one of the continuously variable filters. An audio filter will help improve your receiver's selectivity and will allow you to notch out QRM and to pull through those weak ones.

Yet another valuable accessory is an automatic keyer. Most DX pileups on CW are conducted at high speed (don't let that worry you; all you have to send and receive is your callsign and report). It is tough to send 20-30 wpm with a straight key for an hour or two in a pileup, and a keyer makes it much easier.

Finally, you might consider a speech processor of some kind. If you are running barefoot, the processing will give you several dBs of average gain, and this will definitely help under weak-signal conditions and in pileups. However, do not adjust the processing level too high (as most people do). It is tempting, but you will create splatter on adjacent frequencies, rob your audio of intelligibility, and possibly damage your transmitter.

Techniques

Now, you've got your antennas and your equipment ready. How do you work the DX? There are three main variables you need to consider: What mode will you operate? What band will you operate on? What time of day should you operate?

In general, the beginning DXer or the low-power DXer will do much better on CW than on SSB. There are two major reasons why this is true. First, CW is the better mode under weak-signal conditions, and it tends to be something of an equalizer under good conditions. On bands that are only marginally open, you can often make CW contacts when SSB contacts are virtually impossible. And, because of variations in the receiving station's frequency and pitch, your chances of getting through on CW when conditions are good will be better. Second, there is less competition on CW. There are fewer people tuning the band looking for DX than on SSB, and, thus, your chances are much greater of finding a rare one without anyone else calling. And the pileups are generally smaller and much easier

to get through. So, at least to begin with, you are probably going to do better on CW than on SSB.

Which band do you work? A good rule of thumb is to operate on the highest band that is open at any given time. The higher you get in frequency the less trouble there is with QRN, solar absorption, man-made noise, and harmonic broadcast interference. Right now, near the peak of the sunspot cycle, 10 and 15 are the best bands for low-power, low-antenna DXers. For one thing, your low antennas are going to perform better on those bands.

To be of optimum effectiveness, a gain antenna usually needs to be one wavelength high. This is 66 feet on 20, but it is only about 33 feet on 10. You are going to have a lower angle of radiation on 10 and 15 than on 20, and, therefore, you are going to work DX better. There is less competition on 10 and 15 than on 20, and these bands tend to be "equalizers." For some reason, the difference between a kW and a barefoot exciter is often almost negligible on 10.

So, each time you get on to chase DX, check 10 and 15 first; if they're open, stay there. These bands tend to be best in the wintertime; conditions slack off a little in the summer. Also, they are primarily daytime bands, especially 10. You will rarely work DX on 10 and 15 before sunrise or for very long after sunset, although it does happen occasionally, especially on 15. For a year or two at the sunspot maximum (where we are now), these bands are often open all night.

Year in and year out, sunspot cycle in and out, 20 is the best all-around band for DX. It is open to somewhere in the world almost 24 hours a day. Because of this, it is probably the most crowded amateur band, and the competition for DX is often fierce. Nonetheless, you can work DX on 20. Your best bet is to work CW and to do so early in the morning (about 5:00 to 8:00 am local time) or late at night, when there aren't so many stateside stations on. At these times, depending on the time of year and the sunspot cycle, the band is often open to several parts of the world and the competition isn't too severe.

The worst time to work 20 is from 4:00 to 7:00 pm, local time. This is when everyone rushes home from work and turns on the rig; the band is very crowded and very chaotic, although it's not as bad on CW as it is on SSB.

You will not do very well on 40 and 80 with low power and low antennas. Because of heavy broadcast QRM, most of the DX work on 40 is done on CW below 7025, so you need an Extra class license. And on 80, most of the DX work on SSB is below 3800 and the CW below 3525, again requiring an Extra. These bands are highly seasonal; in the summer months heavy static makes DXing very difficult, so winter is the time to listen. If you have up good antennas for these bands, you should listen occasionally; DX contacts are possible with low power, especially right at sunrise and at sunset.

Obviously, the time of day you are going to operate depends on many variables: the band you want to use, the time of year, your work schedule, your spouse's sleeping habits, etc. In general, though, your best bet is to pick times when the bands you want to work are open and the competition isn't too tough. Usually, this means late at night and early in the morning.

Another thing to remember about times is that there is the least competition on a band when it is just opening. When 15 opens in the morning, you can often hear many DX stations calling CQ and not getting answers; a couple of hours later, when the crowd has gotten up and discovered that the band is open, the competition becomes fiercer.

Try finding a time period that you can operate every day. That way you will learn the bands that are open at that time, the areas they are open to, the severity of the competition, which band you do best on, etc.

The best operating advice to the low-power DXer can be given in one word: Listen! You are not going to get many answers to your "CQ DX"s; they are usually a waste of time and spectrum. When you first get on a band, tune across it slowly. Write down the calls and frequencies of the DX you hear. You can then learn whether the band is open, and, if so, to what direction.

Keep tuning across the band until you hear a station you need or want to work. If the band is open to an area where you need several countries, don't get involved in a rag chew with a country you don't need (unless rag chewing with DX is your main interest). While you are telling a G3 about the great weather you've been having, an LX1 or a C31 might be calling CQ 5 kHz away.

When you hear one you need calling CQ or finishing a QSO, you should call him on his own frequency, unless he designates otherwise. If no one else is calling him, you need only give his callsign once (he knows what it is) and your own two or three times. It is generally better to give short, frequent calls than to make long ones, unless that's the only way to get through.

Once you have worked your first 50-100 countries, you will find that it becomes increasingly difficult to work new ones without getting into pileups. So, like it or not, you'll need to develop some pileup strategies. Most of the time, you are not going to bust through a pileup with sheer force (you don't have enough). You should try it a couple of times, nonetheless; sometimes selective propagation will put you over the top even with your low power.

There are several tactics that might help you get through faster. One is to wait until the pileup subsides before sending your call. See if you can sneak it into a lull in the pileup. You aren't going to get through if you give your callsign two or three times right after the DX station stands by—everyone else is doing the same thing.

Another tactic is to try calling off frequency a little, even on SSB. If a station is listening off of his own frequency, call him on the fringes of the pileup. If he is listening, say, from 14.025 to 14.030, call him at .030 or .031; you probably aren't going to make it at .027.

Though a dangerous one, tail-ending is another tactic. Here you send your callsign quickly just as the station working the DX signs his call or just afterwards. If the pileup is small and the DX station doesn't seem to mind, tail-ending is OK. Otherwise, don't do it.

Another technique which sometimes works on SSB is to say something besides your callsigns; a station who is saying something else often stands out. You might try things like "W8YA in West Virginia" (works well from rare states), "W8YA for a new one," or "W8YA running low power." Even if the DX station doesn't hear you, some of the big guns in the pileup who hear you might mention to the DX station that there is a low-power station or a "W8 who needs you for

a new one."

Incidentally, use standard phonetics when calling DX. Most DX ops know the standard English phonetics, but they won't understand "Walrus Dionysus Two Long Yellow Underwear." Another tactic, though sometimes questionable, is to ask for help. If you have a friend nearby or you know someone in the pileup who is likely to get through, ask him to pass along your call. This shouldn't be done when the DX is rare, but for common and semi-rare DX it's OK. The best advice in a pileup is to listen and send carefully. Timing will be all important for you because you won't make it on sheer force. Always follow the DX station's requests.

Other than calling stations you tune across and calling in pileups, there are a couple more methods for DXing. One is "piggybacking." Here, the guy across town who runs 5 kW to a 32-element beam at 1000 feet calls CQ DX or calls a specific DX station with you (who have carefully cultivated his friendship) standing by. After he exchanges reports with the DX, he calls you into the QSO and you become part of the roundtable. This is definitely OK unless there is a big pileup or an extremely rare DX station, in which case you will probably get clobbered.

Another method is to check into DX nets. There are several on the bands, mostly on 20 and 15, and once you check in you will be allowed to call whatever DX is on frequency without QRM. One good net to try is the YL International SSB Net at around 14.330. This is a very friendly group of people who are willing to help out low-power stations trying to work their DX check-ins. Because they often have a large number of check-ins, you might have to wait awhile before you get to call.

An increasingly popular and controversial DX method is the list. Here, a strong stateside or foreign "emcee" takes a list of stateside calls and passes them on to the DX station, who then calls the stations one by one. This is fine, as long as the DX station has not had the list forced on him. If you need the country, get on the list if you can. Personally, I have never derived much satisfaction from working DX via a list, but if it's the only way to work a new one, I will do it.

One final way to work DX with low power is through satellites. This, of course, requires some VHF gear and some specialized antennas. The best time to try for DX on the satellites is just at acquisition time as they come over the horizon. In the near future, constant orbit satellites will be sent up and will make it possible to work DX consistently for many hours a day with a few Watts and a small VHF antenna.

Using the preceding techniques and methods, and a few of your own that you will acquire through experience, it is quite possible to work DX, lots of it, with low power and low antennas. It is, in many ways, more challenging and more rewarding than it is to the high-power, big-antenna boys who become somewhat blasé about DX after awhile. The main things you need to remember are patience, listening, and timing. If you work on those three things, you can work a logbook full of DX. Spend most of your time on CW on 10 and 15, and on 20 when those bands are not open. Good luck! ■

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A Flier's Guide to the Airwaves

—off we go into the wild blue yonder

How many hams can claim to have carried on a 5-state simultaneous QSO on 2 meters, without repeaters, mobile, where two of the stations were 400 miles apart? It's easy—all you have to do is get your antenna 12,000 feet in the air! A difficult task, you say? Not at all, if you go *aeronautical mobile*.

I'm not going to get into a discussion of the old "handie-talkie in an airliner" trick, except to say that no airline captain or airline radio shop people in their right minds are going to give you permission to play with your toy while their ten-million-dollar jet is boring holes in the sky 5 miles up. If you somehow sneak your hand-held on board without permission, you risk a $10,000 fine and 5 years in stony lonesomeness, loss of license, and the chance of putting 120 people plus yourself into the side of a vertical granite runway.

No, I much prefer to hook my radio onto a small general-aviation type of airplane. Here, the only permission you need to operate your rig is a nod of the head from the guy flying the left front seat.

By now, 95% of you may have one, two, or three misconceptions about aeronautical mobile:

1. It is against FCC amateur rules to operate aeronautical mobile.
2. It is against FAA rules to operate an amateur station in an airplane.
3. No pilot is going to take me joyriding just so I

Photo A. Connecting the antenna onto the mount and running the coaxial cable down the trailing edge of the strut.

Photo B. Installing a temporary antenna mount onto the tie-down ring.

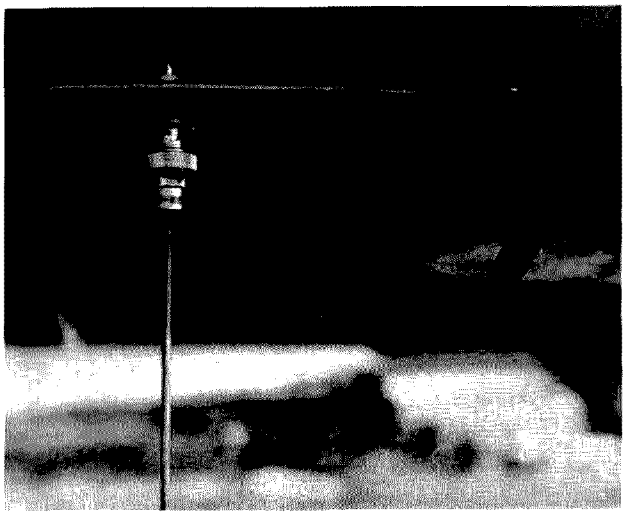


Photo C. Detail of the antenna mount and tiedown ring. The antenna is a 48-cm length of brass brazing rod.

Photo D. The author enjoying a Saturday afternoon aeronautical mobile (at rest) QSO.

can get my antenna 2 miles up.

Now let's pop these bubbles in order.

1. "It is against FCC amateur rules to operate aeronautical mobile." Rubbish. FCC rules (part 97) allow the amateur to operate mobile. Period. They do not restrict you to automobile, boat, snowmobile, submarine, or airplane. You may operate aeronautical mobile under exactly the same rules as if you were operating your automobile station in the same area.

2. "It is against FAA rules to operate an amateur station in an airplane." I wish I had a nickel for every time I've heard this ridiculous statement. FAA rule 91.19 *clearly* states that any electronic device that the pilot feels will not interfere with the safe operation of the flight is authorized for use. As a matter of fact, there was so much confusion over this rule that the FAA went out of its way to issue a clarification of the rule to permit not only hand-held rigs but also permanently-mounted amateur sets for the ham pilot. More about this later.

3. "No pilot is going to take me joyriding . . ." Would you turn down a phone-patch request from one of your neighbors? Wouldn't you give of your time and equipment to someone who wanted to become a ham? Pilots are pretty much the same. Generally, they are quite happy to show off their hobby (or profession) to an interested neighbor. Nor is flying all that expensive. An hour's fuel goes for about $6; if the pilot has to rent the plane, figure on $20 an hour, tops.

One good way of getting to know a pilot is to offer him (or her) a few phone patches to relatives, or invite him over for an afternoon of 20-meter DX work. Gradually lead into the subject of aeronautical mobile, an I'll bet that within the week you'll have your rig in the airplane.

Where do you hang the antenna? Well, if the airplane isn't yours, you're probably going to have to stick to the 2-meter and above bands. I've done my fair share of aeronautical mobile, and I can almost guarantee that an indoor whip or rubber duckie will produce poor results, if any. Even near a window, you are still inside an almost completely enclosed, metallic "screen room," and "getting out" will be difficult, if not impossible.

This situation dictates an outside antenna of some sort, but hanging a whip out in the breeze will also present a fairly difficult mechanical problem. Yes, mechanical—not electrical. Forget the 3-dB-gain long whips, the longwires, and the arrays. A good old quarter-wave whip is more than adequate for aeronautical work. Now the problem will be getting a quarter-wave wire outside the plane, and this is *not* an easily solved problem.

You see, drilling a mounting hole in an airplane requires a tinker's license from Uncle Sammy, and most airplane owners take a dim view of someone punching unnecessary holes in their birds. Also, that wire will have 120 mph winds buffeting it all the time you are airborne, and the last thing you want to do is drop a metal object onto someone's head below. I mean, that kind of thing could ruin his whole day! And for those of you thinking of using a magnetic mount, forget it. That bird's skin is aluminum and besides, the pilot's compass is more than happy to lock onto the antenna base magnet rather than the North Pole, and there are better ways than this of getting lost.

About the only good place for an antenna on OPA (other people's airplanes) is the trunk-lip mount base attached to the baggage (or cargo) door opening. Remember to put in a rubber shim so that the airplane paint job doesn't get marred. If the airplane doesn't have a cargo door, the passenger door may be used, being careful to damage the weather stripping as little as possible.

Another good idea (on high-wing aircraft) is to remove the bolt that attaches the tiedown ring (non-structural) to the strut, insert a home-made whip mounting plate, and reinsert the bolt. Run the coax from this plate into the cabin via the strut, and lace it in place with nylon lacing tie, plastic tie-wraps, or (as a last resort) heavy duct tape. (Photos A, B, and C show construction and installation details of a tiedown-ring mount on the author's Cessna 172.)

If you own the airplane, things are a little easier. I will pass on to you a trick that lets you hang the antenna on the best spot on the airplane—the belly; yet, if and when you decide to sell the airplane, you can remove the antenna mount with no sign of it ever hav-

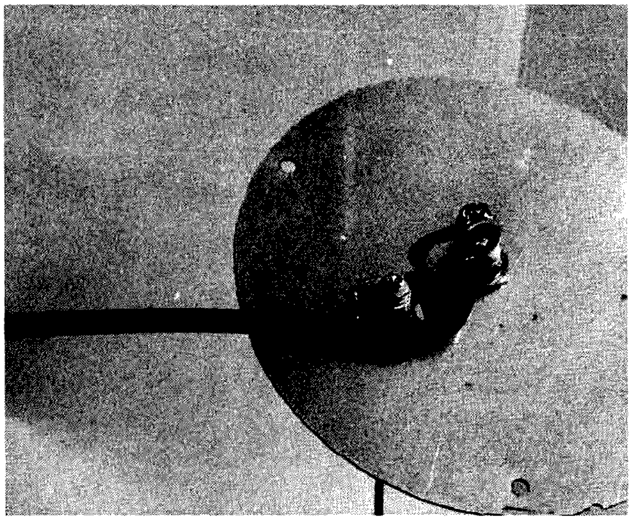


Photo E. Mounting the BNC connector to a spare belly inspection plate. Note that the cable is securely clamped.

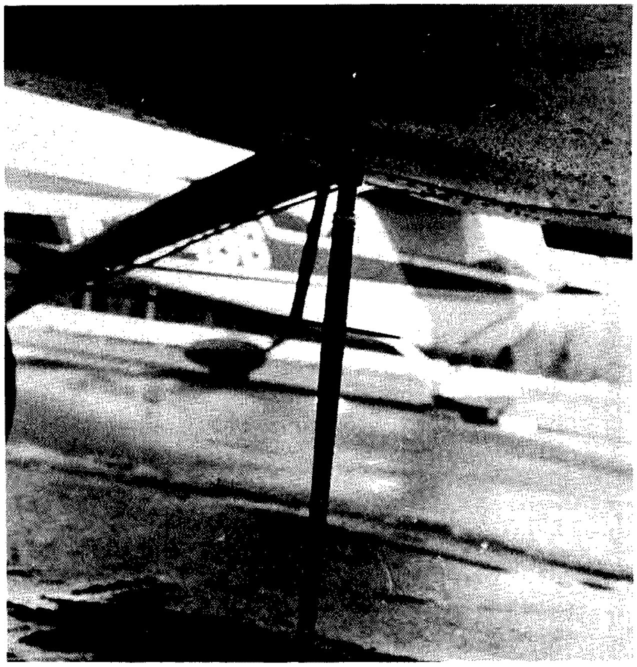
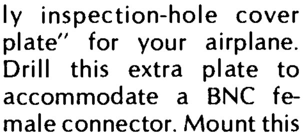


Photo F. The inspection plate mounted on the belly with a 10-meter band rubber duckie antenna attached.

ing been on the airplane. Not only that, you will be able to operate any band you wish simply by using plug-in antennas for the various bands.

The trick is this: Go to your friendly airplane parts store and buy an extra "belly inspection-hole cover plate" for your airplane. Drill this extra plate to accommodate a BNC female connector. Mount this connector onto the plate with the female connector portion on the *outside* of the plate. Remove your present belly inspection plate and store it in a safe place, because you will need it if you ever want to take the ham antenna connector off. Connect your coax cable to the inside of the connector, and string the coax up to where the rig is going to be installed. (This last step really should be inspected by a licensed airframe mechanic.) Now bolt on the new plate and connector where you removed the old plate. Cut an antenna for the band of your choice using the quarter-wave formulas from the *Handbook*. Attach it to a BNC male connector, making sure that you fill the connector body with epoxy to keep the antenna rod mechanically attached to the connector. Connect this antenna to the belly plate, fire up the rig, and you are on the air.



3-TERMINAL VOLTAGE REGULATOR IS NATIONAL SEMICONDUCTOR LM317 FOR CURRENTS UP TO 1.5AMPS, AND LM350 FOR CURRENTS UP TO 3.0 AMPS

Fig. 1. Schematic of 24-to-12-volt converter.

Before flight, though, have your airframe mechanic make a logbook entry in accordance with Advisory Circular 20-98, "Auxiliary Two-Way Airborne Radio System Installations." In some cases, you may have to get a copy of this AC from your general aviation district office and give it to the mechanic, as most of them have never seen this document. I highly recommend that you tell the mechanic exactly *why* and *how* you plan on installing your antenna—before you start. Hell hath no fury like a ticked-off inspector, and one sure way to torque his jaws is to do your work without telling him, and then ask him to "sign off" your brainchild. (See Photos E, F, and G for a detailed view of this belly-plate antenna installation.)

We now come to the subject of power, because you sure don't want to run from nicads all the time. Well, I have good news and bad news. Ninety-five percent of all light aircraft have 12-volt battery systems identical to an automobile battery supply. With these aircraft, you can plug directly into the cigarette lighter, or have your mechanic put in a separate circuit breaker or fuse (not expensive) just to run your ham rig. If you choose to have the breaker installed, I strongly suggest that you have a molex type of pigtail connector installed in both the airplane and on the rig. Aircraft vibration is a mortal enemy, and "Jones," "octal," and "ribbon" connectors have a nasty tendency to vibrate apart. You might also check your local auto parts store for polarized "bullet" connectors which are also relatively vibration-proof.

Now for the bad news. Since 1978, Cessna and a few others have been using 28-volt electrical sytems, but they still use the *same size* cigarette lighter plug and the *same size* circuit breakers and fuses. There is no more sickening smell in this world than $300 worth of French-fried silicon. The answer, of course, is to ask the pilot beforehand what kind of electrical system he has in his airplane—and if he doesn't know, then he is not the kind of pilot I especially like to fly with! At any rate, if the aircraft you are using has a 28-volt electrical system, I recommend that you use one of the new 3-terminal regulators to drop the 28 volts down to 12. Remember during transmit, your rig will be drawing about 2 or 3 Amps. That means that your regulator will be dissipating up to 50 Watts, as a good heat sink is mandatory. Fig. 1 shows an easy-to-make 12-volt regulator for use with 28-volt aircraft.

Well, I've told you how to get the power in and how to get the power out. The only thing left for me to do is pass along a few tips I've found useful in some hun-

dreds of hours of aeronautical mobile.

● Flying is hours and hours of fun punctuated by moments of stark terror. If the pilot motions for you to "cool it"—*shut up*. Do *not* make one more transmission to pass along 73s. A curt "QRT—Stand by" is preferable to lousing up approach control's message about the coverging 707. You always can pick up the conversation after the "aluminum overcast" misses you.

● Remember that at altitude, 10 Watts will travel up to 300 miles, and when you hit the button on .34/.94 over Vermont, you will bring up every machine from Maine to New York, including some that may not be too happy about it. Remember that you have fantastic range at this altitude, so work simplex where possible.

● Working 80 through 10 is possible—but not easy. Unless you own the airplane and are willing to make your ADF sense antenna double in brass for a very short whip (matched, of course, with an antenna tuner), then I suggest you do your aeronautical mobile on a band that requries a short antenna.

● Spikes on the 12-volt aircraft supply are not unknown, especially when the flaps, landing gear, landing lights, or other high-current draw items are switched on and off. A 16-volt zener or "transzorb"-style spike suppressor inside the radio will go a long way towards keeping your radio out of the auto-destruct mode.

● DO NOT take this article as license to string wires and cable hither and yon about the airframe without the advice of a pro. The few bucks (or a case of beer) you may have to pay a licensed expert to check your installation is cheap insurance when it comes to betting your fanny.

● And last, but not least, QSL if asked. Some hams go their whole careers without one single /AM on their walls. Above all, have fun. Aeronautical mobile is the least used yet most rewarding mode of operation. I hope to meet you someday in my *first* AM/AM QSO. ■

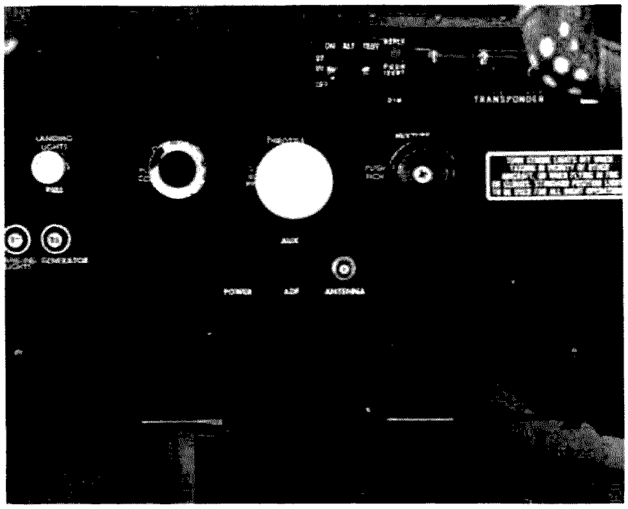


Photo G. A power and antenna patch panel mounted in a Cessna 172.

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Cybernet Ten-Meter Offset

—If you've gone CB to 10, why not go all the way? Add the repeater offset, too!

The CB to 10 FM conversion in the January, 1980, *73*[1] has reheated many cold soldering pencils in the past few months. Some of us were lucky enough to find new or working units in the corner of "Ye Olde CB Shoppe" while others either purchased circuit boards from one of the surplus houses[2] or one of the 10 FM transceiver kits available.[3] This growth in activity has led to an increase in the use of both remote bases and repeaters.

What is described here is a simple way to add a repeater offset to any conversion utilizing the Cybernet board (PTBM033, 036, 039AOX) for not much more than the price of the offset crystal required.

The method used incorporates diode switching of the reference crystal oscillator when transmitting. The theory of operation is basic. There are two points on the motherboard that alternate voltages when switching from transmit to receive. When in the receive mode, TP11 produces 7 volts, while TP14 carries 8.5 volts on transmit. By switching these voltages to the proper offset crystal, either simplex or repeater operation can be selected.

The first consideration must be the selection of the proper reference crystal. If the 11.8066-MHz crystal were replaced by one cut for 12.65167 MHz, as discussed in the *73* conversion article, an offset crystal for 12.61833 MHz must be obtained. Some conversions, however, utilized a crystal for 12.57166 MHz, allowing 29.500 through 29.700 to fall between channels 20 through 40. For these, a crystal for 12.53833 MHz is required to provide for the 100-kHz shift.

The entire circuit shown in Fig. 1(a) can be mounted on a piece of Vectorboard® approximately ½" × 1" as illustrated in Fig. 1(b).

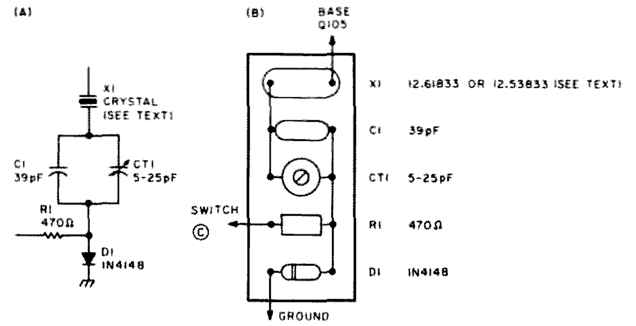

Fig. 1. (a) Repeater offset switching schematic. (b) Component arrangement.

Motherboard Preparation

Complete the following steps:

1) The circuit board track must be cut to separate where C118 (39 pF) and trimmer CT101 connect to ground, as diagrammed in Fig. 2.

2) To maintain continuity around the severed track, a ground jumper must be added near the edge of the board as indicated.

3) On the foil side of the board, insert a 1N4148 switching diode from the isolated area to the ground track.

4) On the component side of the board, insert a 470-Ohm resistor at the

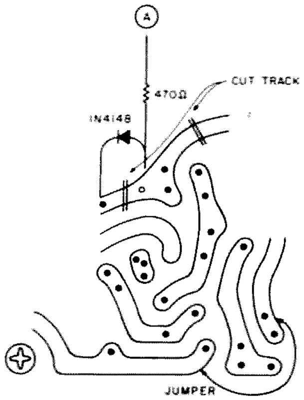

Fig. 2. A 1N4148 diode mounts on the foil side, while the 470-Ohm resistor mounts on component side next to J103.

cold end of this diode. This can be done by inserting one end of the resistor in the hole found between jumper J103 and R108 (1500 Ohms). Mount this resistor vertically from the board.

5) Locate TP11 near the 10.695-MHz crystal oscillator, and mount a 1N4148 diode vertically with the cold end down to the board.

6) Locate TP14 (near TP11) and mount another 1N4148 diode in the same manner (cold end down).

7) Connect the hot end of the diode at TP14 to the common position of a SPDT switch (see Fig. 3).

8) Connect the hot end of the diode at TP11 to the open side of the 470-Ohm resistor mounted vertically on the main board and continue this connection to the SPDT switch at the simplex terminal.

Mounting the Crystal Board

To mount the crystal board, complete the following steps:

1) Run a short length of wire (1″) from the crystal output end of the crystal board to the base of transistor Q105. It is usually best to solder this directly to the lead of the transistor. (Go easy on the heat. They're durable, but don't push it.)

2) For ease of mounting, solder the hot end of the diode on the crystal board to the top of transformer T101. This will not only serve as a good ground connection, but will elevate the crystal board approximately ½″ above the main board.

3) Connect the open end of the 470-Ohm resistor on the crystal board to the offset terminal of the SPDT switch.

Now, all that remains to be done is to adjust the offset crystal to frequency using your favorite counter and you're ready to work into those machines that you've been hearing.

If you or your club are interested, information on items such as receiver conversion kits and direct replacement 6-kHz NBFM i-f filters are available from me by sending an SASE.

See you on 29.6 FM. ■

References

1. "CB to 10 FM," *73 Magazine*, January, 1980, p. 117.
2. Surplus Electronics, 7494 NW 54 Street, Miami FL 33166.
3. Melco 10 FM Transceiver Kits, PO Box 26, Marissa IL 62257.

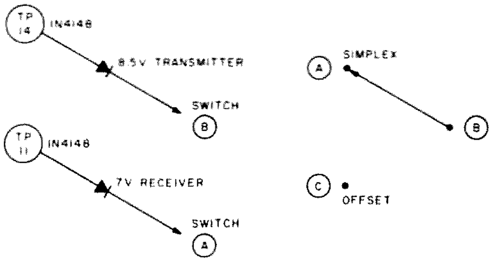

Fig. 3. Cold ends of diodes are connected to board. Hot ends connect to SPDT switches.

A Stout Heart for a Simplex Autopatch

—put your KIM-1 to work

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A simplex autopatch is an automatic phone patch which requires only one frequency for both transmitting and receiving. The simplex autopatch is a time-division type of phone patch; a phone patch whose transmitter is turned off for brief periods of time and whose receiver is turned on, letting the radio user access the phone line. A good discussion of the various types of phone patches has been published in *73 Magazine*.*

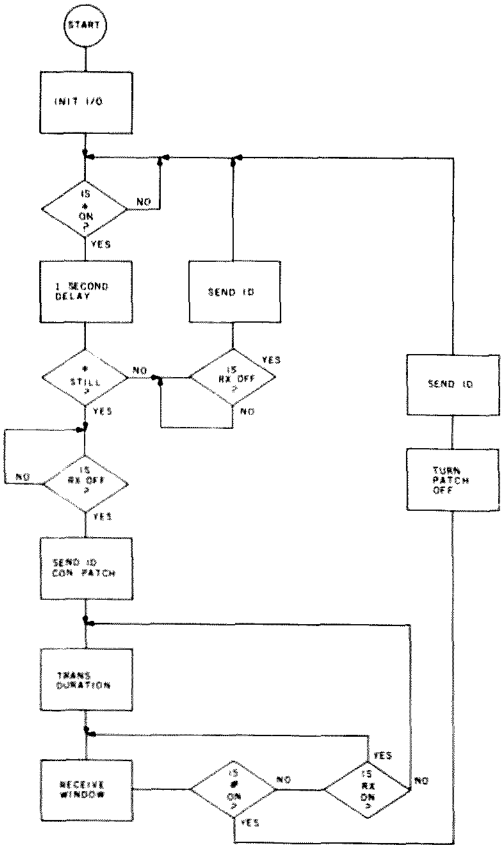

Fig. 1.

The only hardware needed to build this simplex autopatch is a VHF transceiver, three touchtone™ decoders, a phone patch, a touchtone phone line, and a MOS Technology KIM-1 microcomputer.

The KIM-1 computer is the heart of this simplex autopatch since it controls both the transceiver and the phone patch. The VHF transceiver must have a carrier-operated switch connected to the receiver section. This line should be a logic 1 with no signal present and a logic 0 when a signal is being received.

The touchtone decoders that I used are the 567, phase-locked loop type. (This circuitry is not shown since there have been many articles on these decoders in *73 Magazine*.)

The phone patch itself can be any method of coupling audio to and from the phone line. To be able to dial calls directly, the phone line you connect to this system must be able to recognize touchtone digits.

*"Phone Patching '76," *73 Magazine*, June, 1976.

This program uses less than .5K of memory on the KIM-1. The program's starting location is 0300. When started, the program first initializes the I/O ports. PA0-7 and PB0 are assigned as outputs. PB1-7 are assigned as inputs. Next, the program waits until it receives an access command. This command consists of a received signal and the * digit being decoded. After the initial access command has been decoded, the program will wait for about 1 second and check for the access command again. If the access command is not present, as soon as the received signal goes away, a CW ID will be sent.

If the access command is still being decoded, this is interpreted as a request for a phone patch. As soon as the received signal goes away, a CW ID will be sent, the phone patch connected, and a dial tone broadcast. The program then continues on into the transmit delay section. This is where all audio from the phone line is transmitted.

After the transmit delay, the transmitter is turned off and the receiver is turned on. The receiver is then polled for a signal or command. If no signal is received, the transmitter and

Ltr	Code	Ltr	Code	Ltr	Code	Ltr	Code	Ltr	Code
A	60	B	88	C	A8	D	90	E	40
F	28	G	D0	H	08	I	20	J	78
K	B0	L	48	M	E0	N	A0	O	F0
P	68	Q	D8	R	50	S	10	T	C0
U	30	V	18	W	70	X	98	Y	B8
Z	C8	0	FC	1	7C	2	3C	3	1C
4	0C	5	04	6	84	7	C4	8	E4
9	F4	/	94	SPACE	00	END OF MESSAGE			FF

Table 1. ID code table.

autopatch audio are turned back on and the transmit delay repeated. The receiver on-time (or window) is on for only short periods of time, so the audio from the phone is degraded only slightly.

The transmitter delay time can be changed by altering the value in location 0363. The receive window time can be changed by altering locations 0371 and 0376. If a # digit is decoded (the disconnect command) during the receive window, the patch is immediately disconnected and an ID sent. The ID program is located at 0200 and is called as a subroutine. The ID data table starts at location 0068 and can be programmed using the data in Table 1. A flowchart of the autopatch program is shown in Fig. 1.

Table 2 gives a complete list of all connections to and from the KIM-1. All outputs are a logic 1 when on; all inputs are a logic 0 when on. All input connections should be logic levels and connected to the input pins. The touchtone decoders can be tuned to the proper tones as listed in Table 2, or to other frequencies if you want your system to respond to other digits.

The interfacing of the output lines is left up to the reader because of the differences in the devices that you must control. The best way to interface these control lines is to bring them out to a 7406 hex inverter and have the inverter control relays. You would need to do this for the transmitter keying line, the patch connect line, and the patch

Program listing for simplex autopatch.

```
0300  A9 FF     LDA #$FF    SET PA FOR OUTPUT
0302  8D 01 17  STA 1701
0305  A9 01     LDA #$01    SET PBØ FOR OUTPUT
0307  8D 03 17  STA 1703    SET PB1-7 FOR INPUT
030A  AD 02 17  LDA 1702    LOAD AND MASK FOR RECEIVER
030D  29 2A     AND #$2A    ON AND • DECODED
030F  F0 03     BEQ 0314
0311  4C 0A 03  JMP 030A    NO, LOOK AGAIN
0314  A0 00     LDY #$00    PATCH REQUEST DELAY
0316  A2 00     LDX #$00
0318  E8        INX
0319  E0 FF     CPX #$FF
031B  D0 FB     BNE 0318
03ID  C8        INY
031E  C0 FF     CPY #$FF
0320  D0 F6     BNE 0318
0322  AD 02 17  LDA 1702    SEE IF • IS STILL BEING
0325  29 2A     AND #$2A    DECODED (PATCH REQUEST)
0327  F0 07     BEQ 0330
0329  A9 FF     LDA #$FF    NO, SET NO REQUEST FLAG
032B  85 D0     STA D0
032D  4C 34 03  JMP 0334    WAIT FOR RECEIVER TO TURN OFF
0330  A9 00     LDA #$00    YES, SET REQUEST FLAG
0332  85 D0     STA D0
0334  AD 02 17  LDA 1702    WAIT FOR RECEIVER TO TURN OFF
0337  29 20     AND #$20
0339  F0 F9     BEQ 0334    RECEIVER STILL ON
033B  20 00 02  JSR 0200    RECEIVER OFF, SEND ID
033E  A5 D0     LDA D0      SEE IF PATCH WAS REQUESTED
0340  C9 00     CMP #$00
0342  F0 03     BEQ 0347
0344  4C 0A 03  JMP 030A    NO, WAIT FOR NEXT ACTIVATION
0347  A9 34     LDA #$34    YES, CONNECT PATCH
0349  8D 00 17  STA 1700
034C  A9 00     LDA #$00    TRANSMIT DURATION TIMER
034E  85 EE     STA EE
0350  A0 00     LDY #$00
0352  A2 00     LDX #$00
0354  E8        INX
0355  E0 FF     CPX #$FF
0357  D0 FB     BNE 0354
0359  C8        INY
035A  C0 FF     CPY #$FF
035C  D0 F6     BNE 0354
035E  E6 EE     INC EE
0360  A5 EE     LDA EE
0362  C9 05     CMP #$05
0364  D0 EE     BNE 0354
0366  A9 20     LDA #$20    RECEIVE WINDOW TIMER
0368  8D 00 17  STA 1700
036B  A0 00     LDY #$00
036D  A2 00     LDX #$00
036F  E8        INX
0370  E0 20     CPX #$20
0372  D0 FB     BNE 036F
0374  C8        INY
0375  C0 05     CPY #$05
0377  D0 F6     BNE 036F
0379  AD 02 17  LDA 1702    RECEIVE WINDOW
037C  29 26     AND #$26    IS # (DISCONNECT) DECODED
037E  D0 0B     BNE 038B
0380  A9 00     LDA #$00    YES, DISCONNECT PATCH
0382  8D 00 17  STA 1700
0385  20 00 02  JSR 0200    SEND ID
0388  4C 0A 03  JMP 030A    GO LOOK FOR NEXT USER
038B  29 20     AND #$20    NO, WAIT FOR RECEIVER OFF
038D  F0 03     BEQ 0392
038F  4C 47 03  JMP 0347    RETURN TO TRANSMIT
0392  4C 79 03  JMP 0379    KEEP RECEIVE WINDOW ON
```

transmit/receive line, if this line is used. If you want to interface these lines in another manner, remember not to draw more than 1 mA from an output pin.

Inputs	Outputs
PB1— 941-Hz decoder output	PA2—Transmitter keying
PB2—1477-Hz decoder output	PA4—Patch connect
PB3—1209-Hz decoder output	PA5—Patch send/receive switch
PB5—Receiver carrier-operated switch	PB0—CW ID audio output

Table 2. KIM-1 I/O connections.

The simplex autopatch is compatible with normal simplex use on the same frequency. Only transmissions with an access digit are responded to; all other signals are ignored. The following describes how to use the autopatch.

First, to see if you are in range of the autopatch, key your transmitter and momentarily press the * on the touchtone pad. When you release your mike, you should hear the autopatch ID. Second, if you want to use the patch, follow the above procedure, but hold the * down for a couple of seconds. This time, you will hear an ID followed by a dial tone. You can now use the patch just like an autopatch connected to a repeater, with one exception: You must wait about a second before you dial or talk so that your first digit or word isn't missed.

When using the simplex patch, you will notice ticking sounds in the patch audio. This ticking is the receive window that lets you control the patch. When you are finished with your call, send a # and the patch will disconnect and send a final ID.

If you have a problem with the receive window interfering with the quality of the audio from the phone line, the squelch tail on your receiver is probably too long. You can eliminate this problem by removing the electrolytic capacitor following the diodes in your receiver's noise amp. This cured the problem in my system. For what would seem to be a difficult project, the use of the KIM-1 microcomputer turned this autopatch into a relatively easy task. If you have any difficulties in getting your system on the air, feel free to contact me.■

CW ID subroutine.

```
0200  A9 04     LDA #$04    TURN TRANSMITTER ON
0202  8D 00 17  STA 1700
020C  BD 8F 02  LDA 028F,X
020F  95 E2     STA 00E2,X
0211  CA        DEX
0212  10 F8     BPL 020C
0214  A2 08     LDX #$08    SEND LEADING SPACE
0216  20 79 02  JSR 0279
0219  A2 03     LDX #$03    SPACE BETWEEN CHARS.
021B  20 79 02  JSR 0279
021E  20 8A 02  JSR 028A    GET CHAR. TO SEND
0221  AA        TAX
0222  E6 E2     INC 00E2
0224  C9 00     CMP #$00    CHECK FOR SPACE
0226  D0 03     BNE 022B
0228  4C 19 02  JMP 0219
022B  C9 FF     CMP #$FF    END OF MESSAGE?
022D  D0 03     BNE 0232
022F  4C 50 02  JMP 0250
0232  8A        TXA
0233  85 DF     STA 00DF
0235  06 DF     ASL 00DF
0237  F0 E0     BEQ 0219    DONE WITH CHAR?
0239  B0 0D     BCS 0248
023B  A2 01     LDX #$01
0242  20 79 02  JSR 0279    SEND SPC.
0245  18        CLC
0246  90 ED     BCC 0235
0248  A2 03     LDX #$03    SEND DASH
024A  20 5B 02  JSR 025B
024D  18        CLC
024E  90 F0     BCC 0246
0250  A2 08     LDX #$08
0252  20 79 02  JSR 0279    SEND TRAILING SPACE
0255  A9 00     LDA #$00
0257  8D 00 17  STA 1700    TURN TRANSMITTER OFF
025A  60        RTS
025B  86 DD     STX 00DD    MARK SUBROUTINE
025D  A5 E6     LDA 00E6
025F  8D 47 17  STA 1747
0262  EA EA EA  NOP'S
0265  EA EA     NOP'S
0267  EE 02 17  STA 1702    PBØ IS CW AUDIO OUTPUT
026A  A6 E7     LDX 00E7
026C  CA        DEX
026D  D0 FD     BNE 026C
026F  2C 47 17  BIT 1747
0272  10 F3     BPL 0267
0274  C6 DD     DEC 00DD
0276  D0 E5     BNE 025D
0278  60        RTS
0279  86 DD     STX 00DD    SPACE SUBROUTINE
027B  A5 E6     LDA 00E6
027D  8D 47 17  STA 1747
0280  2C 47 17  BIT 1747
0283  10 FB     BPL 0280
0285  C6 DD     DEC 00DD
0287  D0 F2     BNE 027B
0289  60        RTS
028A  A6 E2     LDX 00E2
028C  B5 68     LDA 0068,X
028E  60        RTS

Code Initialization

028F  00 05 3B 03 44 D0 C0 C0 C0 C0 C0 00

Sample ID (DE WD8CHH)

0068  90 40 00 70 90 E4 A8 08 08 FF
```

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The Bearcat 350 Programmable Scanner

—a first-class act from Electra

It's hard to believe that only four years have gone by since Electra released their first keyboard-entry programmable scanner, the venerable BC-210. This eminently-usable little scanner was followed in rapid succession by a flurry of new products: the BCs 250, 220, 211, 300, 160—and now, the BC-350.

This new entry from Electra sports one radical innovation: a fully-alphanumeric display. No longer does the listener have to remember that 155.505 is his local police frequency or the 147.045 is the Robbinsville repeater. He can use the keyboard to write in "Police," "Fire," or "RVL RPTR." Up to 8 characters, alpha or numeric, may be entered for display on any channel. Readout is a brilliant fluorescent display.

The alphanumeric function is not in lieu of a frequency entry; either display may be called up alternately by toggling the A/N key.

Another feature which will be well-received is the faster scan/search rate—20 channels per second (10 on slow speed).

The Bearcat 350 programmable scanner.

Frequency ranges covered are typical of the new Bearcats: 30-50, 118-136, 144-174, and 421-512 MHz. Electra chooses to break these ranges into seven subbands for advertising purposes. It is significant to note that low-band coverage is now advertised as full 30-50 MHz rather than 32-50 MHz as in previous products. Although the earlier units went down to 30 MHz, performance and parameters were not always repeatable.

The 350 is not tiny; in fact, in spite of the photo, it is the largest unit yet produced by Electra: 12" W × 4" H × 9" D. It was definitely not produced with the mobile listener in mind! However, the BC-350 does have a 12-volt input for those with room.

Sensitivity and selectivity are excellent. 0.4 uV on low and high bands and 0.8 uV on UHF are typical. −60 dB rejection ±25 kHz discriminates against adjacent channel interference.

As with some previous models, 50 channels of memory are allocated to 10 bands, allowing selective call-up of various frequency clusters programmed by the user.

For noisy environments such as those encountered in industrial or mobile installations, a 2-Watt audio amplifier provides plenty of sound from the internal speaker. A rear-apron jack is provided for an external speaker or de-scrambler.

Selective scan delay (an Electra patent) allows for immediate resumption of scan or search after the carrier goes off the air, or it may be toggled to wait 2 seconds for responses on that channel.

A priority feature allows sampling of channel one every two seconds if desired to be sure not to miss a call on that channel. An auxiliary function can be used to activate a remote recorder. A count memory permits the user to determine the number of times a channel has been active, even if you have not been there to hear it. A lockout key allows you to temporarily exclude any channels you wish during scan.

The display is divided into two readouts. The left-hand window provides call-

Continued on page 101

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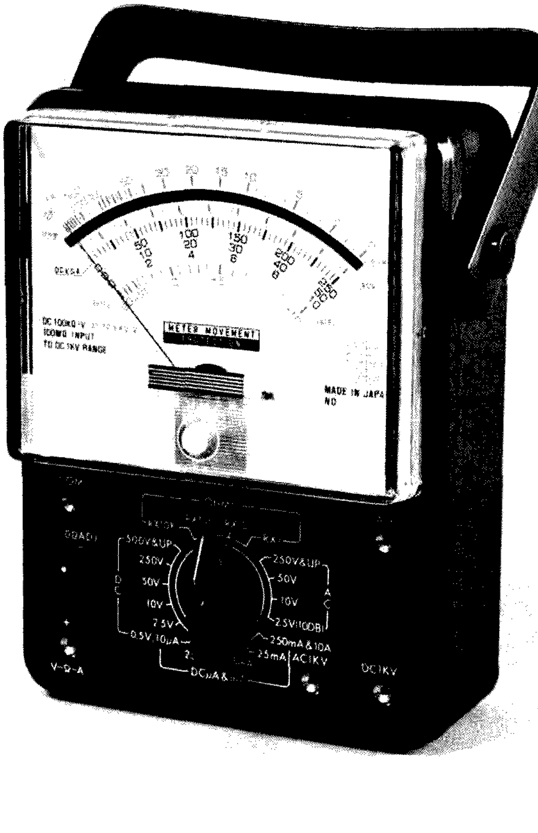
The Calectro Multi-Tester

—a full-size, lab-type multimeter for fans of analog operation

The most common items of test equipment needed in the ham shack or home electronics workshop are rf and af signal generators, oscilloscopes, frequency counters, dummy load/wattmeters, grid-dip oscillators, and—perhaps the *primary* instrument—the multi-tester or multimeter.

Little need be said about the utility of the multimeter on the bench or in the home workshop. This versatile instrument allows one to make basic current, voltage, and resistance readings (as a minimum), and for this reason it is indispensable for even the non-technical amateur or SWL—if for no other purpose than to be able to detect open and short circuits or to check one's ac line voltage. For the home-brewer, experimenter, and kit-builder, the multimeter is invaluable in circuit design and development as well as in troubleshooting applications.



The Calectro 20-205 multimeter.

The basic multimeter, or VOM, is an analog device that has four, five, or more scales, each representing a different type of measurement, such as ac, dc, Ohms, decibels (dBs), and possibly other parameters. The input arrangement and number of ranges depends on the degree of sophistication and cost of the unit. A primary "driver" of quality and cost (they go together, of course!) is the meter's internal resistance—the higher the better, since units with relatively high internal circuit resistance (20,000 Ohms-per-volt or greater) will tend not to unduly distort readings as a result of loading of the circuit under test by the meter itself.

There is little question that the industry is moving toward the digital-readout multimeter. Frankly, this type of tester can enable a greater degree of over*all* accuracy for the average user, just as the digital watch can permit more precise timekeeping than can the two-hands type. For example, a good digital multimeter's accuracy may be on the order of 0.1 to 0.5% of basic dc scale, whereas good analog meters boast precisions of but 2-5%, not to mention such additional problems as interpolation and parallax errors.

Despite the superior accuracy of the digital instrument, there's still a good deal of room for the analog multimeter for general-purpose electronic usage. The better grade instruments are still a good deal less expensive than equivalent digitals. In addition, for general troubleshooting, the smooth analog meter action is often much preferred over trying to interpret running, flashing digits when working with highly dynamic or unstable circuits. Too, movement trends of the parameter being measured are much more clearly discerned on the analog meter.

There's no shortage of analog multimeters in the marketplace. However, one of the better meters I have encountered is the new Calectro (GC Electronics) model 20-205, formerly known as the H3-361. This high quality, "lab-type" instrument is a multi-purpose multimeter that's a good example of what a better analog model can do. The 100,000 Ohms-per-volt dc internal resistance ensures that most circuits under test will be unaffected by

the meter's presence. I found it to be a very rugged, reliable all-purpose measuring device capable of handling a wide range of ac and dc voltages, resistances, dc currents, and dBs.

The Calectro instrument has a large (4") clear plastic-front meter with a two-color mirrored scale for good visibility and ease of interpolation. The 18-position range switch, when coupled with the four front-panel input jacks, enables selection of 22 ranges. Dc voltage ranges run from 0-500 millivolts to 0-1000 volts. Ac measurements of from 0-2.5 volts to 0-1000 volts are available; VUs are measurable in five ranges from −20 to +62 dB; dc resistance scales run from 0-2000 Ohms to 0-20 megohms; dc current scales run from 0-10 microamperes to 0-10 Amperes. Batteries are required only for the Ohms function (two AA-size 1.5-volt penlight cells will do the trick—use alkaline cells for long life), which incidentally in the R×1 range has a center-scale position of 16 Ohms. This enables convenient and accurate resistance measurements down to a mere fraction of an Ohm.

Meter protection is a particularly important feature of any item of test gear. The Calectro unit is well protected by dual silicon diodes. The protection circuit worked well for me, since through operator error I managed to goof in checking out the unit by making several gross mistakes in range switch selection, including inadvertently placing raw 120-V ac line current across the meter when using one of the low Ohms ranges. No damage was experienced.

The unit's accuracy seemed adequate for most in-shack uses and appeared to be better than the rated dc ±3% and ac ±5% (of full scale) accuracy. The double-jeweled ± 2% meter and temperature-stabilized resistors in the innards undoubtedly contributed to the tester's overall excellent accuracy.

The Calectro device is a large instrument as far as multimeters go, being 7¼" H × 6" W × 2¾" D. It comes with standard color-coded test leads and prods and is list priced at $59.95. There are no accessories advertised for use with it.

While one may easily purchase a much less expensive, miniature multimeter, one will likely find the latter to be but a mere toy beside a higher-quality instrument such as the lab-grade unit I've highlighted here. A good analog instrument can be made to do yeoman duty for a multitude of tasks, including battery testing, transistor or diode checking, and field-strength measuring (when used in conjunction with a diode or rf probe). It can even be used as an S-meter for an older receiver. An rf probe, or a set of extra-long coiled test cables with easy-grip clips, would also represent money well spent.

Sure, I know that the future is digital, but analog has its rightful place, and that place just may lie in your workshop. It certainly does in mine!

The 20-205 is sold primarily through general electronic supply houses. This Japanese-made import is distributed by GC Electronics, 400 South Wyman St., Rockford IL 61101. Reader Service number 479. ■

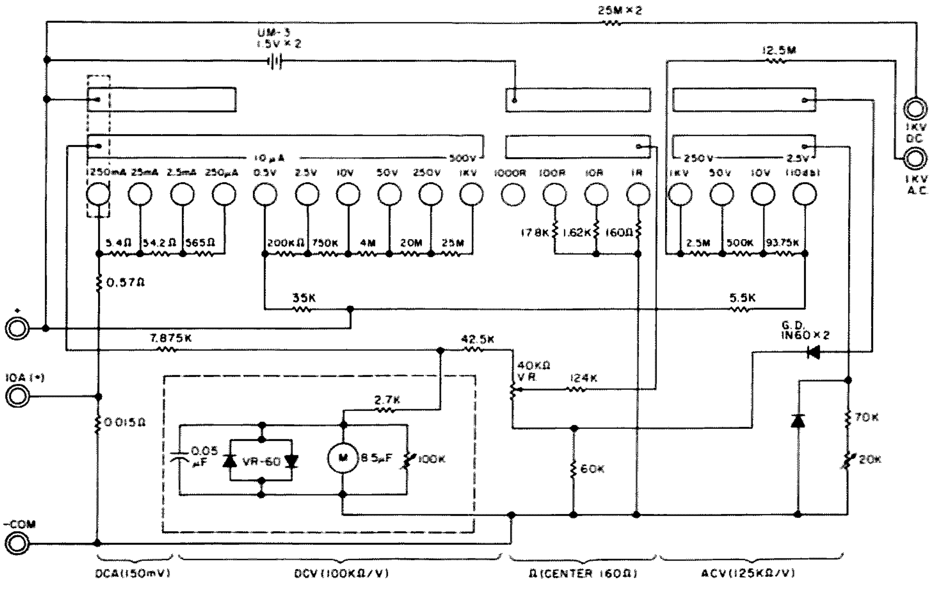


Fig. 1. Schematic for the Calectro multimeter.

✓See List of Advertisers on page 114

Tim Daniel N8RK
73 Magazine Staff

How To Defend Yourself Against Radar

How To Defend Yourself Against Radar by Bruce Bogner and James Bodnar. The Brehn Corporation, 1980.

When it comes to police radar, it seems like the public can't win. In one camp there are the police, backed by the radar manufacturers. On the other side you'll find the people that sell radar detectors and the high-speed buffs that buy them. The information that these two groups provide usually consists of a few facts mixed with a liberal dose of misinformation. The result is a very confused public. The myths, exaggerated claims, and outright lies that are associated with radar are laid to rest in a book called *How To Defend Yourself Against Radar.*

Published by the Brehn Corporation, *How To Defend Yourself Against Radar* is authored by Bruce Bogner, an engineer, and James Bodnar, an attorney. Their combined efforts result in a book that allows you to understand radar without having an engineering degree. Nor will you always need a lawyer to successfully defend yourself against a radar charge.

Most of this 100-page softbound book is devoted to the details of how radar works. You will find out what pitfalls make radar questionable and how a police officer can inadvertently arrest a non-speeder. By the time you digest the first five chapters, you'll probably know more about the subject than most policemen or judges.

The last three chapters outline how to defend yourself against a speeding ticket. You must make painstaking observations at the time of apprehension and careful measures must be used to obtain testimony from the arresting officer. Even if you are not up to defending yourself, this information will be helpful to your lawyer.

No book can guarantee that you will beat a radar rap, but the $6.95 cost for *How To Defend Yourself Against Radar* is a small price to pay compared to a fine and higher insurance rates. *How To Defend Yourself Against Radar* is available from *73*'s Radio Bookshop, Peterborough NH 03458. ■

✓See List of Advertisers on page 114

Dennis G. Brewer K8DIU/4
240 Dellwood Drive
Greenville NC 27834

Guide to RTTY Frequencies

Guide to RTTY Frequencies, *by Oliver P. Ferrell. 1st Edition, 1980. 96 pages, 6" × 9", paperback, $8.95. Gilfer Associates (PO Box 239, 52 Park Avenue, Park Ridge NJ 07656).*

If you are a ham or SWL, you're probably familiar with the well-known book, *Confidential Frequency List.* The *CFL*, by Oliver P. Ferrell, lists a plethora of "utility" stations (nearly everything except hams and broadcast) from 4001 to 25,590 kHz. It covers AM, SSB, ISB, CW, and facsimile modes of transmission.

Mr. Ferrell has compiled a new book, dedicated to radio-teletypewriter (RTTY) stations. The *Guide to RTTY Frequencies* is similar to the *CFL*, but is exclusively about RTTY. Stations are listed in ascending order of frequency from 4003 to 26,860 kHz. Listed, in most cases, are the frequency, callsign, location, type of service, shift, speed, power, and useful remarks (such as language).

Many of the book's entries are positively tantalizing. Nearly every country is represented with news services, military, aeronautical, marine, or point-to-point stations. This could be a fun way to practice your foreign-language skills! It's also a good way to see "what's goin' on" in distant lands. For that matter, it is interesting to see just what's going on in our *own* land—with USCG, USN, FBI, FCC, MARS, and UPI.

As fascinating (and as useful) as the station listings is the book's "Introduction to RTTY Identification" by Webb Linzmayer. Explained, in detail, are the various types of RTTY signals encountered in the high-frequency spectrum. If you've ever used a "multi-speed any-shift" RTTY receiving setup, you've probably wondered about the RTTY signals that you *couldn't* copy. Mr. Linzmayer explains it all. He describes the various teleprinter codes and multiplex systems in use. Mentioned, too, are various privacy measures designed to frustrate the unauthorized receiver (or printer)! While truly encrypted transmissions probably will not be decoded on the basis of this book's information, it's probable that computer buffs will be able to crack the bit-inversion and bit-transposition privacy schemes. Of course, if you are an amateur cryptographer, RTTY will supply you with endless encrypted material. If you should happen to find a way to decode any U.S. military encrypted material, you might call an intelligence officer and mention the fact!

The *Guide to RTTY Frequencies* should be a valuable addition to any RTTY shack or computerized shortwave station.

Hey, look. . . there's Interpol talking about my brother again! ■

See List of Advertisers on page 114

Eric Shalkhauser W9CI
527 Spring Creek Road
Washington IL 61517

The History of Ham Radio

—part XVII

Reprinted from QCC *News*, a publication of the Chicago Area Chapter of the QCWA.

EARLY ACTION ON DILL RADIO BILL EXPECTED

Measure Would Create Independent Commission to Operate Broadcasting

WASHINGTON, April 29.(AP)—The Dill radio bill, which set up an independent commission with complete power over broadcasting, was approved today by the senate interstate commerce commission with indications pointing to an early favorable report to the senate.

Taken in the face of repeated warnings from President Coolidge against establishment of any more separate government agencies, the action had the effect of sidetracking the White bill, backed by the administration, providing for an advisory committee to work with the commerce department in controlling the industry. This bill has passed the house.

Meanwhile Secretary Hoover, whose department recently lost in the federal courts the right to assign wave length to radio stations, took exception to statements recently made in congress to the effect that he was attempting to become "dictator" of the radio world.

"It's the last responsibility I want," he asserted.

He reiterated his opposition to any plan leaving to any one official the responsibility of determining who shall broadcast and on what wave lengths, because of the expense and bureaucracy tendencies involved.

These duties, he said, should be placed in a semijudicial board of commission as provided in the White bill, and the administrative or enforcement end left to an existing government department.

A news story published on April 29, 1926.

From 1912, as wireless was just emerging from its cocoon and Congress first enacted a radio law, until 1927, developments in radio were nurtured by the Department of Commerce under the guidance of then-Secretary Herbert Hoover. Radio was destined to go through many convulsions during those fifteen years . . . the task of prescribing wavelengths . . . issuing licenses . . . specifying power and time on the air . . . legislating. For some 700 applicants, the privilege to broadcast proved chaotic. With the passage of the compromised White-Dill radio bill signed by President Calvin Coolidge on February 23, 1927, the first meaningful legislation on radio control in the United States was accomplished.

Industry Problems

Toward the end of 1926, because of the mounting problems which constantly arose in the broadcast field, the President was compelled to sign into law an emergency measure. Congressional Joint Resolution 125 became effective December 16, 1926. The law required that any applicant for a new or renewal radio broadcast license "waive any right of claim of right as against the United States to any wavelength, or to the use of the ether in radio transmission because of previous license to use the same or because of the use thereof."

The Radio Commission, after a visit with President Coolidge. Left to right, H. A. Bellows of Minnesota, J. F. Dillon of California, E. O. Sykes of Mississippi, and O. H. Caldwell of New York.

The New Law

Sections 2 and 3 of "An Act For the regulation of radio communications, and for other purposes" specified that:

1) The United States be divided into five zones;

2) A Commission be created consisting of five commissioners appointed by the President, each commissioner a resident of the zone represented; and

3) The members of the Commission have terms of two, three, four, five, and six years, respectively, and shall meet from time to time as required by public convenience, interest, and necessity.

Section 4 authorized the Commission to:

1) Classify radio stations;

2) Prescribe the nature of the services to be rendered;

3) Assign bands of frequencies for each individual station;

4) Determine the power and the time on the air;

5) Determine the location, and regulate the kind of apparatus used to prevent excessive interference;

6) Have authority to establish areas to be served and make special regulations applicable to radio stations engaged in chain broadcasting; and

7) Have authority to make general rules and regulations requiring stations to keep such records of progress, transmission of energy, communications, or signals as it may deem desirable. (Radio amateurs to keep a log.)

Commissioners Initiate Course of Action

As early as March, 1927, the following steps were taken by the Commission in General Order #1: Broadcast stations were given authorized channels with even 10-kilocycles separation, original assigned frequencies to Canadian stations were cleared of interfering United States stations, and all amateur and ship station licenses were extended indefinitely as of March 15th.

Time-sharing for all broadcast stations was a major problem. Stations which had deliberately jammed power and had deviated from previously assigned wavelengths came under greatest criticism and penalty.

The Commission immediately set about to reallocate stations in the interest of the listener. By June, 1927, local stations within a given locality were assigned frequencies 50 kilocycles apart. Other stations, especially the higher powered ones, were given assigned frequencies depending on location, public service, and previous time on the air so as to minimize heterodyne interference. In many instances, actual experience and cooperation between stations served as a guide.

The law as enacted applied to all radio stations—ship, land, experimental, amateur, coastal, etc.—with the exception of those operated by the United States Government. Even with the ether lanes crowded, there were over 250 applicants for broadcast-transmitting-station licenses pending at the State Department prior to the effective date of the 1927 Act.

Section 5 of the Act specified that from and after one year after the first meeting of the Commissioners, "all powers and authority vested in the Commission, except as to revocation of license, shall be vested in and exercised by the Secretary of Commerce. The Secretary is to designate call letters of all stations."

Section 9 provided for granting licenses by the Secretary and renewals for three-year periods for broadcast stations, and up to five-year periods for other classes of stations.

Radio Amateur Rulings

The secretary of Commerce extended amateur operators' licenses by issuing the following order on March 16, 1927: "All radio operator licenses valid at the passage of the Radio Act of 1927 are hereby extended for the unexpired period of such licenses."

As these new regulations were issued, the amateur first-grade license was changed to "radio operator Extra Class," and the amateur second grade changed to "Temporary Amateur License." The amateur Extra First, Experimental, and Instruction Grades were eliminated.

On March 26, 1927, the Commission ordered all supervisors in the various regions to issue temporary amateur station licenses pending the review and issuance of new amateur regulations.

To obtain an amateur operator's license, the applicant was requried to pass a code test in sending and receiving Continental Morse code at a speed of at least ten words per minute. Also required was successful completion of a written examination in the theory, construction, and operation of radio equipment.

At the time of renewal, the applicant was required to report satisfactory activity during the last six months of the license term in lieu of taking another examination.

With the passage of the Radio Act of 1927, all concerned with radio prepared for the forthcoming convention of all nations to the International Radio Telegraphic Conference scheduled to take place in Washington, DC, in October, 1927.■

THE NEW RADIO LAW as of FEBRUARY 23,1927

[Public—No. 632 69th Congress]
[H. R. 9971]

An Act For the regulation of radio communications, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act is intended to regulate all forms of interstate and foreign radio transmissions and communications within the United States, its Territories and possessions; to maintain the control of the United States over all the channels of interstate and foreign radio transmission; and to provide for the use of such channels, but not the ownership thereof, by individuals, firms, or corporations, for limited periods of time, under licenses granted by Federal authority, and no such license shall be construed to create any right, beyond the terms, conditions, and periods of the license. That no person, firm, company, or corporation shall use or operate any apparatus for the transmission of energy or communications or signals by radio (a) from one place in any Territory or possession of the United States or in the District of Columbia to another place in the same Territory, possession, or District; or (b) from any State, Territory, or possession of the United States, or from the District of Columbia to any other State, Territory, or possession of the United States; or (c) from any place in any State, Territory, or possession of the United States, or in the District of Columbia, to any place in any foreign country or to any vessel; or (d) within any State when the effects of such use extend beyond the borders of said State, or when interference is caused by such use or operation with the transmission of such energy, communications, or signals from within said State to any place beyond its borders, or from any place beyond its borders to any place within said State, or with the transmission or reception of such energy, communications, or signals from and/or to places beyond the borders of said State; or (e) upon any vessel of the United States; or (f) upon any aircraft or other mobile stations within the United States, except under and in accordance with this Act and with a license in that behalf granted under the provisions of this Act.

Sec. 2. For the purposes of this Act, the United States is divided into five zones, as follows: The first zone shall embrace the St
Maine, New Hampshire, Vermont, Massachusetts
Rhode Island, New York, New Jersey, Del
District of Columbia, Porto Rico, and
zone shall embrace the State or any right
Virginia, Ohio, Mich ommenced in any civil
embrace the S alities under said laws shall
Florid ed in the same manner as if committed;
forfeitures, or liabilities incurred prior to taking
or, under any law embraced in, changed, modified, or repealed by this Act, may be prosecuted and punished in the same manner and with the same effect as if this Act had not been passed.

Nothing in this section shall be construed as authorizing any person now using or operating any apparatus for the transmission of radio energy or radio communications or signals to continue such use except under and in accordance with this Act and with a license granted in accordance with the authority hereinbefore conferred.

Sec. 40. This Act shall take effect and be in force upon its passage and approval, except that for and during a period of sixty days after such approval no holder of a license or an extension thereof issued by the Secretary of Commerce under said Act of August 13, 1912, shall be subject to the penalties provided herein for operating a station without the license herein required.

Sec. 41. This Act may be referred to and cited as the Radio Act of 1927.

Approved, February 23, 1927.

The new radio law as of February 23, 1927.

Wayne E. Elseth WB9PKD
208 South Oakland
Carbondale IL 62901

The Robot 800H

—a specialty terminal for RTTY/Morse/SSTV and you

The clanking of the Model 15 shatters yet another quiet evening with its growl and clatter. Autostart at 2 am certainly makes its shortcomings known quickly.

What to do? Well, how about one of those newfangled computers that can also copy RTTY? Sounds like a good idea to me—so it's over to the back issues of the ham magazines to see what is available. I discovered that there are new models coming out almost every day! Decisions, decisions, decisions. Hmmm, Robot offers a new model, the 800H. It sends and receives Baudot, ASCII, and Morse, and it also has an SSTV character generator. Sounds interesting, indeed, so I call the local Robot dealer to order the Robot Model 800 Super Terminal.

It Arrives

The seemingly endless hours of waiting for the new rig finally came to an end. The UPS man delivers the Robot in perfect condition. I excitedly unwrap it and begin hooking it up in the shack. Included with the terminal are: 1 Model 800 keyboard, 1 six-foot shielded cable with RCA phono plugs on each end, 1 six-foot coax cable with BNC plugs on each end, 2 six-foot three-conductor shielded cables with phone plugs on one end, and 1 instruction manual. Robot has really made it easy to hook up the Model 800!

On-The-Air Performance

The Robot Model 800H is designed to receive and transmit Baudot, ASCII, and Morse code. It will also send SSTV block letters, but will not receive SSTV without using a separate converter.

The Robot Model 800H works wonderfully on RTTY. A status indicator line is provided at the top of the display which gives information about how the terminal is configured, such as receive or transmit, speed, polarity, autostart, Selcal, selcom, and a tuning indicator.

A signal is tuned in by adjusting the vfo until the tuning indicator is at its longest position and is flickering the least. This corresponds to the maximum signal through the filters and to both tones (mark and space) being passed equally well. There are connectors on the rear panel for connecting an oscilloscope if you wish to use one to tune in your signals. The terminal can be configured to receive in one of three modes: normal, autostart, or selcom.

Normal-mode receive allows any signal which makes it through the filters to be printed on the screen. This mode works very well on signals that vary in strength. Were one of the other modes to be used, such as autostart, characters would be lost when the signal dropped out and the autostart delay had not yet allowed the resumption of displaying the received RTTY information.

Autostart mode prevents the display of unwanted characters on the screen without a RTTY carrier being present. There is a built-in 3-second delay before characters will be displayed during which a valid carrier must be present.

Selcom mode is a dual-function mode. It supports WRU ("Who are you") automatic answer-back and automatic message recording (Selcal, or selective calling). The WRU code is user programmable by merely typing in the desired 8-character code, as in the Selcal code. The status line on the display will show the codes as you type them and will allow corrections to be made without any fuss. Merely hit the delete key and the last character entered vanishes from the screen.

There are three transmit modes which are selectable by the user. They are continuous, line, and word modes. Continuous mode is similar to RTTY operation using a teletype™ machine. Your carrier is keyed on and remains on while you hunt and peck for the proper keys. Line mode does not transmit anything until the Model 800 detects a carriage return. It then sends the entire line while still allowing you to type in the next line of text. Word mode sends each word as it is completed and the Model 800 detects a space. This allows the correction of spelling errors before sending the word.

Speeds may be changed between any of six available speeds. They are: 60, 66, 75, 100, and 132 wpm (Baudot) and 110 baud ASCII. Speeds may be changed by merely typing one command. The terminal toggles between the various speeds available in the terminal.

There are three shifts that the Model 800 can copy. The terminal can be toggled between 170 Hz and 850 Hz. By straddle-tuning the signal, 425 Hz can be copied. Each time the CTL-Shift key is depressed, the terminal changes shifts. Should you run into a situation where the received signal is reverse polarity, the polarity may be inverted by pressing CTL-Reverse. Typing CTL-Reverse again will toggle the Model 800 back and forth from normal to inverted modes.

There are RY and Quick Brown Fox test messages available by pressing a key. An automatic CW ID is provided for use in RTTY mode. You can fill up the buffer (up to 511 characters) with any combination of messages and IDs and they will be sent automatically when you switch the Model 800 into transmit mode.

The Model 800 wordwrap feature makes reading the received copy much easier. If a received word will not fit entirely on the present line being typed, the program will erase the unfinished word and move it in its entirety to the next line down. In this way words retain their meaning much better by not being written on two separate lines.

RTTY Performance

The Robot Model 800H is outstanding when used on RTTY. Signals can be tuned in easily by using the status line tuning indicator. The built-in demodulator easily equals the performance of many stand-alone terminal units.

One possible problem exists, though. When ordering the Model 800, be sure to specify that high tones are to be installed in your unit if you want to work 2m RTTY. The standard unit is supplied only with low tones which will work fine on HF but will not be compatible with VHF mark and space tones. My unit was supplied with the low tones, and a trip back to the factory was required to modify it to work on VHF.

Morse Code Operation

The Robot Model 800 also has provisions for Morse Code reception. A very narrow audio filter is built in which helps select the particular signal of interest. The narrow filter also makes it extremely difficult to tune in the signal.

When receiving Morse code, the signal is tuned until the terminal regenerates the code on its internal speaker. The tuning indicator in the status line helps in tuning by indicating the signal level passing through the filter. Merely tune for maximum indication.

Problems arise if you expect the terminal to provide perfect copy under field (read "real life") conditions. It won't. The terminal hopes to see perfect machine-sent code. How could you expect otherwise? It is a machine, too. Its program has some provision for sloppy fists, but when combined with the touchy audio level adjustments and the critical tuning adjustments required for copy, the program tends to let you down.

When the terminal does not understand the character sent, it types an asterisk. International Morse code A-Z, 0-9, .,?:;-/, AR, AS, BT, KN, and SK are all recognized and printed by the terminal.

The terminal will also send Morse from 3 to 99 words per minute. The 511-character buffer is functional when sending code as well as RTTY. Here, too, the buffer allows you to type and edit your message while the buffer is being sent.

The terminal can also be used as a Morse code trainer. It will generate random characters which can be copied by utilizing the split screen. Received practice copy is printed on the bottom half of the screen, and sent copy is typed on the upper half of the screen. Your accuracy can then be checked by comparing the two versions.

SSTV

The Robot Model 800 also supports SSTV. It will send up to a 6 × 6 character message using block letters. This can be a help to contest operators who normally use a menu board to pass QSL information. By merely typing the desired information on the terminal, it will be sent via SSTV.

The terminal also will send a gray scale, checkerboard, reversed black/white characters, large characters, and partial frames. Cursor control is available to help with formatting your message. Home up, line feed, delete, repeat, and return functions are supported in SSTV mode. This allows a greater flexibility in formatting your messages.

Documentation

The Robot Model 800 is supplied with a very attractive three-ring binder to hold the system information and instructions. I consider this to be a plus. Being able to put my finger on the system information quickly helps to learn the commands faster and helps me to find my errors in operating the system faster. The only problem is that my unit, which is one of the earliest with the high tones/split-screen options installed, does not have a complete set of documentation. I find myself looking at advertisements to see just what my terminal can actually do and then experimenting in order to discover the commands required to perform the various "new" functions. What with the rush to get the product into the marketplace, an omission here and there is expected. By the time you read this, Robot will have everything working fine and will be able to supply all the information you might require.

Conclusion

The Robot Model 800H is a very useful piece of equipment to have in your shack. It will provide RTTY, Morse, and SSTV capabilities to you while being packaged in a small neat enclosure. The keyboard provides a good "feel" to the touch typist, which is a real plus when reading the incoming RTTY message and formatting your reply in the buffer.

The terminal has problems copying Morse code, but you must keep in mind that the filter that is as good as the human ear has not yet been designed. The human ear can discern subtle tone differences which can differentiate between two signals on virtually the same frequency. My four years of electronic warfare experience make my standards for copying Morse very stringent. I know of no terminal or program that can equal an experienced operator when copying code. I heartily recommend the Robot Model 800 for the enthusiast who needs a very high quality silent RTTY/Morse/SSTV terminal.

For more information, contact *Robot Research, 7519 Convoy Court, San Diego CA 92111*. Reader Service number 478. ■

Paul Pauliukonis WD9AHH
741 Sixty-First St.
Downers Grove IL 60516

The Better Vertical

—elevated feed means low angle of radiation

How would you like to be a proud owner and user of an inexpensive (around $60-$70) vertical DX antenna which—

- Is self-supporting.
- Is attractive in appearance.
- Can be installed in a limited space.
- Gives a low vertical radiation angle even when it is one wavelength long.
- Can be used on all present and future amateur bands.
- Minimizes TVI because its radiation is vertically polarized and because harmonics are radiated at high vertical angles.
- Is safe from shock hazards because its base is grounded.
- Has a built-in lightning protection system.

If you answered in the affirmative, then this antenna is for you. This article describes how to build, install, and tune a 33-foot, elevated-feed vertical antenna.

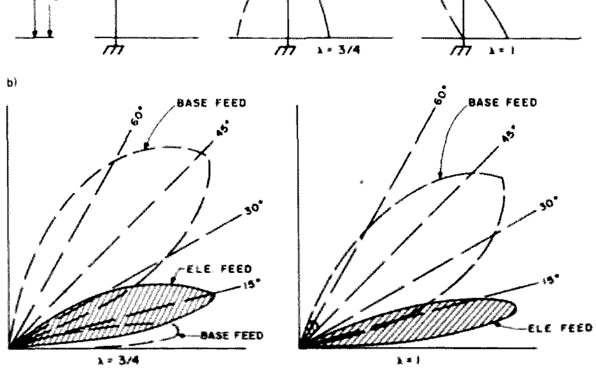


Fig. 1. (a) Current distribution and (b) vertical radiation patterns for 3/4λ and 1λ elevated-feed vertical antennas.

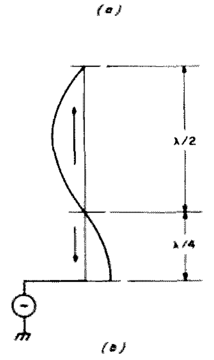


Fig. 2. Currents along antenna element for 3/4λ, elevated feed (a) and base feed (b).

Theory

An elevated-feed vertical antenna is not a vertical antenna which is elevated. It is a vertical antenna which is fed at a point which is 1/3 of its height from the ground—see Fig. 1(a).

I first came across the discussion of this antenna in *Amateur Radio Techniques*.[1] It contains a discussion of how an elevated-feed vertical antenna can be applied to amateur work to obtain "... low-angle radiation, without unwanted high-angle lobes, from vertical aerials of appreciable electrical length."[2] It explains how feeding a vertical antenna at the 1/3 point produces a current distribution different from that of a base-fed antenna. This is true only in cases where the antenna element is 3/4λ or 1λ long. If element length is 1/2λ or less, the elevated feed will perform approximately the same as a base-fed vertical antenna of the same height.

The comparisons of the current distributions and approximate vertical-radiation patterns for the base-

fed and elevated-feed antennas are shown in Fig. 1. To understand how a low vertical radiation angle is achieved in the elevated-feed antenna, one should study the current distribution along an antenna element. *The ARRL Antenna Book* states that current is reversed every 1/2λ along the element.[3] Fig. 2(a) shows how this results in an inphase collinear array in the elevated-feed antenna which is 3/4λ long. This inphase current distribution along the antenna element is the reason for its low vertical angle of radiation. If the same antenna were fed at the base, the current distribution would not be in phase —see Fig. 2(b)— and an unwanted high-angle lobe would appear in the vertical plane as shown in Fig. 1(b).

Design Considerations

In the design, I gave priority to the following considerations:

(1) Limiting the design to a reasonable height.
(2) Incorporating a top hat to dissipate static charge.
(3) Positioning the tuning unit near the ground.
(4) Designing and building a strong yet inexpensive center insulator from readily available materials.
(5) Designing the antenna strong enough to be self-supporting.

I chose an overall antenna length of 33 feet as this would give me a full wavelength—the longest practical length for DX operation—on 10 meters. The 33-foot length meant that the upper section must be 22 feet because the antenna is fed 1/3 of the length from the ground. This would make it 1/2λ from the feedpoint on 15 meters, so I detuned it slightly to lower the impedance at that point. The optimum length of the upper section, as determined by 15-meter and 20-meter band impedance curves, was found to be 24.5 feet.

Because aluminum tubing comes in 8-foot sections, and because I would lose 2-feet in the bushings and overlap, the available length from three sections was reduced to 22 feet. To get around this limitation, I decided to enlarge the considered top-hat section to achieve the desired effective length. Four top-hat radials, each 1.3 feet long, were experimentally found to provide the missing link.

The prospect of climbing a stepladder to adjust the tuning unit did not appeal to me. To avoid this, I chose to place the tuning unit near the ground and to use a 12.5-foot section of RG-8 foam coaxial cable to carry the power from the tuning unit to the feedpoint. Theoretical approximation showed that, at the worst, an swr of 7:1 would be present. The additional power loss for a 12.5-foot section of RG-8 foam cable with an swr of 7:1 was found to be 0.25 dB. I preferred this to climbing the ladder.

Power limit at an swr of 7:1 is found by dividing the power rating of the cable at an swr of 1:1 by the swr under operating conditions.[4] For this application, this is 2200/7 = 314.3 Watts. The output from a kW linear should be approximately 500-600 Watts. For intermittent duty, the average power would be half of this figure, or some 300 Watts. This does not give much of a safety factor, but I decided to go ahead and worry about it when and if I acquired a linear.

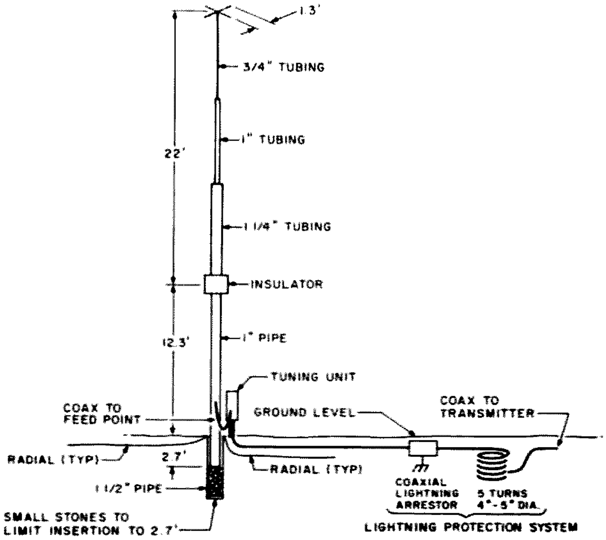


Fig. 3. Final design of the elevated-feed vertical antenna.

To make the antenna as attractive as possible, I designed it strong enough to be self-supporting. This presented no great problem except for the center insulator, which proved to be the greatest challenge of the whole project. It must be strong enough to support the upper 2/3 of the antenna without guying. I finally settled on building the insulator from PVC pipe reinforced with plexiglas™ panels and nylon cord, the whole thing held together with silicone rubber bathroom caulk and epoxy. I calculated the insulator's strength to be much greater than that of the aluminum tubing right above it. So, theoretically at least, the antenna should break at the tubing and not at the insulator.

By calculating stress values for the whole antenna, I found that if I used 1" steel pipe for the bottom 1/3 section and 1-1/4", 1", and 3/4" aluminum tubing for the 3-piece upper 2/3 section, the antenna would be strong enough to be self-

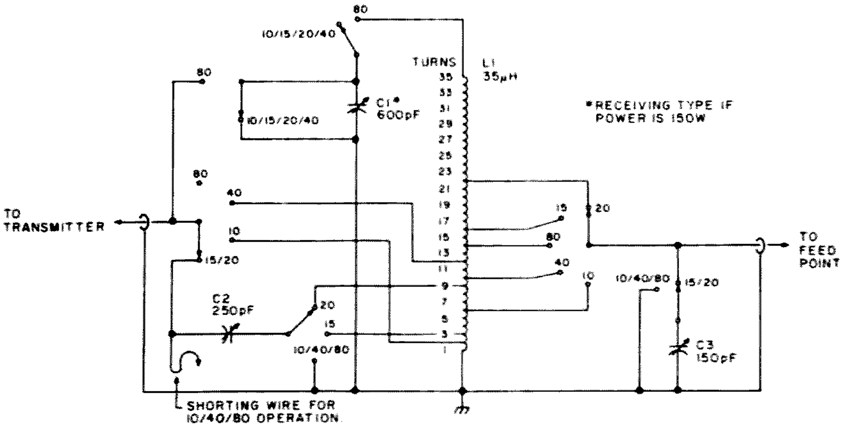


Fig. 4. Antenna tuning unit set for 20 meters. All air variables not in use are shorted and grounded.

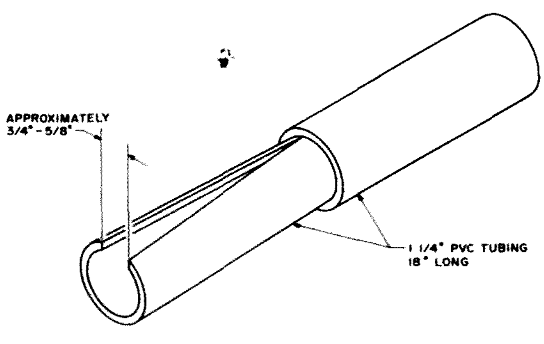


Fig. 5. Joining the two 1-1/4" PVC sections.

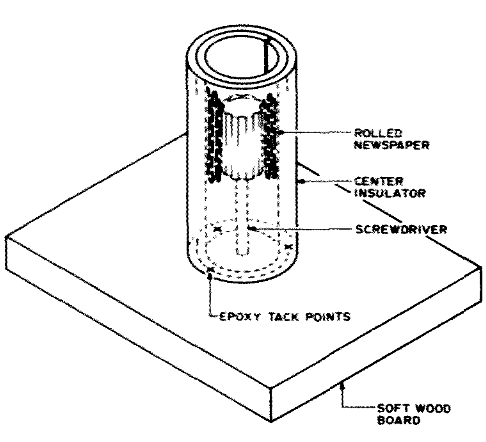


Fig. 6. Jig for the construction of the center insulator.

supporting. The weakest link would be the 1-1/4" aluminum tubing section. Moral support for this decision came from Capt. P. H. Lee's excellent book, *The Amateur Radio Vertical Antenna Handbook*, where he used this size tubing to construct his Mark II antenna.[5] He claimed that the antenna was flexible; it bent with a high wind and did not break.

The final design of this antenna is shown in Fig. 3, and the tuning unit is shown in Fig. 4.

Construction Procedure

The construction is started by the assembly of the center insulator. Fig. 5 shows how one piece is cut and inserted into the other piece. Use PVC pipe cement to bond the two pieces together.

Fig. 6 shows how an inexpensive jig can be constructed from a screwdriver and a piece of soft wood. This jig will hold the cemented PVC pipe in a vertical position to ease the task of cementing the plexiglas panels. The panels can be epoxied to the pipe first so that they will stay in place when applying the silicone rubber bathroom caulk.

Before cementing the plexiglas panels, insert the steel pipe and aluminum tubing into the PVC pipe to the dimensions shown in Fig. 8, i.e., to within 1/2" from each other, centered at the center of the insulator. Mark the radial direction on the pipe, aluminum tubing, and insulator. Drill holes 90° apart in the pipe and tubing for the mounting bolts, drilling through the PVC pipe. When drilling in pipe, *use a 1/4-20 tap drill* and enlarge the hole to 1/4" when the pipe is removed. The position of all holes is shown in Fig. 7. To avoid weakening the pipe, stagger the tap holes. This procedure will align all the holes and assist in the final assembly.

When the bathroom caulk has cured, wind five bands around the panels as shown in Fig. 7. Use nylon or dacron line approximately 1/8" in diameter and space the bands evenly. Epoxy the line for extra strength and to prevent it from unwinding. Drill the two vent holes between the panels in the center of the insulator. Build a little roof over the vent by using caulk. This will prevent moisture from seeping into the insulator.

The three sections of the aluminum tubing are assembled as shown in Fig 9. The bushing is made by cutting 6" from the smaller of the two pieces at the junction, splitting it and forcing it over the shortened piece.

The top hat is made by cutting a 3-foot length from aluminum clothesline, bending it in the center, and bolting it in place as shown in Fig. 10. After it is bolted in place, bend it until it is perpendicular to the tubing. After bending, cut it to the dimension shown (1'4") and spread the two wires until they are 90° apart. Install the top button and seal the whole area with bathroom caulk.

If possible, obtain a piece of 1" Schedule 40 pipe which is 15 feet long. If this cannot be obtained, use one 10-foot and one 5-foot section. Position the 5-foot section next to the insulator and join the two pieces together by using a 12-inch piece of 1-1/4" Schedule 40 pipe and 1/4-20 bolts. Use aluminum sheet between the pipes for a tight fit. Drill and tap the holes at this junction by following the same procedure as outlined previously when drilling holes in the center insulator. Drill one 7/16" hole approximately 4-5 feet from the bottom end of the pipe. This is the exit hole for the coaxial cable.

Cut a piece of RG-8 foam

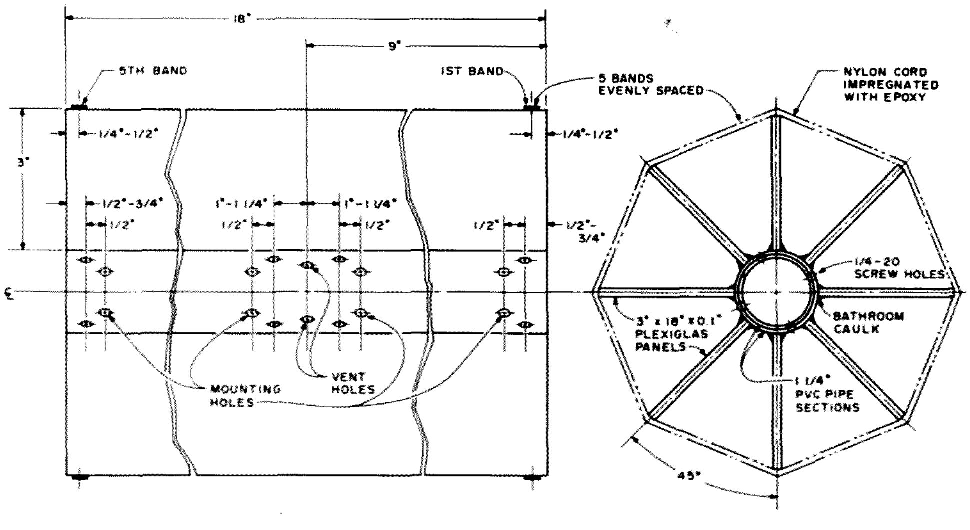


Fig. 7. Construction of the center insulator.

coaxial cable 15 feet long. Strip one end as shown in Fig. 8. Allow sufficient length of shield to produce the slack. During assembly, the pipe and aluminum tubing will come together across the 1/2" gap forcing the coax down. The slack is needed to prevent bending or damaging the center conductor. Impregnate the center conductor and the shield with solder so that about 1/4" of soldered length will protrude from the silicone rubber caulk when applied. Apply silicone rubber caulk as shown in Fig. 8 to seal the cable from moisture.

Thread the cable from the insulator end to the 7/16" exit hole by using a length of wire taped to the cable. Exercise caution in taping the cable since the hole does not allow too much clearance for the RG-8 cable.

Fig. 11 shows the position of the three components prior to assembly. Use electrical tape and aluminum sheet wrapped around the tubing and the pipe as necessary to ensure a tight fit for the center insulator. Cut holes in them for the bolts to pass through and smooth all edges so that the center insulator slides smoothly over the aluminum tubing and the steel pipe.

Slide the center insulator over the aluminum tubing. Verify the markings which were made during the drilling to avoid hole alignment problems.

Attach the shield of the coaxial cable to the pipe first. To do it, drill and tap a 1/4-20 hole in the pipe about 1/2" from the end, as shown in Fig. 8. Screw a 1/4-20 bolt from the outside of the pipe. Secure the shield to the bolt inside the pipe with a nut. Tighten the nut. Cut the bolt flush with the outside of the pipe wall.

Bend one edge of aluminum tubing and drill a 10-32 clearance hole in the bent section, as shown in Fig. 8. Attach the center conductor to the tubing by using 10-32 hardware.

Slide the aluminum tubing until it butts against the pipe. If the slack in the shield is of correct length, the two pieces should butt without any problem. If they do not butt properly, more slack in the shield will be required.

With the two sections butted, slide the whole antenna until it rests against a wall or other stationary object. Slide the center insulator over the pipe until the mounting holes are in alignment. Secure the insulator to the pipe by using 1/4-20 × 1/2 bolts. Gently slide the aluminum tubing out of the insulator until the mounting holes are in alignment. Secure the insulator to the tubing using 1/4-20 × 2 bolts and nuts.

Install the antenna in a 1-1/2" pipe, 5 feet long, which is driven into the ground to a depth of 4-1/2 feet. Small stones are dropped into the pipe to limit the depth of insertion. Aluminum or hardware shims are used to hold the antenna in place.

A ground radial system is needed for optimum performance, especially on the 80- and 40-meter bands. I have five radials, each 33 feet long, and I plan to install eight more. As with every vertical antenna installation, a low ground resistance is necessary for good performance. A high ground resistance (few or no radials) results in high power losses because the ground resistance is in series with the radiation resistance of the antenna.

For this installation, I attached the ground radials to the 1-1/2" buried pipe. I grounded the antenna to the pipe by using a 1/2" × 1/8" aluminum grounding strap.

Tuning Unit Construction

The schematic of the tuning unit is shown in Fig. 4.

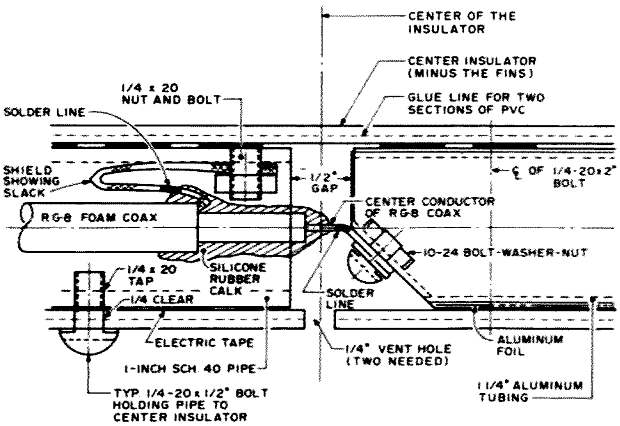


Fig. 8. Locations of the pipe and tubing within the center insulator.

The unit is installed next to the antenna, but not grounded to it. It is grounded only to the shield of the coaxial cable.

I constructed my tuning unit on a piece of plexiglas 7-1/2" × 16-1/2" and mounted it inside a watertight cabinet. Since I had enough air-variable capacitors in my junk box, I decided to be extravagant and use separate C2 and C3 air variables for the 15-meter and 20-meter bands.

One word of encouragement: The construction of this unit is not complicated. The cost to build it need not be high. I obtained all the parts and the cabinet for about six to seven dollars at two hamfests held in my local area. The real bargain find was an old Army surplus tuning unit which was priced at $5.00. This unit yielded two air variables, the coil, and the enclosure. To those of you reading this article who have not been to a hamfest, my advice is to go to one! It is lots of fun plus being a place for some real bargains.

Once the tuning unit is built, connect it to the coax feeding the antenna and to the transceiver placed next to the unit. Follow the procedure below to obtain tap points for your coil.

Tuning Procedure Using Swr Meter

(1) Connect the swr meter in the line between the transceiver and a dummy load.

(2) Tune the transceiver as usual for maximum output on the 80-meter band. Adjust the swr meter sensitivity for a full-scale forward power indication.

(3) Do not change any of the transceiver or swr meter settings. Switch the swr meter to read reflected power.

(4) Disconnect the dummy load and connect the tuning unit in its place.

(5) Using the turns ratio in

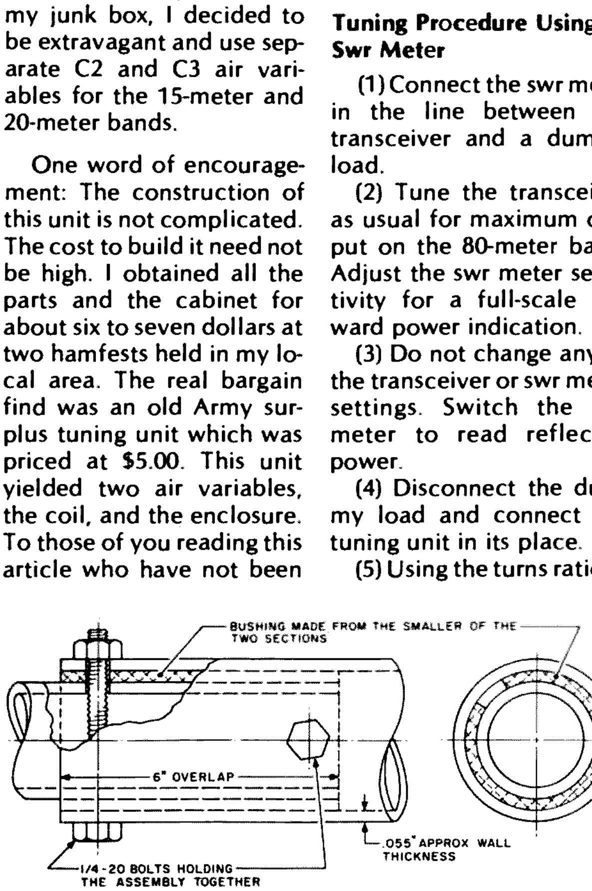


Fig. 9. Assembly of the aluminum tubing sections.

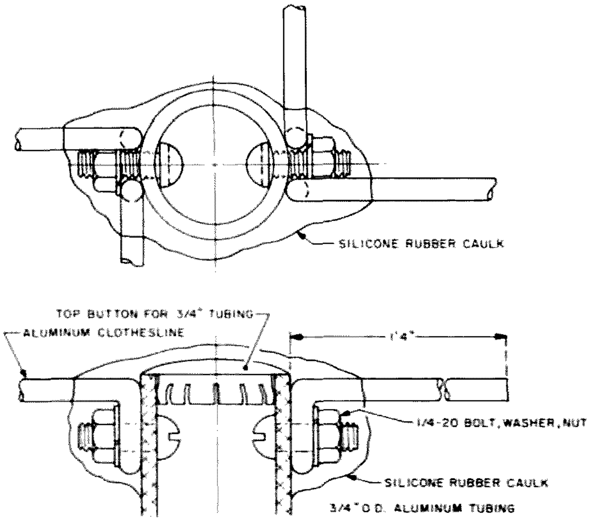


Fig. 10. Top-hat assembly.

Fig. 4 as a guide, connect the appropriate wires to the coil using alligator clips or equivalent.

(6) Position all tuning unit switches to 80 meters and adjust all air variables to *minimum* capacitance.

(7) Watching the swr meter, place the transceiver in the transmit mode. The swr meter may show anything from an off-scale reading to an swr of 1:1.

(8) Not changing any of the settings on the transceiver or the swr meter, note the swr reading. Place the transceiver in the standby mode.

(9) If the swr was high, adjust the taps on the coil and repeat steps 7 and 8. If the swr was low (swr meter deflection is 1/2-2/3 scale, equivalent to an swr of about 3:1 to 5:1), leave the taps alone and adjust the air variable for an swr of 1.3:1 or lower.

(10) Repeat steps 7 to 9 until an swr of 1.3:1 or lower is obtained. Record all settings for future reference.

(11) Repeat this procedure for the other bands.

The procedure is designed to obtain the best possible match by adjusting the turns on the coil first. Once this is accomplished, air variables are used to reduce the swr still further. Always adjust one component at a time and fight the temptation to tinker with knobs. It took me two days to learn this lesson.

Connecting the Antenna To the Shack

After installation and tuning, connect the antenna to the shack by using buried RG-8 coaxial cable. Install the lightning protection system as shown in Fig. 3. It consists of a coaxial lightning arrestor grounded to a 5'-6' ground rod, followed by the turns in the coax. Tape the arrestor well with electrical tape to prevent moisture damage.

Performance

The theoretical performance calculations were hammered out with N9CR during various coffee breaks. He has a newly installed three-element tribander atop a 60' tower. We chose to compare the relative merits of the elevated-feed vertical antenna to those of the beam 60 feet in the air.

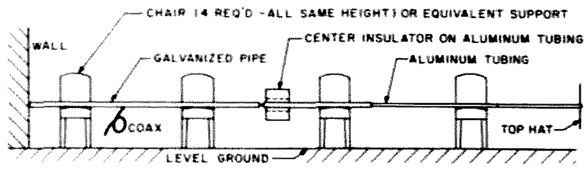


Fig. 11. Assembly of the elevated-feed antenna.

Theoretical data for this comparison came from *The ARRL Antenna Book* and and P. H. Lee's book, *The Amateur Radio Vertical Antenna Handbook.*[6,7] The summary is presented below. We chose the 20-meter band for this comparison.

A three-element beam 1λ above ground has a vertical pattern consisting of two lobes. Only the lower lobe is good for DX. It has a horizontal beamwidth of about 60° (−3-dB points) and a vertical beam width of about 15° in the lower of the two lobes. Judging by the published patterns, we assumed that the power going into the antenna is divided equally between the two vertical lobes.

The beamwidth of the elevated-feed vertical antenna on 20 meters is approximately 20° in the vertical plane. Since it is non-directional, the horizontal beamwidth is 360°.

For DX operation, the spherical area illuminated by the beam is 60° × 15° = 900 "square degrees." The spherical area illuminated by the elevated-feed antenna is 20° × 360° = 7200 "square degrees." The power gain of the beam relative to that of the elevated-feed antenna can be calculated theoretically as

$$\text{Gain(dB)} = 10 \log P_1/P_2$$
$$10 \log 7200/900$$
$$9.03 \text{ dB over elevated feed}$$

Because only half of the power (3 dB down) goes into the "useful lobe," the actual gain that the beam realizes over the elevated-feed vertical antenna is 9.03 dB − 3.0 dB = 6.03 dB, or 1 S-unit.

Jokingly, we both agreed that although N9CR's tribander at 60 feet had a gain of 6 dB over my elevated-feed vertical, I held a 13.3 dB "gain advantage" in cost.

On the air, the antenna performed beautifully for DX on 28 MHz and 21 MHz where the radiation is at low vertical angles. On 14 MHz, the antenna performed very well over the United States and Canada, and fairly well for DX. On 7 MHz and 3.5 MHz, the antenna lays down a strong ground wave; I had very good signal reports from stations 30 to 40 miles away. Many fine 80- and 40-meter QSOs were also had with stations as far as 800 miles away.

Conclusion

I wish to express my thanks to K9CGD to whom this project was first presented and who encouraged me to proceed with it. Thanks are also due N9CR who nursed the project from the beginning to the end and who, having tried the antenna on the air, pronounced that "...it worked as expected." I feel that the elevated-feed principle has much to offer to the amateur radio operator. In fact, I like this antenna so much that I am planning to optimize performance on 20 and 40 meters by designing and building one which will be 66 feet tall. But that's another project. ■

References

1. *Amateur Radio Techniques*, an RSGB Publication, Fifth Edition, 1974, pp. 233-234.
2. *Ibid.*, p. 233.
3. *The ARRL Antenna Book*, 1968 edition, pp. 32-33.
4. *Ibid.*, p. 100.
5. *The Amateur Radio Vertical Antenna Handbook*, Capt. Paul H. Lee, USNR, K6TS, Cowan Publishing Corporation, 1974 edition, p. 94.
6. *The ARRL Antenna Book*, pp. 46-48 and 56-58.
7. *The Amateur Radio Vertical Antenna Handbook*, pp. 11-13 and 18-19.

Paul Grupp KA1LR
73 Magazine Staff

The TET SQ-22 Antenna

—walking the dog with a two-meter quad

The HB9CV Swiss quad designs have been around for quite a while, but they have seen relatively little commercial exploitation in the USA. Available and quite popular in Japan for several years, they are now offered here by TET USA of Norman, Oklahoma.

The TET SQ-22 two-meter antenna is a vertically-polarized Swiss quad antenna that follows the HB9CV design. It consists of two two-element assemblies in a phased configuration, with all four elements driven. The antenna is very compact, yet the gain and front-to-back ratio figures claimed are impressive—16 dB forward gain and 20 dB front-to-back ratio. Without a test range, these figures are impossible to either confirm or deny, although they do seem slightly optimistic. Nevertheless, with the antenna mounted six feet atop a house and turned with a small TV-type rotator, gain and F/B ratio appear to be excellent.

Assembly presented no problems. The parts were carefully marked and packed, and the quality of materials used is higher than average. Assembled exactly according to instructions, the center frequency of resonance was about 146 MHz, a reasonable compromise. Since I rarely operate FM below 146 MHz, I retuned the antenna for a slightly higher center frequency.

N1BEJ with the TET SQ-22 two-meter antenna.

After several months of operation, the SQ-22 has given no cause for complaint. I use it constantly for accessing repeaters and simplex operation and have never wished for more gain. If you're in the market for an antenna for two-meter FM and want something a little beyond the ordinary, you might want to look into the SQ-22. For the truly adventurous, an eight-element Swiss quad for two meters is available from TET, as well as Swiss quads for several other bands from 20 meters to 432 MHz.

For more information, contact *TET USA, 425 Highland Parkway, Norman OK 73069.* Reader Service number 476. ■

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Newcomer to Nicads?

—you'll get a charge out of this informative overview

The following covers some of the more common problems encountered by users of nicad batteries. The last section of this article explains some of the technical aspects of the nicad cell.

Virtually all problems involving batteries come with complaints like: "Battery life too short"; "Won't hold a charge"; or perhaps, "Battery too weak." Sometimes there is a real problem—and sometimes the battery is not getting what it must to do a good job.

Here are some practical tips:

1. Fully charge the battery. Some chargers have a NORMAL-TRICKLE switch. In the TRICKLE position, it would take 24 to 60 hours to fully charge a dead battery. On NORMAL, it would take 12 to 14 hours. Nicad batteries can be charged continuously at the NORMAL rate with absolutely no damage to the batteries whatsoever. Leaving the radio on while charging will cause the charging rate to be longer.

2. Don't over-discharge the batteries. Turn OFF the radio when the batteries become low (the SQUELCH control usually won't silence the radio).

3. Never insert batteries backwards. This will almost certainly ruin something.

4. Inspect your batteries occasionally for any indication of rust or corrosion. A white, powdery deposit around the rubber seal at the positve end of the cell or an oily discoloration on the label may be the first sign of an upcoming failure.

5. If your batteries have a short life, check the battery-charging system. Two simple checks will be enough to find the problem. First, check to see if the charger is putting out enough current. Second, check to see if the radio draws too much current. If the charger and radio are OK and you are allowing enough time on charge, then the battery is probably at fault.

Fully discharged, open-circuit	*1.2 V
Fully charged, open-circuit	*1.27 V
Fully charged, charging at 0.1 C	1.45 V
Freshly charged, begin discharging at C	1.4 V
Fully discharged, discharging at C	1.0 V

*These voltages are reached slowly as the cell is allowed to stand for a time.

Table 1. Cell Voltages at 20°C.

What is a Nicad Battery?

The nicad battery is two or more nicad cells connected together. The nicad cell is called a secondary (storage) cell and is used to store electrical energy until needed. It may be recharged many times during its life. The cell may be described electrically by its voltage and capacity.

Cell voltage is determined solely by the materials from which the cell is made. Nickel and cadmium in a potassium-hydroxide electrolyte produce a cell with a nominal voltage of 1.2 volts. There is only a relatively small change in cell voltage from fully-charged to discharged conditions. Refer to the section on battery-testing (following) for cell voltage-measuring techniques. Cell voltage varies from 1.4 volts when just charged to 1.0 volts, at which point it is considered discharged. Nominal cell voltage is 1.2 volts since the cell is very near 1.2 volts for most of the time it is in use. (Of course, if you have a 10-cell battery, the battery voltage is nominally 12 volts.)

Cell capacity is defined as the maximum current the cell will deliver continuously for one hour. This capacity is given by the battery manufacturer in milliampere-hours (mAh) for small cells, and Ampere-hours (Ah) for large cells. Capacity is determined by the size of the cell. For example, an AA-size cell is rated around 350 to 500 mAh and a D-size cell is rated at 2.0 to 4.09 Ah. A very important figure associated with cell capacity is the one-hour discharge rate (C) which is numerically equal to the capacity. For example, for a quantity, C, we can discuss the charge and discharge of nicad cells conveniently without concern for actual cell capacity.

Temperature

Battery operation should be at temperatures between minus 20 and plus 40 degrees C. They may, however, be stored indefinitely at temperatures between minus 60 and plus 60 degrees C. Most batteries will self-discharge at rates dependent upon the storage temperature involved. At 0° C, discharge amounts to 90% in 60 days. At 20° C, it is 50% in about 55 days, and at 50° C, it is 50% in about 20 days.

Life

Generally, batteries may be expected to last several years under normal use. A minimum of 300 cycles of complete charge and discharge is to be expected. If only a partial (say, 20%) discharge is used, the life may extend to 5000 cycles. However, if the battery is partially discharged continuously, it should be periodically deep discharged to realize its full capacity.

Charge and Discharge

Most batteries are normally discharged (in-circuit) at rates less than C and charged at a rate of 0.1 C. If a trickle charge option is available, the charge rate is 0.01 to 0.05 C. Most batteries may be left on NORMAL (0.1 C) charge for indefinite periods without damage. At the normal rate, a completely discharged battery will recharge in 12-14 hours. Less time is required for partially discharged batteries. Charge rates above 0.1 tend to overheat the cell and cause damage. Special "Rapid-Charge" cells are required for fast-charging applications.

Table 1 (showing cell voltages) may be of help in understanding battery function during charge and discharge.

Testing

The battery, charger, and radio constitute a small system which is one end of a communication link. When this system fails, testing each element is necessary to determine the proper correction. Based on experience, the charger is the most likely to fail, followed by the battery and then the radio. However, due to ease of testing, test the charger and radio first.

For the 12-volt, hand-held radio chargers, connect a milliammeter using a D'Arsonval movement (such as: Simpson 260 or Triplett 630), capable of measuring 55 mA, in series with a 240-Ohm, 1-Watt resistor. Connect the meter-resistor combination across each and every set of charging contacts for a 12-volt battery. Observe correct polarity. The charger current should be 45-55 milliamperes.

Consult the appropriate data sheet for the radio under test. Measure all applicable maximum current drain on: full squelch receive, full volume receive, and transmit. Readings should not exceed spec maximums.

A quick battery check would be: Charge at normal (0.1 C) rate for 15-30 minutes. Measure battery or cell voltage. Less then 1.2 volts per cell (12.0 volts for a 10-cell battery) indicates possible defective cells.

For a more complete battery test for a hand-held radio battery with 10 AA cells, fully charge the battery for 12-14 hours at the normal (0.1 C) rate. Connect a 27-Ohm, 10-Watt resistor across the battery and monitor the time required to discharge the battery to 1.1 volts per cell. The time should be close to 60 minutes.

This test will vary according to ambient temperatures. The time will run short if the ambient temperature is much over 25 degrees C, or if started with the battery more than slightly warm to the touch.

Conclusions

The nickel-cadmium batteries will perform excellently if used within their limitations. Poor performance usually results when the limits are exceeded. ■

TR-9000 *from page 32*

supply and standby and power switches, as well as provisions for using external headphones. Another source of memory backup power is the BC-1 power adapter. We suspect that a functional equivalent of the BC-1 could be homebrewed for much less than the $20 list price. One accessory that Kenwood does not offer but in our experience is helpful for weak signal work is a receiver preamplifier. A quality unit can really enhance SSB operation without adding to the noise figure.

We liked the compatibility that Kenwood built into the TR-9000. The power cord and touchtone connector are the same as those used with the TR-7600 and the 7625. The microphone is identical to that used with the TR-7800 and can be pressed into service with Kenwood's VS-230 remote digital vfo. One exception to this area is the rather unusual connector used for the backup power supply.

The TR-9000 offers a tremendous number of features for a reasonable if not downright inexpensive price. If you want to take a crack at two-meter SSB and CW operation and still have a radio that allows you to chew the rag with the gang on the local repeater, you'll find a *flexible* answer in the TR-9000.

For further information, contact *Trio-Kenwood Communications, Inc., 1111 West Walnut Street, Compton CA 90220.* ■

BC-350 *from page 78*

outs to signal priority, lockout, delay, auxiliary, and channel number. The right-hand display may be manually toggled between digital frequency display and alpha readout.

A Closer Look

A glance inside the custom diecast metal cabinet reveals the complexity of the circuit, but shows the precision of professional design.

Frequency increments searched and programmable vary with the band plan procedure. On low and high band FM, channel spacing is 5 kHz, on aircraft band 25 kHz, and on UHF 12.5 kHz.

An automatic squelch circuit may be called up to respond to any signal level which produces 20 dB SINAD (S + N/N). This is handy for most listening requirements which do not require constant juggling of the squelch sensitivity right at threshold.

Frequency coverage was actually somewhat greater in our evaluation unit than advertised. We programmed 30.0-50.995, 118.0-136.995, 144.0-174.005, and 420.45-512.9875 MHz. This allowed reception of the first megahertz of the six-meter band (FM demodulation only) and a few beeps and whistles from NASA's weather satellites!

As with its predecessor, the advanced BC-300, the BC-350 has a non-volatile memory—no batteries to change.

The BC-350 is advertised for $599.95. For more information, contact *Electra Company, PO Box 29243, Cumberland IN 46229.* Reader Service number 480. ■

FUN!

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"Don't you ever run out of material for your column?" is a question that often crosses your FUN! editor's desk. The answer, quite honestly, is "no." Amateur radio is a subject so full of history and interesting bits of information that, quite likely, the well will never run dry. After all, new ham facts are being created every day.

Take our monthly crossword puzzle. Each month a new topic; each month a new puzzle. Oh, occasionally we may repeat a word or clue here and there, but, on the whole, each month's puzzle is entirely different. And we're never really stuck for material.

Do you know where the world's first crossword was printed? Why, in the FUN! column, of course! No, not this FUN!, but one carried in the December 21, 1913, *New York World*. It's nice to be carrying on a tradition.

Now, what has all this to do with this month's topic, emergency communications? Absolutely nothing. It's just that we occasionally like to digress.

ELEMENT 1—CROSSWORD PUZZLE
(Illustration 1)

Across

1) Emergency messages
2) Mobile antenna
7) Box (abbr.)
9) Where third-party info is entered
11) Emergency's cause
14) Distantly activated (abbr.)
15) ARRL state (abbr.)
16) Over
18) Quasi-military service (abbr.)
21) Emergency service (abbr.)
23) Military colors
26) Strong signal needle action
28) Radiogram
31) Tell you later (abbr.)
33) "_______ the traffic"
35) Brick _______
38) 42 across often needs this (abbr.)
40) Plate voltage (abbr.)
42) Emergency ringleader (2 words)

Down

1) Dits and dahs
2) Erstwhile training contest (abbr.)
3) Old-style Hertz (abbr.)
5) Active circuit condition
6) Desirable emergency gear is this
8) Flood boat's meager propulsion
10) Emergency workers need this (abbr.)
11) Light-bulb action in many emergencies
12) 4-land state (abbr.)
13) ARRL emergency official (abbr.)
17) Peruvian prefix
19) League post (abbr.)
20) Here (abbr.)
22) Big emergency "nuisance"
24) Mode: most 2-meter CD nets (abbr.)
25) Baloney (abbr.)
27) Popular rig prefix
29) Female version: frequency hog
32) End of message
34) Organized roundtable (abbr.)
36) Automatic noise limiter (abbr.)
37) Jams emergency traffic
38) An engineering degree (abbr.)
39) Board type (abbr.)
41) Many clubs use emergency work to gain this (abbr.)

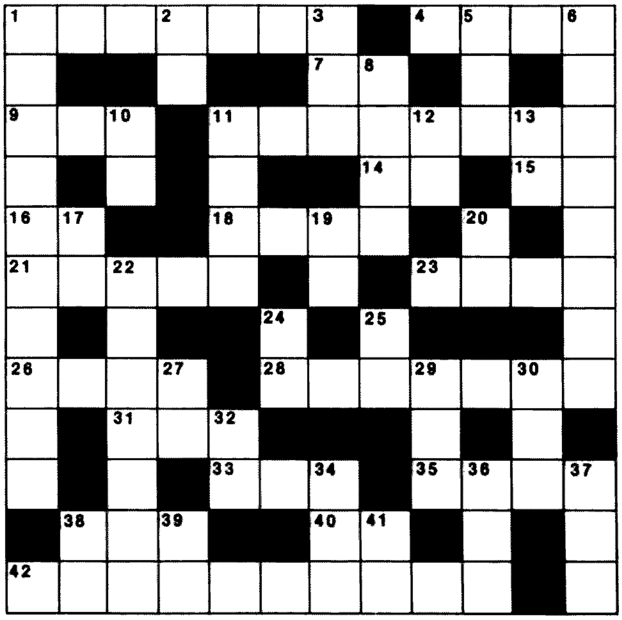


Illustration 1.

ELEMENT 2—MULTIPLE CHOICE

1) We all know that $\overline{\text{SOS}}$ is the distress signal, but what is the urgency signal, signifying a message concerning the safety of a ship or person?

1) $\overline{\text{TTT}}$
2) $\overline{\text{XXX}}$
3) $\overline{\text{URG}}$
4) There's no such thing as an "urgency" signal.

2) While tuning across the band, you hear someone shouting, "Pan, Pan, Pan." What's happening?

1) He's sending an urgency message
2) He's looking for a kitchen implement to fry his eggs in
3) He's calling for an open frequency
4) He's using an international sign that means he's listening 10 kHz up

3) What does $\overline{\text{SOS}}$ stand for?

1) Save our ship
2) Save our souls
3) Secure our safety
4) The individual letters mean absolutely nothing, chosen only for their distinctive sound

4) What were the official Conelrad broadcast frequencies?

1) 540 and 880 kHz
2) 640 and 1240 kHz
3) 710 and 1600 kHz
4) 21.390 and 146.52 MHz

5) How did the word "Conelrad" originate?

1) It's an abbreviation of control of electromagnetic radiation
2) It's an abbreviation of consolidated network for limiting radio
3) From its founder, Joseph Conelrad
4) From the Conelrad video display located at each participating radio station

ELEMENT 3—TRUE-FALSE

	True	False
1) The original official ARRL station, W1MK, was destroyed by a flood.	_____	_____
2) RACES is an ARRL organization.	_____	_____
3) If caught in a life or death situation, you're allowed to operate in any amateur subband, even if it's outside your license privileges.	_____	_____
4) QRRR was the original amateur distress call.	_____	_____
5) Before $\overline{\text{SOS}}$, the international distress call was CQD.	_____	_____
6) "Mayday" is the phone distress call in honor of Marconi, who was born on May 1, 1870.	_____	_____
7) MARS used to be called AARS.	_____	_____
8) Novices may not pass emergency traffic.	_____	_____
9) In an emergency, the FCC may order all U.S. amateurs off an entire band.	_____	_____
10) The *Titanic's* $\overline{\text{SOS}}$ was the first ever sent by a ship at sea.	_____	_____
11) Alaskan amateurs may use 4,383.8 kHz for emergency communications at any time.	_____	_____
12) In RACES, the amateur controlling on-scene emergency communications is called the "Master of Ceremonies."	_____	_____
13) The "Transcontinental Corps" is a radio club dedicated to helping hams in need.	_____	_____
14) ARRL numbered radiograms violate the FCC's rules prohibiting secret codes and ciphers.	_____	_____
15) If a natural disaster strikes a foreign country, third-party emergency traffic can be passed—even without a formal agreement.	_____	_____

ELEMENT 4—SCRAMBLED WORDS

Unscramble these words dealing with things hams might bring to an emergency site.

rotnegera	toobs	dofo
stranvercei	wobtoar	shalltifgh
nett	loots	hotnicgl
	dicnemie	

ELEMENT 5—HIDDEN WORDS
(Illustration 2)

Hidden in this puzzle are the names of 10 different types of emergencies. The words are formed in any direction—horizontally, vertically, or diagonally, forwards or backwards. As you find each word, circle it.

R	A	C	A	D	R	A	Z	Z	I	L	B	E	F	N
P	Z	A	P	F	M	F	U	A	L	H	E	A	L	D
S	M	L	R	O	V	F	E	R	E	R	S	P	M	J
A	C	E	U	C	B	H	I	E	R	R	I	A	Y	M
U	P	D	R	E	Y	A	O	R	U	G	H	B	R	O
E	A	R	T	H	Q	U	A	K	E	Q	T	A	I	C
H	D	Y	S	U	E	J	U	C	H	E	U	C	S	I
U	T	I	C	R	C	N	D	K	D	L	O	H	E	T
Y	Y	F	E	R	R	I	L	O	I	C	K	E	N	O
D	P	G	H	I	S	I	O	Y	E	K	C	S	D	D
A	H	W	H	C	H	L	C	Y	M	L	A	Y	G	A
Y	O	E	L	A	F	C	I	E	R	U	L	M	T	N
F	O	A	O	N	S	S	H	R	O	N	B	T	O	R
M	N	O	F	E	X	P	L	O	S	I	O	N	U	O
H	N	G	I	B	E	S	A	L	L	K	J	O	H	T

Illustration 2.

FUN! MAILBOX

Just a note letting you know your work is greatly appreciated in *73 Magazine*. I enjoy your writing. I am studying for my General and would like to have an Advanced someday. There is a lot to learn and I am trying to crawl!

Keep up the good work. Thank you very much.

James Ross
Long Beach CA

Thanks a lot, Jim.—J.E.

THE ANSWERS

Element 1:
See illustration 1A.

Element 2:
1-2 Many hams might send XXX after sitting at their key for more than a few hours. Others just have it written on that jug near their operating station.
2-1 Did we get you again? Of course, he may just be looking for his peanut butter.
3-4 And QSB must mean: "Quickly Sinking Band."
4-2 There you would listen to the president's message—if your receiver wasn't melted by the blast.
5-1 So enemy planes couldn't find our cities via radio. But how would you have shut down the CBers?

Element 3:
1 True—No code practice that night.
2 False—The FCC, when it feels like it.
3 True—if absolutely necessary, you can even operate outside the amateur bands.
4 True—Like SOS, it had a distinctive sound.
5 True—As you may have guessed, it meant "CQ Distress."
6 False—From the French *m'aidez* (help me).
7 True—Back before WWII, when it was the Army Amateur Radio System.
8 False—Why not?
9 True—The FCC, like a 500-pound canary, can do anything it wants to.
10 True—Alternating with CQD.
11 True—As long as they're within 50 nautical miles of the state and are not airborne.
12 False—Only if he has a co-host.
13 False—They're upper-level ARRL traffic handlers.
14 False—Probably not, since the codes are regularly printed. But they're never been challenged on it, either.
15 False—Unfortunately not, and many unwitting amateurs end up violating the law. Usually, however, a temporary agreement permitting emergency traffic is put into place—as in last year's Italian earthquake.

T	R	A	F	F	I	C	■	W	H	I	P
E	■	■	D	■	■	P	O	■	O	■	O
L	O	G	■	D	I	S	A	S	T	E	R
E	■	L	■	I	■	■	R	C	■	C	T
G	O	■	■	M	A	R	S	■	H	■	A
R	A	C	E	S	■	M	■	D	R	A	B
A	■	O	■	■	F	■	B	■	■	■	L
P	I	N	S	■	M	E	S	S	A	G	E
H	■	T	B	A	■	■	■	O	■	A	■
Y	■	E	■	R	U	N	■	W	A	L	L
■	E	S	P	■	■	E	P	■	N	■	I
N	E	T	C	O	N	T	R	O	L	■	D

Illustration 1A.

R	A	C	A	D	R	A	Z	Z	I	L	B	E	F	N
P	Z	A	P	F	M	F	U	A	L	H	E	A	L	D
S	M	L	R	O	V	F	E	R	E	R	S	P	M	J
A	C	E	U	C	B	H	I	E	R	R	I	A	Y	M
U	P	D	R	E	Y	A	O	R	U	G	H	B	R	O
E	A	R	T	H	Q	U	A	K	E	Q	T	A	I	C
H	D	Y	S	U	E	J	U	C	H	E	U	C	S	I
U	T	I	C	R	C	N	D	K	D	L	O	H	E	T
Y	Y	F	E	R	R	I	L	O	I	C	K	E	N	O
D	P	G	H	I	S	I	O	Y	E	K	C	S	D	D
A	H	W	H	C	H	L	C	Y	M	L	A	Y	G	A
Y	O	E	L	A	F	C	I	E	R	U	L	M	T	N
F	O	A	O	N	S	S	H	R	O	N	B	T	O	R
M	N	O	F	E	X	P	L	O	S	I	O	N	U	O
H	N	G	I	B	E	S	A	L	L	K	J	O	H	T

Illustration 2A.

Element 4:
(Reading from left to right) generator, boots, food; transceiver, rowboat, flashlight; tent, tools, clothing; medicine.

Element 5:
See illustration 2A.

SCORING

Element 1:
Twenty points for the completed puzzle, or ½ point for each question correctly answered.

Element 2:
Four points for each correct answer.

Element 3:
One point for each correct answer.

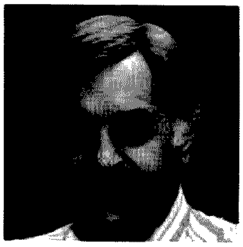
Element 4:
Each word deciphered nets you 2½ points.

Element 5:
Two points for each word found.

So, how well are you prepared?

1-20 points—Emergency? What emergency?
21-40 points—Know someone who passed a message during the great 1951 Philadelphia Hoagie Famine
41-60 points—Regularly checks into local VHF net to "pass a personal"
61-80 points—Spends every night hopping from net to net—your handle is "Sparks"
81-100+ points—Member of RACES, MARS, AREC, NTS, ARPSC, and the National Anagram Society

LEAKY LINES



Dave Mann K2AGZ
3 Daniel Lane
Kinnelon NJ 07405

Perhaps some of you who are reading these lines will have been among the group of twenty-odd hams who happened to be standing around the booth of a company which I prefer to go unnamed. The scene was the recent Dayton Hamvention, and the time was Saturday afternoon at the very height of the afternoon festivities. This particular firm is one of the few remaining American manufacturers engaged in the production of major equipment, that is to say, transceivers, as distinguished from associated items such as microphones, antennas, keyers, and so forth.

Their current model is not new, but has been on the market for some time. But I have had little opportunity to look at it, so this was really the first time for me to see it close up. I was chagrined to see that among other things, they had seen fit to include a pretty shoddy-looking silk-screened knob that probably cost no more than a few pennies to produce. This was the sort of penny-dreadful junk one would only find on inexpensive kits and cheaper rigs. It was certainly grossly out of place on a radio which sells for upwards of 1600 bucks, in my humble opinion. (Actually I've never been humble in my whole life; this figure of speech just happened to issue forth from the typewriter.)

At the precise moment that my eyes happened to light on this misbegotten knob, I was suddenly overcome by an uncontrollable impulse to lash out at someone, and since the only eligible person happened to be the company rep who was manning the booth, he was elected. I said, "You know...you and your company ought to hang your heads in shame. Here we are: The Japanese have their fangs and talons poised at our jugular. We keep talking about the urgent necessity of regaining the markets that foreign business has taken from us. In scores of fields: optics, photography, automobiles, electronics...even pianos and sporting goods such as fishing tackle and baseball gloves...we have lost out, and now we suffer disadvantage, not only to our pocketbook, but our national pride."

The luckless object of my polemic seemed to be looking for a hole to crawl into. His eyes were bugging out of his head. I continued.

"We know that the reason there are so many VWs, Datsuns, and Toyotas on the road is because of the rotten product that Detroit insisted on making.

We drove the car customers right into the arms of the foreign producers. And now what happens? You guys have the gall to do the very same dumb thing that Detroit did, despite the clear and certain knowledge that the American people were sick and tired of getting shafted by our own companies and shifted to imports. You put out a rig that looks as if it were slapped together in someone's garage! You ought to hang your heads in shame!"

I surreptitiously peered at the people standing around the booth and they were all nodding in agreement. I could see that if I continued much longer, this gang might start heating up the tar and ripping open the pillows. So I decided to call a halt to my diatribe, and I walked away, leaving the poor guy swabbing the sweat from his brow.

About a year ago, when I was putting together a little switching arrangement so that I could go from HF to VHF on radioteletype, I needed to get hold of a switch and figured that in the interest of durability and reliable operation I'd better get myself a good American-made one. There were plenty of switches available that would have done an adequate job, but I thought that I would do better with a device of proven reliability. So I spurned all the cute little mini-switches and went to a good store and laid out almost six bucks for an American-made switch. (Again, I will leave the name of the company unspoken.) Well... you guessed it. The switch was an absolute dog! It was constantly intermittent, and I could never be certain that it would make contact. I had to spend much time jiggling the damned toggle back and forth to make sure that the thing switched properly. Please bear in mind that there was no appreciable voltage or current involved, since I was merely activating a pair of sensitive relays that operated from the 13.8-volt 2-meter supply, and since the actual switching took only a split second, there was no way that any operational stress could have played a part in the failure of the device. Any light switch in my house gets more use in a single week than this switch would be likely to get in a whole year!

So what did I do? Simple. I ripped the high-falutin' American-made switch out of the gadget and replaced it with a cheap little import picked up in a blister pack from my handy-dandy neighborhood Radio Shack store. It has now been in use for about three months with no sign of any difficulty. And it cost all of 98 cents, as I recall.

I am outraged. I guess it's no secret that there are more foreign rigs being sold in the US than ever, and it's pretty clear that hundreds of millions of hard-earned American dollars are leaving the country and going into foreign pockets. There's no doubt that this constant drain (and you can multiply it by a large factor because the very same situation can be observed in all sorts of manufactured goods, as I indicated earlier) is virtually crippling the American economy. While our national administration struggles to bring the economy into line by increasing productivity and reducing inflation, we are ignoring this fundamental fact: that American productivity must go hand in hand with quality. For if we produce shoddy merchandise, buyers are entitled to go elsewhere. They yearn to be patriotic, but that does not mean that they will hold still while they are being exploited.

Somehow, American manufacturers of ham gear are going to have to find a way to produce top-quality goods at a price which can compete on an equal basis with the imports. It isn't going to be easy.

By the way, while at the Hamvention, I looked at another line of goods, also produced by an American company. In line with my previous demurral, I will not divulge their name. They had removed the covers so that it was possible to see the circuit boards. I can tell you that I was appalled at the shoddy appearance of the workmanship, if you can dignify it with that term. This is supposedly top-line stuff. Mounted components looked as if they had been scrounged from someone's tailgate out in the flea market, and without particular care in selecting them. Cockeyed, poorly-dressed leads and solder splashes were the rule rather than the exception, and some of the visible hardware had been deformed by the careless application of the wrong-sized screwdrivers.

I have often looked carefully at imported equipment, and I must say that even the most inexpensive gear is generally immaculately assembled and good to look at. Is that too much to ask?

RADAR AND LIVES

I swore that after last year's trip, I would never drive to Dayton again, but would fly. But when the time approached, I forgot all about the resolution. Thirteen hours on the road is getting to be a mite exhausting. And I have yet to ride on Interstate 80 without encountering either a horrendous downpour or impenetrable fog.

Last year, we went in a couple of rented Winnebago RVs. The trip was fun, albeit very tiring, not to mention the horrendous cost of the gasoline. This year, we used two cars. The most impressive thing was the performance of the radar detectors mounted in each of the automobiles. They operated flawlessly, and I am convinced that they are a must, particularly if the vehicle is not equipped with cruise control. The gadgets never failed to alert us to the presence of police radar. I am in no position to give you qualitative comparisons of the brands, not having tried a great variety. But Wayne gave a fairly broad evaluation in one of his columns (June, 1980) and it behooves anyone who is anxious to avoid a nasty confrontation with the gendarmes to consider the purchase of one of these devices.

There are still a few places in which radar detectors are considered illegal. I suppose the authorities consider the collection of fines more important than the prevention of highway accidents. It is obvious that the known presence of radar patrols influence drivers to slow down, thus reducing the accident rate. The fact that most cars I saw on this trip were indeed equipped with detectors and the additional fact that few cars were pulled over by the police must be correlative. I am positive that radar detectors are a demonstrably effective deterrent to traffic fatalities.

Indeed, we can all think of far more urgent jobs for the police to be doing than lying in wait for unwary motorists who are "putting the pedal to the metal." While the original impulse to buy and use a radar detector may be ignited by the simple desire to avoid traffic citations, the end result is fewer accidents. And since the use of detectors by the public invariably results in a lessening of the need for high numbers of police patrolling the roads, this will liberate more officers and make them available to track down the ever-increasing population of real criminals who terrorize society and who run amok in our streets, parks, and subways, creating havoc and tragedy.

If that is the consequence, then every car in America ought to be equipped at the factory with a radar detector.

NO-CODE LICENSES

The response to my April piece about code-free licensing has been practically unanimous. Numerous cards and letters have come in, and only three favored a code-free entry level license. In point of fact, the results of a survey (published in *QST*) showed conclusively that the vast and overwhelming majority of amateurs opposed such a change.

Case closed!

HAM HELP

I'm interested in any information on converting an RCA RT-175/PRC-9 27-38.9-MHz receiver/transmitter. My particular interest is in power supplies and schematic information on these radios. Thank you for your trouble.

Dick Howe
2210 Taggert St.
Wesleyville PA 16510

I am interested in obtaining a schematic for a Precision Signal Generator, series E-200 C, manufactured by Precision Apparatus Co., Inc., Elmhurst, LI, New York, serial number 34845. I would appreciate any help that anyone can give me. Thanks.

A. B. Wells WA5COH
PO Box 50
Tunica LA 70782

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

SARTG WORLDWIDE RTTY CONTEST

Contest Periods:

0000 to 0800 GMT August 15
1600 to 2400 GMT August 15
0800 to 1600 GMT August 16

This is the 11th annual contest sponsored by the Scandinavian Amateur Radio Teletype Group (SARTG). Operating classes include: (a) single operator; (b) multi-operator, single transmitter; (c) SWL. Please note that the logs from multi-operator stations must contain the names and callsigns of all operators involved. The same station may be worked once on each band for QSO and multiplier credits. Only 2-way RTTY QSOs will count.

EXCHANGE:

RST and QSO number.

SCORING:

QSOs with your own country count 5 points. Other countries in the same continent are 10 points. Other continents are 15 points. In the USA, Canada, and Australia, each call district will be considered as a separate country. Use the DXCC list and the above-mentioned call areas for multipliers. Note that contacts with a station which would count as a multiplier must be found in at least 5 logs or a contest log must be received from the multiplier station in order to be valid. Final score is the sum of QSO points times the sum of the multipliers. SWLs use the same rules for scoring, but scores are based on stations and messages copied.

AWARDS:

Top stations in each class, country, W/K, VE/VO, and VK call district.

ENTRIES:

Logs must be received by October 10th and should contain: band, date/time in GMT, call-

CALENDAR

Aug 8-9*	**European DX Contest—CW**
Aug 15-16	**SARTG Worldwide RTTY Contest**
Aug 15-17	**Rhode Island QSO Party**
Aug 15-17	**Now Jersey QSO Party**
Aug 22-23	**Ohio QSO Party**
Aug 29-30	**Occupation Contest**
Sep 12-13	**European DX Contest—Phone**
Sep 12-13	**G-QRP-Club CW Activity Weekend**
Sep 12-13	**New Mexico QSO Party**
Sep 12-14	**Washington State QSO Party**
Sep 19-20	**Maryland-District of Columbia QSO Party**
Sep 26	**DARC Corona—10-Meter RTTY**
Oct 3-4	**California QSO Party**
Oct 17-18	**Minnesota QSO Party**
Oct 17-18	**Scout Jamboree on the Air**
Oct 24-25	**CQ Worldwide DX Contest—Phone**
Nov 8	**DARC Corona—10-meter RTTY**
Nov 8	**OK DX Contest**
Nov 14-15	**European DX Contest—RTTY**
Nov 28-29	**CO Worldwide DX Contest—CW**
Dec 26-31	**G-QRP-Club Winter Sports**
Jan 16-17	**73's International 160-Meter Phone Contest**

***see last issue**

RESULTS

1981 SSTV CONTEST RESULTS

This year's SSTV contest may not have been the pinnacle of excitement and fun as it has been in previous years, but it brought several situations into clear focus (no pun intended). As you know, the SSTV Contest and Worldwide DX Contest happened during the same weekend. What you don't know is the problems and entanglements of trying to coordinate with uncoordinative sources. We've outguessed and outmaneuvered obstacles during the past several years, but the law of numbers finally caught us. We have two possible considerations for next year's contest: 1) Conduct the SSTV Contest on either the first or second full weekend of March, whichever one doesn't become scheduled for the DX (phone) Contest. Furthermore, if some "surprise attack" produces contests on both of these weekends, the SSTV Contest will shift to the third weekend of March. If that consideration is accepted, the formal 1982 SSTV Contest announcement will read accordingly. That will necessitate checking with the SSTV Net (Saturdays, 1800 GMT, 14,230 kHz) for specific details. 2) Forego on-the-air operational contesting and conduct a technical achievement contest. If SSTVers as a whole prefer to design, tinker, and construct rather than operate, we're ready to make the change and recognize your efforts. Your opinions and suggestions are vitally important. Please contact Dave Ingram W4TWJ or Brooks Kendall W1JKF during the Saturday SSTV Net with your comments. Now let's look at the results.

1981 SSTV CONTEST COMMENTS

WB4OVX in Virginia was noticed having a ball during the contest, showing his new Collins KWM-380. *N6WQ* related that contacts seemed down approximately 30% and felt this was due to the simultaneous ARRL DX Contest. The most *common comments* heard on the air during the contest related to the two contests (DX and SSTV) falling at the same time. *Fortunately*, however, the SSTV contesters were heard expressing their understanding and sympathy. Although we couldn't get enough forewarning from the ARRL and although 73 coordination was difficult, we still had a good contest. Respect among on-air SSTV contesters was quite commendable. A friendly and relaxed air among all SSTV contesters was apparent. *10* and *20* meters seemed (in that order) the most popular (SSTV) bands.

Thanks to everyone for contest support (whether or not you sent a log!) Congratulations to N9AWR on winning first place in the contest! Bravo!!

Dave Ingram K4TWJ
Brooks Kendall W1JKF

1981 SSTV CONTEST SCORES

Call	Contacts	Countries 5 Points	Continents 5 Points	States/ Prov's	Grand Total
N9AWR	139	16 (80)	6 (30)	36	285
N6WQ	112	14 (70)	5 (25)	29	236
W2GND	38	4 (20)	3 (15)	21	94
XE1HT	15	3 (15)	1 (5)	5	40
XE1AAK	17	3 (15)	1 (5)	7	44
W0KXP	8	2 (10)	2 (10)	2	30

sign, exchanges sent and received, points, multipliers, and final score. Use a separate sheet for each band and enclose a summary sheet showing the scoring, classification, callsign, name, and address. In the case of multi-operator stations, include the names and callsigns of all operators involved. Comments will be very much appreciated by the contest committee. Send logs to: SARTG Contest and Award Manager, C. J. Jensen OZ2CJ, PO Box 717, 8600 Silkeborg, Denmark.

RHODE ISLAND QSO PARTY

1700 GMT August 15 to
0500 GMT August 16
1300 GMT August 16 to
0100 GMT August 17

The Rhode Island QSO Party is sponsored by the East Bay Amateur Wireless Association. RI stations work other RI stations and the rest of the world. Others work RI stations only. The same station may be worked once per band and mode.

EXCHANGE:

Send RS(T) and state, province, country, or RI city.

FREQUENCIES:

Phone—3900, 7260, 14300, 21360, 28600, 50.110, 144.2, 146.52.

CW—1810, 3550, 3710, 7050, 7110, 14050, 21050, 21110, 28050, 28110.

Use of FM simplex is encouraged, but no repeaters are allowed.

SCORING:

All stations score 2 points per phone QSO, 3 points per CW QSO. RI Novice and Technician stations score 5 points per QSO. RI stations score 5 points per QSO. RI stations multiply total QSO points by the number of states, provinces, and DX countries worked. Others multiply total QSO points by the number of RI cities and towns worked. Note that there are 39 cities and towns in Rhode Island.

Certificates will be awarded to the top-scoring station in each RI county, state, province, and DX country; the top-scoring Novice and Technician station in each RI county and state; and the ARC in each state, province, and DX country that submits the highest aggregate score with a minimum of 3 logs per club.

ENTRIES:

Logs must show date/time in GMT, call exchange, band, and mode. On a separate sheet show name, call, mailing address, club affiliation (if any), total QSO points, multiplier claimed, and final score. Entries must be postmarked no later than September 15th. Send logs and summary to: East Bay Amateur Wireless Association, PO Box 392, Warren RI 02885. Include an SASE for a copy of the results.

NEW JERSEY QSO PARTY

2000 GMT August 15 to
0700 GMT August 16
1300 GMT August 16 to
0200 GMT August 17

The Englewood ARA invites all amateurs worldwide to participate in the 22nd annual NJ QSO Party. Phone and CW are considered the same contest. A station may be contacted once on each band; phone and CW are considered separate "bands" but CW contacts may not be made in phone band segments. NJ stations may work other NJ stations, and NJ stations are requested to identify themselves as "DE NJ".

EXCHANGE:

QSO number, RS(T), and ARRL section, country, or NJ county.

FREQUENCIES:

1810, 3535, 3900, 7035, 7135, 7235, 14035, 14280, 21100, 21355, 28100, 28610, 50-50.5, and 144-146.

Suggest phone activity on the even hours; 15 meters on the odd hours (1500 to 2100 GMT); 160 meters at 0500 GMT.

SCORING:

Out-of-state stations multiply the number of complete contacts with NJ stations times the number of NJ counties worked (21 maximum). NJ stations count 1 point per W/K/VE/VO QSO and 3 points per DX QSO. Multiply total QSO points by the number of ARRL sections (including NNJ and SNJ—maximum 74). KP4, KH6, KL7, etc., count as 3-point DX contacts and as section multipliers.

AWARDS:

Certificates will be awarded to the first-place station in each NJ county, ARRL section, and country. In addition, a second-place certificate will be awarded when 4 or more logs are received. Novice and Technician certificates will also be awarded.

ENTRIES:

Logs must show date/time in GMT, band, and emission. Logs must be received not later than September 12th. The first contact for each claimed multiplier must be indicated and numbered and a checklist of contacts and multipliers should be included. Multi-operator stations should be noted and calls of participating operators listed.

Logs and comments should be sent to: Englewood Amateur Radio Assoc., Inc., PO Box 528, Englewood NJ 07631. A #10-size SASE should be included for results. Stations planning active participation in NJ are requested to advise the EARA by August 1st of their intentions so that they can plan for full coverage from all counties. Portable and mobile operation is encouraged.

OHIO QSO PARTY

Starts: 0000 GMT August 22
Ends: 2400 GMT August 23

KØHAA

STATION	MO	DAY	YR	GMT

FREQ	REPORT	MODE
		TWO WAY

JIM RAPPE
P. O. BOX 372
IPSWICH, SO. DAK. 57451
EDMUNDS CO. 10-X 10912
SO. DAK. 10-X #1SD (15 PTS.)
PSE QSL TNX **73**

QSL OF THE MONTH

This month's QSL winner was submitted by Jim Rappe KØHAA of Ipswich SD. It's bold and carries that personal touch.

If you would like to enter the contest, put your QSL *in an envelope* and mail it along with your choice of a book from *73*'s Radio Bookshop to *73 Magazine*, Pine Street, Peterborough NH 03458, Attention: QSL of the Month. Entries which do not use an envelope (the Postal Service does *occasionally* damage cards) and do not specify book choice will not be considered. Sorry.

THE CHAWED RAG.......

NEWSLETTER CONTEST WINNER

We were overwhelmed by the response to the *73 Club Newsletter Contest.* The staff would like to thank the 200+ clubs who submitted material during the first month. Each, in its own way, was a winner. Keep up the good work!

Choosing a winning club newsletter is not an easy task. There are many different kinds of clubs and no two have similar newsletters. How does a judge compare the Abington Amateur Radio Club bulletin with the Kansas Amateur Radio publication? The Abington club has six members while the circulation of the Kansas newsletter is in the thousands.

Even if we could resolve the problem of different sizes, there is the problem of production quality and appearance. The Chicago Autopatch Repeater Organization Limited uses eye-catching graphics in their newsletter while the Minuteman Repeater Association publication employs a slick-looking magazine format. In establishing a set of criteria for choosing a winner in the first month of the newsletter contest, the judges made circulation, style, and looks secondary considerations. What we were looking for was the best source of *information.*

The size of your club, the budget for the newsletter, and the method of reproduction don't matter very much if you are not giving the readers something they can use.

Our August winner, *The Chawed Rag,* published by the Richardson Wireless Klub, offers more than just club news. After all, the members who are interested and involved will probably know all the minute details of what went on at the last meeting. Instead of publishing a rather boring description of who was there and what they argued about, *The Chawed Rag* highlights the club's upcoming activities. The issue we reviewed was full of enthusiastic information about Field Day.

The Richardson Klub's newsletter does not limit itself to local happenings. It offers a look at the DX world, the technical aspects of radio, and the latest FCC actions. Gathering and publishing this kind of information does not need to be a time-consuming job. The savvy newsletter editor relies on someone else to locate, research, and write up the hot ham radio stories. *The Chawed Rag* does this by reprinting material from DX newsletters, *The W5YI Report*, other clubs' bulletins, and even the local grapevine.

There are at least two-dozen specialized ham publications available for a $5- to-$25-a-year subscriptions. You can take advantage of DX tips that are only a few days old by subscribing to a weekly source of DX news. *HR Report* and *The W5YI Report* will supply you with a biweekly roundup of ham radio happenings. You can keep your members informed about the latest satellite news by excerpting material from AMSAT's *Satellite Report*. The gold mine is there; is your club newsletter making the most of it?

Because of the limited appeal of these publications, only a few of your club's members will want to subscribe. But that doesn't stop you from sharing headlines and stories. Club newsletters are in a unique position to share this information because they can print it shortly after it first appears. The major ham magazines, *73* included, have printing deadlines that make much of this material very old news if they try to publish it.

With only a few exceptions, the publications mentioned do not mind if you reprint their material, *provided credit is given*. That way, readers who want to find out more will know whom to contact. You can reprint this material directly or repackage it to fit your newsletter's style; just remember to give credit where credit is due.

Don't be afraid to offer your club members something extra. Your club's newsletter is a valuable tool—use it! Keep those newsletters coming.

Sponsored by the Cuyahoga Falls Amateur Radio Club, the contest is open to all radio amateurs worldwide. All contacts must be made direct on any amateur band from 160 to and including 2 meters. Repeaters and OSCAR contacts are not permitted.

EXCHANGE:

RS(T) and ARRL section, DXCC country, or Ohio county.

FREQUENCIES:

5 kHz up from the low end of each General class band, both on SSB and CW. Club station W8VPV will operate near these frequencies.

SCORING:

Score 2 points for each contact with an Ohio station. Contacts with a Falls member will be worth 10 points and contacts with W9VPV, the club station, will count 25 points. Ohio stations will score 5 points for out-of-state contacts plus the member and club stations bonuses. Multiply your QSO point total times the sum of counties (maximum 88), ARRL sections (maxium 74), and DXCC countries on each band.

Plaques to the top single operator in Ohio and outside Ohio. Certificates to the top single operator, multi-single, and multi-multi in each ARRL section, Ohio county, and DXCC country.

ENTRIES:

Each log must show the date/time in GMT, band and mode, plus the complete exchange. A copy of the official log sheet and reporting form are available from the club by sending an SASE. Dupe sheets must be completed for any stations with more than 300 contacts. Some form of summary sheet showing the scoring and usual signed declaration is also requested. Send a large SASE for a copy of the results. Deadline for logs is September 21st. All entries and requests for forms/logs should be addressed to: The Cuyahoga Falls ARC, PO Box 6, Cuyahoga Falls OH 44222.

OCCUPATION CONTEST

Starts: 1800 GMT August 29
Ends: 2400 GMT August 30

The Radio Association of Erie PA is sponsoring its first contest. The club thought it might be interesting to see what kinds of work or occupations fellow hams are involved in. The contest is open to all amateur radio operators.

EXCHANGE:

RS(T), occupation and state, province, or country.

FREQUENCIES:

CW—50 kHz from the bottom of the ham bands.

Phone—50 kHz from the top of the ham bands.

Repeater contacts are not permitted; however, simplex is permissible.

SCORING:

Count 1 point per QSO with multipliers determined by the number of similar occupations worked. One multiplier point is given for every 5 similar occupations. Also, another multiplier point is given for every 3 retirees worked. Final score is the product of the QSO points times the total multiplier.

AWARDS:

A plaque will be given to the top-scoring station. Certificates for the top stations in each state, province, and country.

ENTRIES:

Mailing deadline for logs is October 1st and they are to be sent to: Chris Robson KB3A, 6950 Kreider Rd., Fairview PA 16415. Please include an SASE for a copy of the results.

DX

Yuri Blanarovich VE3BMV
Box 292
Don Mills
Ontario M3C 2S2
Canada

BURMA UNLOCKED

What a surprise! After a few years of effort by various groups that were trying to activate XZ-land, all of a sudden there was a signal that got DXers excited and rushing to their rigs to work that #3 on the most-wanted list.

Station XZ5A started the operation on May 22 on 21270 with an opening to the east coast, and then worked some Europeans and Japan. Wow! No warning or announcement preceded this operation, except the unfilled "promises" of JA8BMK about his VU7-Andaman, 3V8, and other possible African operations. He was conspicuously absent from the bands and those looking for him were rewarded by this juicy catch.

As far as we were able to find out, the operation was carried out by JA8BMK and JA8BKM, plus one Burmese national. Operation was quite sporadic with apparently limited operating time (QRM to the chief of police's TV?) on SSB frequencies of 21270 and 14170 and some CW activity around 14007 and 21007. Propagation was what they would say was below normal, or el stinko—the signals were very weak.

On May 23, a number of west-coast stations had their chance of getting through. The east coast was handicapped by the absence of XZ5A when the bands were open to that area. There was a short (a few minutes) "window" around 1200Z on CW and a few SSB contacts were made in what sounded like, perhaps, a demonstration for the local government officials. Otherwise, thousands of DXers were scanning the bands hoping to get their chance to score. It was a battle of good antennas and persistence. You had to hear the signals before you could work them. Fortunately, there were no list "undertakers" and the operators at XZ were doing a good job under the circumstances.

Judging by the propagation conditions and limited operating time, there would be many unfulfilled hopes of getting this rare one. But there is one very positive sign: Burma finally might be unlocked and activated for future operations by nationals or expeditions. We are looking forward to some pictures from the expedition.

Congratulations to "Jin" Tishihiko Fukuta JA8BMK and company for this historic event. If you were fortunate to work XZ5A, QSL cards go to JA8BMK, PO Box 150, Asahikawa, Hokkaido 070, Japan.

10M BEACONS

28.175	VE3TEN, Ottawa	245	A9XC
200	Common frequency	247	EA2OIZ
205	DLØIGI, Mt. Predigstuhl	250	VE7TEN
207	N4RD, Florida	257	DKØTE
210	3B8MS	275	ZS6PW
212	ZD9GI	277	DLØAAB
215	GB3SX, Crowborough	280	YV5AYV
220	5B4CY	285	VP8ADE, Adelaide Isle
225	VE8AA, Lake Contwoyto	290	VS6HK
230	ZL2MHF	316	ZS6DN
235	VP9BA	888	W6IRT
237	LA5TEN	892	WD9GOE
238	OA4CK	992	DLØNF

ABOLISH RS/RST SYSTEM?

I have read in other magazines about DL7DO's proposal to eliminate our "useless" RS and RST reporting, the reason being that everyone, especially in the contests, is giving out 59 or 599. Apparently it does not mean anything. What is the proposed solution? Use Q1 to Q3, where Q1 would mean: I don't hear you; Q2: I hear you; Q3 (I guess): I hear you too much—you just broke my speaker. This apparently would save a lot of time. Really? I think he is replacing something with "same-thing." He still has two digits to send, so there is no saving there. Only the *range* is reduced, from the scale of 9 down to 3. So we get *less*-accurate reports and from those who were giving out 59s, we now get Q3s.

So what do we gain? Nothing. We do not save time—we are still exchanging two digits. We eliminate more-accurate reporting for those who still use it. "S" has quite a well-defined meaning: It relates to the scale of about 5 dB per one S-unit.

Let's have a look at the contester who is giving out those "meaningless" 599 reports. The majority of contest stations run more than QRPp and a screwdriver for an antenna. When the bands are good, 80% of stations are coming in well over S9. So should we give out "599plus30-zerofour"? Or should we measure our S-meter and give out 58.7 reports? When you work stations at the rate of eight QSOs/minute, do you read your meter with a magnifying glass? Hell, no! You work them as fast as you can. If the station is weak or QRM is on the frequency, then the smart operator gives a 55 or 35 to tell the other guy that he is not that terribly strong and he should repeat his stuff twice.

Would the Q3 reports look any better in the contest log? Or should we not exchange the reports at all? What else is there to say to complete the contact? I'm quite surprised to see the serious magazines support this type of proposal by even printing it. We have more important things to worry about.

If one wants a comparison report on the antennas, the S-meter reading is meaningful. Then it is also good to know what type of rig the other guy is running because not all S-meters were created equally. Some are as generous as QRM and some were made in GM-land. It should be remembered that all this is relative because there are so many factors affecting the signal strength: antenna, propagation, QSB, balun, etc. It is not unusual, with bands being so hot lately, to have that thing sitting at the end of the scale.

So, let's stop worrying about the good and established things that we have and let's spend more time improving our skills and equipment!

GEOMAGNETIC PREDICTIONS

There is a source of very useful geomagnetic activity predictions available from the Ottawa Magnetic Observatory. These can be obtained easily by phoning 1-(613)-824-5595. This service is available 24 hours a day and the latest forecast is updated every Tuesday and Friday.

During the April 11 through 14 period, the activity of the geomagnetic field was very high. The maximum of this magnetic storm was on April 13 at 0000 to 0900 GMT. The last time the magnetic field was disturbed to such an extent was during a nine-hour period in August, 1972. The aurora borealis was seen extensively across Canada and the USA and as far south as Arizona and the Gulf Coast.

There are three levels or magnitudes of geomagnetic activity used to describe the geomagnetic field: active, unsettled, and quiet, meaning, in terms of propagation, rotten, average, and good to excellent. This is especially useful when planning that expedition or contest operation.

Thank you for all the encouragement and letters. I would like to get the feeling of the makeup of the majority of this column's readers. I would like to tailor this column in such a way that we can satisfy the majority of readers. It is impossible to satisfy everyone. There are some of those who love lists and nets and there are also those who consider it to be in the "multi-operator" category. I will try to elaborate more on various techniques and perhaps the "ideal" situation in working DX without getting too many chasers upset.

I am in the process of setting up an Apple II computer with a word-processing program and some other sorting and filing programs. This should help in

setting up the files, DX info, and QSL manager lists.

We will try to get the fresh information on recent DXpeditions, including some photographs. If you have any pictures, especially color ones, please send them to VE3BMV, Box 292, Don Mills, Ontario M3C 2S2, Canada.

Good DX and see you all in the pileups!

10-METER BEACONS

The 10-meter band is very dependent on solar activity. During the peak of the sunspot cycle, the propagation conditions on the higher bands (10, 15, and 20 meters) are superb. The bands are open just about all the time. All parts of the world are coming through at the same time. It is not unusual to work all six continents within five minutes. When there is a disturbance, however, the band is as dead as a doornail.

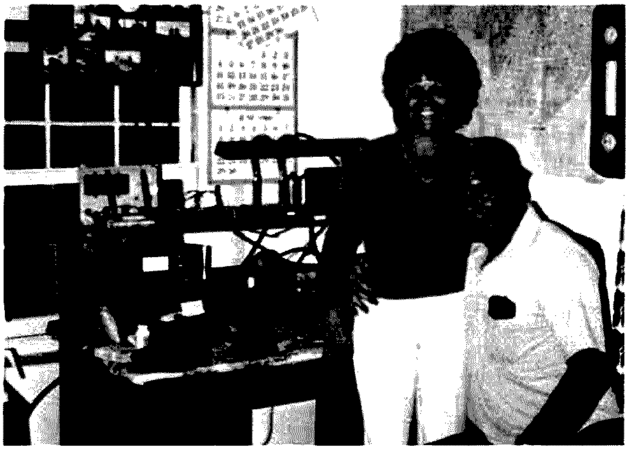
Going back a few years, there was quite a bit of interest in studying propagation, especially on the 10m band. There were some openings, but many times everyone was just listening instead of calling. So, if all were just listening, nobody knew when the band was really open. A number of clubs and individuals started beacon stations, transmitting signals on certain frequencies in the 10m band. This proved to be very useful. Many are using the beacon signals to follow the openings to certain areas of the world. Most of them are using about 100 W and a vertical antenna. It is important to remember that not all of them are active all the time. So don't bet on it—the band could be open without a certain beacon being heard.

DX NEWS

C6A Bahamas was on during the CQ WPX CW contest by K5IU, N5RM, and KC4XR. They were on between May 23 and June 2, operating all bands 10 through 80 on CW and SSB. QSL to their home callsigns.

EA9-EC9 Ceuta Novice net meets at 29000 almost daily, with a number of EC9 stations usually available. EA Novices now are allowed to operate in that segment of the 10m band.

FG7BQ St. Barthelemy Island. Charles is a public official on this island, which is situated between Puerto Rico and FG7 and



Frank WB3KBZ/VP9 and Dotty Blaylock at their shack in Pembroke Parish, Bermuda. Frank is very active, especially on phone, operating on 15 and 20m and the YL SSB system.

is administered from FS7. He hangs around 28635 almost daily from 2100Z. QSL to Charles Querrand, St. Barthelemy City Hall, via Guadeloupe, F.W.I.

FG0DDV/FS Saint Martin by the members of North Jersey DX Association. Active on 10 through 80 in the usual DX splits plus General portions of US bands; also six-meter operation. QSL via W2QM.

FR7AI/G Glorioso was active until May 11. Showed up on various nets. QSL via FR7AI CBA (*Callbook* address).

HB0 Liechtenstein was activated by DA1WA/HB0, members of Wiesbaden ARC, on May 23 through 31, 6 through 160 CW, SSB, and RTTY. Worldwide QSL via DJ0LC; stateside QSL with an SASE to Stephen Hutchins, Box 4573, APO NY 09109.

HS4ANK. Joel is a recent arrival in Thailand and hopes to fill the void left by the departure of Fred Laun and George Collins. Daily schedules are: 14220 at 1200Z and 21300/350 or 28500 from 1600Z. QSL via Joel Duniap, PO Box 38, Khonkaln, Thailand.

H44RW Solomon Islands. Ron ZL1AMO was active mostly on CW on 10, 15, and 20 during his April to May visit. QSL to his home address.

HZ1AB Saudi Arabia is active with a number of operators around 14230 to 14240 at 1500, 1900, and 2200Z and on 7008 at 0430. QSL cards go via K8PYD.

J5HTL Guinea Bissau. Operator Hillar Loor is a resident and he assisted the J5AG DXpedition in their operation. He will be active on 10 and 15 SSB for about a year. J5AG operators SM3CXS, SM0AGD, and SM3DVN made over 20,000 contacts, with 10,000 on CW, during their nine-day stay. Their operation was hampered by only having electricity 14 hours a day. During the off-periods, they used the car batteries to run their IC-701 rigs.

KA2AA Minami Torlshima was supposed to be on again during July. They tried to provide advance word about the operation and to concentrate on 40 and 80.

KH1/KB6 Canton Island was supposed to be activated by an American operator on and after May 20.

KP4/A. Two different groups have filed for the permission to reactivate *Desecheo* In the immediate future.

LU1ZA South Orkneys, Juan Carlos, joins the LU3ZY (S. Sandwich) schedule on occasional Tuesdays and Fridays at 0100Z. QSL via LU2CN. VP8ZR is near 14275 from 1930Z, QSL via G3KTJ.

NN3SI Smithsonian Institution operated during the WPX CW contest within 33 kHz of the band edges. QSL to NN3SI, Smithsonian Institution, Washington DC 20560 USA (indicate

DX INFORMATION
(Day and time in GMT)
Nets

Frequency	Time	When	Net
21355	1800	Diy	Afrikaner
28750	1200	Dly	DK2OC
14220	0630	Diy	VK2BKD, VK5MQ, VK9NS
14250	1500	Dly	W7PHO
14225	2300	Dly	W7PHO
21345	2330	Dly	W7PHO
28510		Dly	10m DX Net
7080	0200	Sun	40m DX Net
3795	0630	Sat/Sun	80m DX Net
14265	0500	Tue/Sat	Pacific DX Net
14250	0500	Fri	JY3ZH Arabian Knight
28616	1600	Sun	JY3ZH Arabian Knight
21416	1530	Sun	Foreign Service Net
7260	1300	Sat	E Coast Apple Net
3790	0030	Mon	VE3 Swap Shop
		Bulletins	
14001	0200	Mon	W6TI DX Bulletin
14173	1600	Sun	CANADX Net
14220		Dly	DX Exchange Info
1835	0130	Fri	W1AW DX Bulletin
3990	0430		SSB
7290			
14290			
21390			
28590			
1835	0000	Fri	CW 18 wpm
3580	0300		
7080			
14080			
21080			
28080			
3625	0100	Fri	RTTY 60 wpm/170 Hz
7095			
14095			
21095			
28095			

"WPX Contest" on the envelope).

ST0 Southern Sudan. LA1RR/ST0 expects to be there for two years and is usually around 28500/600 kHz from 1000Z. QSL via LA bureau.

S2BTF Bangladesh should have been activated by Peter HS1AMB on June 1-3 and continue on for several months.

TL8CN Central African Republic on CW daily: 7003/7004 from 0400Z and 21020/25 from 1300Z. Tony also runs SSB skeds on 28520/25 from about 1900Z. QSL via W5RU. TL8RC active on low ends of 40 and 80 from 0000Z. QSL via F6EZV.

TY9ER Benin, fired up as planned by DJ2BW and DL8DC, was to be on until May 13. QSL via DL8DC.

UK1PAL Franz Josef Land is expected to be active again. There was activity by the two YL operators, Rita and Natasha, using YL1P and EK1P callsigns. QSL via UP2BBM, Box 88, Moscow. The operators are with the USSR YL Arctic Expedition. Next stop is to be YL0B from Dickson Island.

VK9 Melish Reef is quite possible in the very near future. KB7NW's boat, *Banyandah*, will be refitted in Hawaii for the second leg of the operation by another group of operators. Hopefully, they will have a little bit better signal than the first group had from KH5 and KH5K.

VQ9CCT Chagos is no one other than VK9CCT and is active on 20m SSB.

W8HMI Frank Smith began his *African trip* on May 17. He was to start with EL and then 5Z, 9J2, 5H3, 6O, 5Z, and ST. He planned to operate mainly on 20m SSB. He was to return to the US by June 30. QSL to 6900 Conover Pl., Alexandria VA 22308.

ZA Albania. Very slim chance of getting on. DL7FT was in Dayton and showing his ZA license—but only the old one.

ZD9 Tristan Da Cunha was to be on after May 12 by ZD7AL and ZD7SE, transportation permitting.

ZM7TT Tokelau. Latest news was that Baruch has a license but not the landing permit; expected to get that one around May 20. Also, another group with VK9NS, VK2BJL, was to be on around May 15.

3A0 Monaco DXpedition by the Monaco DX Group (PA0SIM, PA2WLE, PA3AKP, PE1AMC, PE1AUX, and PE1CUG) was planning to be on July 10-20. Will be QRV on VHF, HF, and UHF bands, including OSCAR. No skeds, no lists! QSL via PA3ARM.

3B8AE/3B9 Rodriguez has been showing up on the F6EXV list on 21285 at 1630Z. QSL via Box 18, Rodriguez, via Mauritius. Op is Moussa.

3D6 Swaziland is activated by W6YB/3D6 for two years. He was heard around 21290 on long path. QSL via KA7IJA. Also, ZS6ANL/3D6 is active on 10m CW.

VK4NIC/3X Guinea. Ian is now back in Australia awaiting his next assignment, which he believes will be in Canada. Ian made a very favorable impression on the authorities in Guinea, opening the doors for future operations. PA0FAF expects to be stationed in 3X this summer and hopes to do some operating.

The ten most-wanted countries according to *The DX Bulletin* are: BY, VS9K, XZ, ZA, VU7L, VK Heard, 7O, XU, FB8W, and VU7A.

AWARDS

Since its inception two years ago, *73 Magazine* has absorbed the escalating costs to maintain its world-renowned Awards Program. All expenses directly affecting the program have dramatically shot up in price! As of August 1, 1981, to offset these enormous costs, prices for *73* Awards will become $4.00 each and annual endorsements will become $2.00 each. These prices still will be below other competitive award sponsors in our hobby.

Award applicants are cautioned to be sure their remittance after August 1st reflects the new prices. Unfortunately, any applications received after this date which have the incorrect amount enclosed will have to be delayed while the applicant is notified of the discrepancy. This procedure will cost us both more time and money, so we plead with our readers to have the amount right the first time.

FOREST COUNTY PA

A micro-expedition to Forest County, Pennsylvania, will be held on the 1st and 2nd of August, 1981.

The call will be WB3IQE/3 and the mode is CW only. Frequencies used will be 80, 40, and 15 meters. We will operate on two bands at a time, using the bottom 50 kilohertz of the bands. Exact frequencies and bands will depend on conditions at the time. We will certainly spend some time outside the Extra-only subbands. QSL to WB3IQE, RD1 Box 297, Brockway PA 15824. US stations send a stamped self-addressed envelope. Canadian stations send a self-addressed envelope and unused Canadian stamps good for letter to USA. DX stations include 1 IRC for QSL via ship, 2 IRCs for QSL via air.

THE GREAT ESCAPE EXPEDITION

Members of the Lake County Amateur Radio Club are planning a DXpedition from the jail cell in Crown Point, Indiana, that John Dillinger fled in 1934 during his famous "wooden gun" escape, the final exploit of the notorious bank robber/killer before he was shot to death by FBI agents in front of the Biograph Theater in Chicago.

Dubbed "The Great Escape DXpedition," the operation is scheduled for 1800Z August 29 to 0300 August 30, and from 1400Z to 2300Z August 30.

Operators will be using the club callsign, W9LJ (Leaky Jail), on 14,300 SSB and 7,115 CW, plus or minus QRM.

Each contact will be confirmed, by a special QSL commemorating the escape, upon receipt of a card and a stamped, self-addressed envelope. Send in your QSL to Robert Wiberg WD9EZB, 534 E. 37th Ave., Lot 72, Hobart IN 46342.

The operating site will be the actual cell in which the desperado was held at the time of his breakout.

No longer used as a jail, the old building in which Dillinger was held for murdering an East Chicago policeman during a bank robbery has been restored as part of a commercial complex housing a museum, a restaurant, a ballroom, and a shopping mall.

LITTLE GULL ISLAND

Radio Central ARC will sponsor an unusual 24-hour mini-expedition to Little Gull Island, running August 8th at 1600Z to August 9th at 1600Z. Callsign will be WA2UEC.

Little Gull Island is a small island in Long Island Sound about fifteen miles northeast of Orient Point. They will operate on the lower portions of the General bands, 10 to 80 meters, both CW and SSB. There will also be a Novice station operation. A photo QSL card will supply all information about the trip.

Please QSL via *Callbook* WA2UEC with SASE, the W2 Bureau, or IRCs. This will be the first of a series of mini-expeditions.

For more information, contact Frank Kiefer K2PWG, 1 Sherrill Lane, Port Jefferson Station NY 11776.

PEND OREILLE

On August 27-30, the Pend Oreille Amateur Radio Club will be operating a special event station from the Pend Oreille County Fairgrounds in Cusick, Washington, during the fair. We will be on the air each day from 1600Z to 0500Z using the Newport High School Radio Club's call (WB7TBN). Frequencies will be (SSB) 14.340, 21.400, 28.700, 3945, (CW and RTTY) 3715, 28.090, 21.090, 14.080, and 3650. There will be a special commemorative QSL card available to all amateurs who contact our station and submit an SASE.

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received two months prior to the month in which the event takes place. They should be sent directly to Editorial Offices, 73 Magazine, Pine Street, Peterborough NH 03458, Attn: Social Events.

WEST YELLOWSTONE MT
JUL 31-AUG 2

The WIMU (WY-ID-MT-UT) Hamfest will be held from July 31-August 2, 1981, in West Yellowstone MT. Lodging and campgrounds are available. There will be product displays as well as activities for YLs and harmonics. Talk-in on 146.52, 3.920 or 1.250. For further information, contact "WIMU '81," c/o Les Belyea N7AIK, Box 327, Belgrade MT 59714.

JACKSONVILLE FL
AUG 1-2

The Greater Jacksonville Hamfest Association will hold the ninth annual Jacksonville Hamfest and Northern Florida Section ARRL Convention on August 1-2, 1981, at the Orange Park Kennel Club, located at the intersection of I-295 and US 17 just south of Jacksonville. Advance registration is $3.50 and registration at the door is $4.00. Swap tables are $12.00 per table for both days (no one-day tables). All events will be held indoors and will include a full slate of programs as well as meetings of several statewide and regional organizations. Door prizes will be awarded at both hourly and grand prize drawings. Plenty of free parking will be available. The headquarters hotel is the Best Western First National Inn just across from the hamfest site on US 17. Special hamfest rates will be available. Talk-in on 146.16/.76 and 146.07/.67. For advance registration, hotel rates, or more information, contact Robert J. Cutting W2KGI, 1249 Cape Charles Avenue, Atlantic Beach FL 32233, or Andy Burton, Jr., WA4TUB, 5101 Younis Road, Jacksonville FL 32218. For swap tables, contact WA4TUB at the address listed above.

ESCANABA MI
AUG 1-2

The Delta County Repeater Association will hold the 33rd annual Upper Peninsula hamfest on August 1-2, 1981, at the Flat Rock Township Hall, Escanaba MI. Registration is $2.00. The many activities will include a DX forum, an ARPSC workshop, a satellite-TV seminar, net meetings, and a swap and shop. There will be prizes and a banquet on Saturday evening. For more information, contact Aileen Gagnon WA8DHB, co-chairman of the prize committee, Kipling Loc., Mtd. Rte., Gladstone MI 49837.

LEVELLAND TX
AUG 2

The Hockley County Amateur Radio Club and the Northwest Texas Emergency Net will sponsor their 16th annual picnic and swapfest on Sunday, August 2, 1981, beginning at 8:00 am at the city park in Levelland TX. This event is for the entire family. Bring your own picnic basket for lunch at 12:30. A $3.00 registration is requested. There will be swapping all day, with tables provided. Talk-in on .28/.88 (WR5AFX).

MOBERLY MO
AUG 2

The third annual North Central Missouri Hamfest will be held on Sunday, August 2, 1981, at the air-conditioned Municipal Auditorium, 201 West Rollins, Moberly MO. Doors open at 9:00 am. Tickets are $1.50 in advance and $2.00 at the door. Features include commercial dealers, a flea market (no charge for tables), an ARRL display, exhibits, prizes, women's programs, a special forum with Bob Heil K9EID on CB-to-10-meter conversions, and a buffet lunch. Drinks and hot dogs will be available all day. Talk-in on 147.69/.09, 146.52, and 3963. For more information, contact Charles Coy WB0ENV, 601 McKinley, Moberly MO 65270.

ANGOLA IN
AUG 2

The Steuben County Radio Amateurs will hold their 23rd annual FM Picnic and Hamfest on Sunday, August 2, 1981, at Crooked Lake, Angola IN. Admission is $2.50. There will be prizes, picnic-style BBQ chicken, inside tables for exhibitors and vendors, and overnight camping (with a fee charged by the county park). Talk-in on 146.52 and 147.81/.21.

BELVIDERE IL
AUG 2

The annual Big Thunder ARC Hamfest will be held on August 2, 1981, at the Boone County Fairgrounds, Highway 76. Advance tickets are $2.00. Indoor tables are available at a nominal cost and there will be acres of outdoor space available free. Camping is permitted. For advance tickets, send an SASE and check to Bob Anderson K9DCG, 910 W. Locust Street, Belvidere IL 61008.

COLBY KS
AUG 2

The first Northwest Kansas Amateur Radio Swap Meet will be held on Sunday, August 2, 1981, beginning at 9:00 am at the Community Building, Colby KS. Admission is $1.00 and tables are $1.00 each (same for dealers). An auction will be held at 2:00 pm. Other features will include a TVRO demonstration, activities for the ladies, and old-fashioned informal swapping, selling, and visiting. Lunch will be available. Talk-in on 146.22/.82 and .52/.52. For more information, contact WA0GBN or KA0FBQ.

WINCHESTER VA
AUG 2

The Shenandoah Valley Amateur Radio Club will celebrate "31 years without interruption" at its annual hamfest on Sunday, August 2, 1981, at the Clark County Ruritan Fairgrounds in Berryville VA, 10 miles east of Winchester on Route 7. Gates open at 7:00 am for exhibitors and tailgaters, for whom fees will be the same as last year. Registration is $3.00, and wives and young children will be admitted at no charge. Hourly prize drawings; major prizes will include three transceivers. Breakfast and Ruritan's famous barbequed chicken dinners will be available. Talk-in on 146.22/.82, 147.90/.30, and 146.52/.52. For further information, contact Joann Aaron WB2CMV, PO Box 139, Winchester VA 22601.

POMONA CA
AUG 8

The Tri-County Amateur Radio Association will hold its annual hamfest on Saturday, August 8, 1981, from 9:00 am to 3:00 pm at the Los Angeles County Fairgrounds (Thummer's Patio), Pomona CA. There is no admission charge. Bring your own picnic lunch. Refreshments will be available. Featured at a noon raffle will be grand prizes of a Quasar 10" TV and a Tempo S-1 handie-talkie. The drawing donation is $1.00 and the winner need not be present. Talk-in on 146.34/.94. For additional information, write TCARA, PO Box 142, Pomona CA 91767.

BEAVERTON OR
AUG 8-9

The Willamette Valley DX Club will hold the 1981 Northwest DX Convention on August 8-9, 1981, at The Greenwood Inn in Beaverton OR, just west of Portland. The grand prize will be an Icom-730. Speakers will include Carl WA4ZNH and Martha WB4FVU. For more information, write PO Box 555, Portland OR 97207.

BURLINGTON VT
AUG 8-9

The Burlington Amateur Radio Club will hold its annual International Hamfest on August 8-9, 1981, at the Old Lantern Campground, Charlotte VT (14 miles south of Burlington, just off Rte. 7). Admission is $4.00 (US funds). Planned events include a flea market, commercial exhibits, a CW contest, a tower-raising contest, an HT transmitter hunt, and the traditional Canadian-American tug-of-war. Talk-in on .34/.94. For more information, contact Hap Preston W1VSA, PO Box 312, Burlington VT 05402. For campground reservations, call Old Lantern Campground at (802)-425-2120.

LEXINGTON KY
AUG 9

The Bluegrass Amateur Radio

Society will hold its annual Central Kentucky Bluegrass Hamfest on Sunday, August 9, 1981, from 8:00 am until 4:00 pm EDT at a new location, the Tates Creek Junior High School, Centre Parkway, Lexington KY. Tickets are $3.50 in advance and $4.00 at the door. Outdoor flea market space is free with admission. There will be technical forums, indoor exhibits, door prizes, a grand prize of a two-meter all-mode transceiver, a ladies' program, a protected paved flea market area, and free parking. Talk-in on 146.16/.76. For more information, please contact Ernie Cohen K4DHN, 3379 Sutherland Drive, Lexington KY 40502

WILLOW SPRINGS IL
AUG 9

The Hamfesters Radio Club will hold its 47th annual hamfest on Sunday, August 9, 1981, at Sante Fe Park, 91st and Wolf Road, Willow Springs IL.

ST. CLOUD MN
AUG 9

The St. Cloud Amateur Radio Club Hamfest will be held on August 9, 1981, from 8:00 am to 4:00 pm at the Whitney Senior Center in St. Cloud MN. Features will include a swapfest, prizes, and refreshments. Talk-in on 146.34/.94. For further information, contact Mike Lynch KA0HQS, 2115 1st Street South, St. Cloud MN 56301, or phone (612)-251-2297.

MONTGOMERYVILLE PA
AUG 9

The Mid-Atlantic Amateur Radio Club will hold its annual J.B.M. Hamfest on Sunday, August 9, 1981, from 9:00 am to 4:00 pm, rain or shine, at the Budco 309 Drive-In Theater, ¼ mile north of the intersection of Rtes. 63 and 309, Montgomeryville PA (6 miles north of the Fort Washington interchange of the Pennsylvania Turnpike). Admission is $2.50 with $1.00 additional for the first tailgate space and 75¢ for each additional space. Tailgate setup begins at 8:00 am. Featured will be an Alternate Energy Fair which will include exhibitions of various energy resources, as well as door prizes and a flea market for both the hamfest and the Alternate Energy Fair. Refreshments will be available. Talk-in on 147.66/.06 (WB3JOE) or 146.52. For further information, call Don Schuenemann WB3AYT at (215)-822-9076.

AUSTIN TX
AUG 14-16

The Austin Amateur Radio Club and the Austin Repeater Organization will hold the ARRL-approved VHF '81, a combination state convention of the Texas VHF FM Society and the second annual Super Central Texas Swapfest, on August 14-16, 1981, at the Hilton Inn, Austin TX. Registration is $5.00 in advance (August 1st deadline) or $6.00 at the door. Tickets are good for technical sessions, seminars, the swapfest, and more (all indoors and air-conditioned). Other features include the hidden transmitter hunt, the Saturday night boat ride, and the Texas barbecue dinner, prizes, an ARRL forum, and dealers. Talk-in on 146.19/.79. For additional information, contact VHF '81, PO Box 13473, Capitol Station, Austin TX 78711.

OMAHA NE
AUG 14-16

Satellite Television Technology will hold a Satellite Private Terminal Seminar on August 14-16, 1981, in Omaha NE. Included will be more than 50 exhibit booths with low-cost home satellite TV reception terminal equipment and systems. The seminar program will teach how to make this equipment function at peak performance at all times. Three lecture halls will be set up with test equipment and operating portions of systems where attendees can meet with experts and obtain information about their own installations. For more details on the program and registration, contact SPTS '81 Omaha, PO Box G, Arcadia OK 73007, or phone Rick Schneringer at (405)-396-2574.

OAKLAND NJ
AUG 15

The Ramapo Mountain Amateur Radio Club (WA2SNA) will hold its 5th annual flea market on August 15, 1981, at the American Legion Hall, 65 Oak Street, Oakland NJ, only 20 miles from the GW Bridge. Admission is $1.00; YLs and harmonics will be admitted free. Indoor tables are $6.50 and tailgating is $3.00. Door prizes will be awarded and refreshments will be available. Talk-in on 147.49/146.49 and 146.52. For more information, contact Walt Zierenberg WD2AAI, 344 Union Avenue, Bloomingdale NJ 07403, or phone (201)-838-7565.

HUNTSVILLE AL
AUG 15-16

The Huntsville Hamfest (formerly the North Alabama Hamfest) will be held on Saturday and Sunday, August 15-16, 1981, at the Von Braun Civic Center in Huntsville AL. There is no admission charge. There will be prizes, exhibits, forums, an air-conditioned indoor flea market, and ladies' activities. Tours of the Alabama Space & Rocket Center are available for the family. A limited number of camping sites with hookups are available at the VBCC on a first-come, first-served basis. Flea market tables are available for $3.00 per day. Talk-in on 3.965 and .34/.94. For more information write, Huntsville Hamfest, PO Box 4563, Huntsville AL 35802.

TACOMA WA
AUG 15-16

The Radio Club of Tacoma will hold its annual Hamfair on August 15-16, 1981, at Pacific Lutheran University in Tacoma, WA. Featured will be many outstanding technical seminars, games and contests for all members of the family, a large flea market and commercial display area, dinner and after-dinner entertainment, and valuable door prizes. Trailer parking and lodging are available. For more details, contact Eva Anderson WB7QNS, 517 Berkeley Avenue West, Tacoma WA 98466, or phone (206)-564-8347.

WARREN OH
AUG 16

The Warren Amateur Radio Association will hold its 24th hamfest on August 16, 1981, at the Kent State University branch, Warren OH. There will be six major prizes. For more information, write PO Box 809, Warren OH 44482.

HAMDEN CT
AUG 16

The 5th annual WELI/Hamden Radio Club Flea Market will be held on Sunday, August 16, 1981, from 9:00 am to 5:00 pm at Radio Towers Park, Benham Street, Hamden CT. General admission is $1.00 and dealer's charge is $5.00 per space with room for one car. For further information or reservations, write Hamden Radio Club, 199 Wayland Street, Hamden CT 06518, or call (203)-288-3765 after 5:00 pm.

LAFAYETTE IN
AUG 16

The Tippecanoe Amateur Radio Association will hold its 12th annual hamfest on Sunday, August 16, 1981, at the Tippecanoe County Fairgrounds, Teal Road and 18th Street, Lafayette IN. The grounds will open at 7:00 am and advance tickets are $3.00. Features will include a large flea market, manufacturers, dealers, fun, and prizes. Talk-in on 146.13/.73 or 146.52. For advance tickets and additional information, send a check (payable to Lafayette Hamfest) to J. B. VanSickle K9KRE, RR 1, Box 63, Westpoint IN 47992.

WILMINGTON DE
AUG 16

The Sixth Annual New Delmarva Hamfest will be held on Sunday, August 16, 1981, at Gloryland Park, Bear DE (5 miles south of Wilmington), from 8:00 am to 4:00 pm. Admission is $2.25 in advance, $2.75 at the gate, and YL and jr. ops will be admitted free. Tailgating or table space under the pavilion is $3.50. There will be a limited supply of free tables, or bring your own. Refreshments will be available. First prize of an Icom IC-2A and many other prizes will be awarded. Talk-in on .52 and .13/.73. For map, info, or advance tickets, send an SASE to Stephen J. Momot K3HBP, 14 Balsam Road, Wilmington DE 19804. Make checks payable to Delmarva Hamfest, Inc.

FARMINGTON ME
AUG 22

The Sandy River Amateur Radio Club/Somerset Amateur Radio Association Hamfest will be held on Saturday, August 22, 1981, at the Farmington Fairgrounds, Farmington ME. Admission is a $1.00 donation. Free camping will be available from 5:00 pm Friday until Sunday morning. Light refreshments also will be available. Talk-in on 146.37/.97, 147.615/.015, or 146.52/.52. For additional information, send an SASE to Charles Stenger W1HTG, Box 111, East Dixfield ME 04227.

MARYSVILLE OH
AUG 22-23

The Union County Amateur Radio Club will hold its fifth annual Hamfest-81 on August 22-23, 1981, at the Union County Fairgrounds, Marysville (near Columbus) OH. Gates open until Sunday at 4:00 pm. Admission is $2.00 in advance and $3.00 at the gate. Children will be admitted free. Featured on Saturday night will be movies, popcorn, round and square dancing to a live band, and overnight camping with hookups, all free. Food will be available all night with a big country breakfast starting at 3:00 am. On Sunday there will be forums, door prizes, and meetings. There will be no extra charge for sellers at the flea market which opens at 4:00 pm on Saturday and 6:00 am on Sunday. Talk-in on 147.99/.39 and .52. For more information, write Union County Amateur Radio Club, 13613 US 36, Marysville OH 43040.

ST. CHARLES IL
AUG 23

The Fox River Radio League will host the 1981 Illinois State ARRL Convention in conjunction with its annual hamfest, all to be held on Sunday, August 23, 1981, from 8:00 am to 4:00 pm at the Kane County Fairgrounds in St. Charles IL. The Convention program features forums on antennas, DX, and ARRL operations. There will also be several contests and demonstrations of amateur radio communications modes. Advance tickets are $1.50 and $2.00 at the gate. Talk-in on 146.940. For advanced tickets, send an SASE to Jerry Frieders W9ZGP, 1501 Molitor Road, Aurora IL 60505. Commercial exhibitors should contact Mike Pittard KA9EVT at (312)-896-7383.

WENTZVILLE MO
AUG 23

The Saint Charles Amateur Radio Club, Inc., will hold Hamfest '81 on August 23, 1981, at the Wentzville Community Center, West Main Street, Wentzville MO. Advance tickets are $1.00 each or 4 for $3.00; at the door tickets are $1.50 each or 4 for $5.00. Parking is $1.00 per car (no camping on hamfest site). Featured will be a reserved flea market for amateurs, a free general flea market area, free bingo, a cake walk, refreshments, and prizes (including a first prize of a Kenwood TS-130S transceiver). Free doughnuts and coffee will be available to the early birds. Talk-in on .07/.67 and .52. For information on motels, tickets, displays, prize lists, camping, etc., write Bill Graham WB0ZEH, 215 Bermuda, O'Fallon MO 63366.

BLUEFIELD WV
AUG 23

The East River Amateur Radio Club, Inc., will hold the Bluefield Hamfest '81 on Sunday, August 23, 1981, at the Brushfork Armory/Civic Center located on US 52, one mile north of Bluefield WV. Admission is $2.00 in advance and $3.00 at the gate, and includes a prize ticket. Tailgaters are $2.00 each and tables are $5.00 each (3 or more are $4.00 each). There will be food, dealers, a flea market, forums, and entertainment. Talk-in on .89/.49 and .52/.52. For more information, write Bluefield Hamfest '81, 2113 Hemlock Hill, Bluefield WV 24701.

DES MOINES IA
AUG 23

The Iowa 75-Meter Net will hold a picnic and swapfest on Sunday, August 23, 1981, at Ewing Park in southeast Des Moines IA. A potluck meal will start at 12:00 noon and a program (including prizes) will follow. Talk-in on .34/.94. For further information, contact Lovelle Pedersen WB0JFF, Net Secretary, 2327 W. Reinbeck Road, Hudson IA 50643.

TIOGA COUNTY PA
AUG 29

The Tioga County Amateur Radio Club will hold its 5th annual hamfest on Saturday, August 29, 1981, from 8:00 am to 4:00 pm, at the Tioga County Fairgrounds just off Rte. 6, between Wellsboro and Mansfield PA. There will be a free outdoor flea market and inside space will be available. Registration is $3.00. Features will include prizes, demonstrations, and food. Pennsylvania's Grand Canyon is nearby. Talk-in on 146.19/.79 and .52. For more information, write PO Box 56, Mansfield PA 16933.

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SEWELL NJ
AUG 30

The Gloucester County Amateur Radio Club will hold the GCARC Hamfest on August 30, 1981, from 8:00 am to 3:00 pm (7:00 am for tailgaters and dealers) at the Gloucester County College, Tanyard Road, Sewell NJ. Admission is $2.00 in advance and $2.50 at the door. Tailgaters' and dealers' charge is $6.00 (which includes one free admission). Refreshments and free parking will be available. Features will include seminars, prizes, contests, and speakers Dale Smith, from the ARRL, and Miles (Brownie) Brown W2PAU, an RCA antenna expert. FCC exams will be given from Tech through Advanced. Talk-in on 146.52 and 147.78/.18. For more information and reservations, send an SASE to GCARC Hamfest Committee, PO Box 370, Pitman NJ 08071, or phone (609)-456-0500 or (609)-338-4841 days or (609)-629-2064 evenings.

LA PORTE IN
AUG 30

The La Porte and Michigan City Amateur Radio Clubs will hold their annual La Porte County Hamfest on Sunday, August 30, 1981, rain or shine, at the County Fairgrounds on Highway 2, west of La Porte IN (50 miles SE of Chicago). There will be an outdoor paved flea market area, indoor tables at $1.00 each, a satellite TV demonstration, and overnight trailer parking for early birds. Advance tickets are $2.00. For reservations or information, send an SASE to PO Box 30, La Porte IN 46350.

GEORGETOWN IL
SEP 5-6

The Illiana Repeater System will hold the 12th annual Danville Area Hamfest on September 5-6, 1981, at the Georgetown Fairgrounds, Georgetown IL. The gates will open at 6:30 am. Tickets are $1.50 in advance and $2.00 at the gate. There will be a flea market, forums, family entertainment, many prizes (including a Santec synthesized hand-held), and free parking. Talk-in on 146.22/.82 and 146.52. For more information or advance tickets, contact Lowell Wells WD9AFG, Hamfest Chairman, RR 3, Box 215, Danville IL 61832, or phone (217)-759-7560.

BLOOMINGTON IN
SEP 6

The Bloomington Area amateur radio hams will hold their 4th annual Hoosier Backyard Hamfest on Sunday, September 6, 1981, rain or shine, from 7:00 am until 5:00 pm at 2335 Vernal Pike, Bloomington IN. Admission is $2.00. Features will include door prizes, a swap 'n shop, vendors, free setups, balloon rides, a 50/50 drawing, refreshments, ATV demonstrations, and an Aptron ATV converter as the grand prize. Talk-in on 147.78/.18, 146.04/.64, or 223.26/224.86. For further information, contact Bob Myers K9KTH at 2335 Vernal Pike, Bloomington IN, or call (812)-332-2433.

AUGUSTA NJ
SEP 12

The Sussex County Amateur Radio Club will hold its third annual SCARC '81 hamfest on Saturday, September 12, 1981, from 8:00 am to 3:00 pm at the Sussex County Farm and Horse Show grounds, Plains Road off Rte. 206, Augusta NJ. Pre-registration for outdoor flea-market sellers is $4.00; at the gate, $5.00. Pre-registration for indoor flea-market sellers is $5.00; at the gate, $6.00. Other registration is $2.00. There will be door prizes and plenty of free parking. Talk-in on 147.90/.30 and 146.52. For additional information or pre-registration, write Sussex County Amateur Radio Club, PO Box 11, Newton NJ 07860, or Lloyd Buchholtz WA2LHX, 10 Black Oak Drive, Vernon NJ 07462.

GAITHERSBURG MD
SEP 13

The Foundation for Amateur Radio, with the support of more than 50 affiliated clubs in the greater Washington-Baltimore areas, will hold the Gaithersburg Hamfest on Sunday, September 13, at the Montgomery County Fairgrounds, Gaithersburg MD. Gates open at 8:00 am; *setup* and talk-in begin at 6:00 am. Events featured include commercial exhibits, indoor flea market, tailgating, and ladies' activities. Admission is $3.00 at the gate; children under 12 admitted free. For further information, write Foundation for Amateur Radio, PO Box 523, Bowie MD 20715, or contact Stuart Meyer W2GHK, hamfest chairman, 2417 Newton Street, Vienna VA 22180; (703)-525-6286 (office) or 281-3806 (home).

KEW GARDENS NY
SEP 13

The Hall of Science Amateur Radio Club will hold its annual electronic hamfest on Sunday, September 13, 1981, from 9:00 am to 4:00 pm, at the municipal parking lot, 80-25 126th street, Kew Gardens, Queens NY. Featured will be free parking, door prizes, refreshments, a raffle, and an auction. Sellers' spaces are $3.00; buyers' admission is $1.00. Talk-in on .52. For additional info, contact Tom Doyle KA2DTB at (212)-351-6354 (days).

PORT JEFFERSON LI NY
SEP 13

The Suffolk County Radio Club will hold its ARRL-supported 4th annual Electronic Flea Market on Sunday, September 13, 1981, with a rain date of September 20, 1981. The site is the Odd Fellows Hall, Jane Boulevard, Port Jefferson LI NY. Walk-ins will be $1.50 and sellers will be $3.00. There will not be any charge for XYLs and harmonics of attending hams. Gates will open at 7:00 am. Bargains, prizes, food, and hamship will be available. Talk-in on .52, .94, and 223.50. For more information, contact Floyd Davis at (516)-234-9376.

TIVERTON RI
SEP 13

The Bristol County Amateur Radio Association will hold its annual indoor/outdoor flea market on September 13, 1981, from 12:00 noon to 4:00 pm at the VFW hall in Tiverton RI. Admission is $1.00 and flea market spaces are $6.50. Door prizes will be drawn. Talk-in on 147.63/.03 and .52. For maps, send an SASE to Ann M. Carro KA1DNB, 652 Old Colony Terrace, Tiverton RI 02878.

FINDLAY OH
SEP 13

The Findlay Hamfest will be held on Sunday, September 13, 1981, at the Hancock Recreational Center, just east of I-75 exit 161, on the north edge of Findlay, 40 miles south of Toledo. Tickets are $2.00 in advance and $2.50 at the gate. Tables are $2.50 per half. Setups on Saturday are from 5:00 pm to 9:00 pm and on Sunday at 6:00 am. Major prizes include a deluxe low-band rig, two hand-helds, a memory keyer, and more. For tickets, information, or reservations, *send* an SASE to PO Box 587, Findlay OH 45840

HAMBURG NY
SEP 18

The 10th annual Ham-O-Rama '81 will be held on Friday and Saturday, September 18-19, 1981, from 7:00 am to 5:00 pm at the Erie County Fairgrounds near Buffalo NY. Advance tickets (deadline: September 4th) are $3.00 and tickets at the gate will be $4.00. Children under 12 will be admitted free. The outside flea market is $2.00 per space and the inside flea market is $7.00 per space. Features will include new equipment displays, computers, technical programs, ladies' programs, and valuable awards. Talk-in on 146.31/.91. For advance tickets, send an SASE to David G. Baco WA2TVT, 130 Vegoia Avenue, Cheektowaga NY 14225.

GRAND RAPIDS MI
SEP 19

The Grand Rapids Amateur Radio Association will hold its annual Swap and Shop on Saturday, September 19, at the fairgrounds in Hudsonville MI. There will be door prizes, dealers, an indoor swap area, and an outdoor trunk swap area. Gates will open at 8:00 am for both swappers and the public. Talk-in on 146.16/.76. For more information, write Grand Rapids Amateur Radio Association, Inc., PO Box 1248, Grand Rapids MI 49501.

GRAYSLAKE IL
SEP 19-20

The Chicago FM Club will hold Radio Expo '81 on September 19-20, 1981, at the Lake County Fairgrounds, Rtes. 45 and 120, Grayslake IL, about 30 minutes north of Chicago and 45 minutes south of Milwaukee. The flea market is open from 6:00 am to to 6:00 pm and the exhibits are open from 9:00 am to 9:00 pm on both days, rain or shine. Tickets, good for both days, are $3.00 in advance and $4.00 at the gate. Features include seminars, a ladies' program, prizes, free parking, a new camping site with hookups, commercial ham and computer displays, and full food services. Bring your own tables and chairs to the indoor and outdoor flea market (or even tailgate).

Space is free with a gate ticket. Talk-in on 146.16/.76, 146.52, and 222.5/224.10. For more information, call (312)-BST-EXPO. For advance tickets, send a #10 SASE to Box 1532, Evanston IL 60204.

PEORIA IL
SEP 19-20

The Peoria Area Amateur Radio Club will hold the Peoria Superfest '81 on Saturday and Sunday, September 19-20, 1981, at the Exposition Gardens, W. Northmoor Road, Peoria IL. Gate opens at 6:00 am; commercial building at 9:00 am. Activities include forums, amateur and computer product displays, a flea market, ladies' programs, and children's activities. Full camping facilities are available. Talk-in on 146.16/.76. For more information, contact Charles W. Kuhn WD9EGW, 7005 N. Tobl Lane, Peoria IL 61614.

NEWTOWN CT
SEP 20

The Candlewood Amateur Radio Association's flea market and auction will be held on Sunday, September 20, at the Essex House, Rte. 6 in Newtown CT, Exit 8 off I-84, from 10:00 am to 4:00 pm. Admission is $1.00; tables are $6.00. Activities include door prizes, a raffle, dealers, and a magic show for the kids. Talk-in on 147.72/.12. For more information, contact George WB2THN at (914)-533-2758 or Ken KA1GDS at (203)-744-6953.

ROSS OH
SEP 20

The Greater Cincinnati Amateur Radio Association, Inc., will hold its annual Cincinnati Hamfest on Sunday, September 20, 1981, at Stricker's Grove on Ohio State Rte. 128, one mile west of Ross (Venice) OH. There will be exhibits, 10 major prizes, food, and refreshments available. Activities include a flea market with radio-related products only, a transmitter hunt, entertainment, and an air show. Admission is $4.00. For further information, contact Lillian B. Abbott K8CKI, 1424 Main Street, Cincinnati OH 45210.

MT. CLEMENS MI
SEP 20

The L'Anse Creuse Amateur Radio Club will hold its 9th annual Swap and Shop on Sunday, September 20, 1981, from 9:00 am to 3:00 pm at the L'Anse Creuse High School, Mt. Clemens MI. Take I-94 east-bound to the Metropolitan Parkway exit, then the Metropolitan Parkway to Crocker, go left on Crocker to Reimold and then right on Reimold to the last school, L'Anse Creuse High School. Admission is $2.00 at the door or $1.00 in advance. There will be FCC representatives and a test equipment table. There will be plenty of food and parking, plus hourly prize drawings. Prizes include a first prize of $250, a second prize of $100, and third prize of $50. Talk-in on 147.69/.09 and 146.52. For more information, send an SASE to Mike Corcoran N8CEN, 650 Chippewa, Mt. Clemens MI 48043.

AUGUSTA GA
SEP 20

The Augusta Amateur Radio Club will hold its annual hamfest on Sunday, September 20, at the Julian Smith Casino in Augusta GA. Tickets are $1.00 each; tailgaters, $3.00. Open at 9:00 am, everything is indoors except the flea market. There will be door prizes, a grand prize drawing at 3:00 pm, bingo, and refreshments. Talk-in on 146.34/.94. For more information, contact Diane Miller WB4YHT at (404)-860 3700.

ELMIRA NY
SEP 26

The Elmira Amateur Radio Association will hold the sixth annual Elmira International Hamfest on Saturday, September 26, 1981, at the Chemung County Fairgrounds. Gates will open at 8:00 am. Tickets are $2.00 in advance and $3.00 at the gate. Features will include a free flea market, tech talks, and dealer displays. Food will be available and door prizes will be awarded. The grand prize will be three items: an Icom IC-255A, an Icom IC-2AT, and an Avanti mobile antenna. A shuttle service from the Chemung County Airport will be provided for fly-ins who bring an HT. Talk-in on 147.96/.36, 146.10/.70, and 146.52/.52. For more information and/or tickets, contact John Breese WA2FJM, 340 West Avenue, Horseheads NY 14845.

LOUISVILLE KY
SEP 26-27

The eleventh annual Greater Louisville Hamfest and the 1981 Great Lakes Division Convention will be held on September 26-27, 1981, at the East Hall of the Kentucky Fair and Exposition Center in Louisville KY. There will be a large indoor exhibitors' area and flea market, completely air-conditioned. For more information, write The Greater Louisville Hamfest, PO Box 34444, Louisville KY 40232, or phone (502)-634-0619.

VIRGINIA BEACH VA
SEP 26-27

The 6th annual Tidewater Hamfest-Computer Show and ARRL Roanoke Division Convention will be held in the Virginia Beach Pavilion on September 28-27, 1981. Featured will be ARRL, traffic, and DX forums and XYL free bingo. FCC license exams will be given to those sending a form 610 request in advance. Free transportation to the oceanfront will be provided for the Neptune Festival. Admission is $3.50. There will be an advance ticket drawing for a handheld FM transceiver. Flea market tables are $5.00 for one day or $7.00 for both days. For tickets and information, write TRC, PO Box 7101, Portsmouth VA 23707, or phone (804)-587-1695.

GAINESVILLE GA
SEP 27

The 8th annual Lanierland ARC Hamfest will be held on September 27, 1981, beginning at 9:00 am in the Holiday Hall at the Holiday Inn, Gainesville GA. Doors will open at 8:00 am for dealer setups, and free tables and an inside display area will be provided. A large parking lot will be available for the flea market, and all activities and facilities will be free to all. A boat anchor auction and prize drawings will be featured. Prize tickets are $1.00 each or 6 for $5.00. Food will be available next door. Talk-in on 146.07/.67. For more information and free dealer space reservations, contact Paul Watkins W4FDK, Rte. 11, Box 536, Gainesville GA 30501, or phone (404)-536-8280.

GRASS VALLEY CA
SEP 27

The Golden Empire Flying Club and Radio Systems Technology are pleased to announce the annual fly-in and avionics swap meet to be held at the Nevada County (CA) Airpark on Sunday, September 27, 1981. The pilot of any antique or homebuilt aircraft will receive a free "miner's lunch" and a beverage of the pilot's choice. Pastries, bratwurst, and hot dogs will be available also. The swap meet will be free. Table space is limited and it is first-come, first-served. This is the only swap meet in the country to feature the trading of used avionics products. Pilots are reminded that Nevada County Airport is considered a mountain strip, and are advised to check density altitude. For more information, contact Golden Empire Flying Club, PO Box 375, Grass Valley CA 95945.

BEREA OH
SEP 27

The 7th annual Cleveland hamfest will be held on Sunday, September 27, 1981, at the Cuyahoga County Fairgrounds, Berea OH, from 0800 to 1500. Exhibitors' 8-foot spaces are $25.00 (which includes a table). Also, power is available if requested in advance. For more information, write Cleveland Hamfest Association, Box 27211, Cleveland OH 44127.

ADRIAN MI
SEP 27

The Adrian Amateur Radio Club will hold its hamfest on September 27, 1981, at the Lenawee County Fairgrounds, Adrian MI, from 8:00 am to 3:00 pm. There will be prizes, games, and programs. Limited tables available and inside space available for your table. Tickets are $1.50 in advance; $2.00 at the door. Talk-in on 146.31/.91 and .52. For tickets, tables, and information, contact the Adrian Amateur Radio Club, Inc., PO Box 26, Adrian MI 49221. Tables reserved by check no later that September 20.

NEW LONDON NH
SEP 27

The 5th annual Connecticut Valley FM Association hamfest/flea market will be held on Sunday, September 27, 1981, from 9:00 am to 5:00 pm at the King Ridge Ski Area, New London NH. Adult admission will be $1.00 and flea market setup will be $5.00. Children under 16 will be admitted free. The food concession will be by King Ridge.

NEW PRODUCTS

STANDARD KEYBOARD CATALOG AVAILABLE

A 24-page catalog of standard keyboards is now available from George Risk Industries, Inc. Bulletin KB-20 includes data on the company's Model 753, 756, and 771 standard keyboards, plus a variety of new models ranging from 10 to 98 keys. Featured are the new process control keyboard with serial I/O for industrial control system applications, user-programmable ASCII keypads, and a full complement of keyboard enclosures and accessories. Off-the-shelf models include low-cost units for hobby/educational use and keyboards suitable for a variety of prototype, limited production, and specialized applications. Ruggedized versions for heavy-duty industrial and military applications are also offered.

Free copies may be requested from *George Risk Industries, Inc., GRI Plaza, Kimball NE 69145; (800)-445-5218.* Reader Service number 482.

LOW-COST DATA TERMINAL INCLUDES COLOR GRAPHICS

A microprocessor-controlled, interactive data terminal with color graphics, reverse video, programmable and resident character sets, selectable baud rates and data formats and a light-touch, flexible-membrane keyboard with finger positioning overlay and aural feedback has been introduced by RCA MicroComputer Products.

This professional quality terminal is suitable for a wide variety of applications requiring interactive communication between computer and user. Microprocessor intelligence and LSI video control circuits bring performance, features, and flexibility at low cost.

This versatile terminal can be interconnected with standard RS232 modems for communication across telephone lines. The VP-3301 is compatible with most time-sharing and data-base computer networks.

The character display format, 40 characters by 24 lines or 20 characters by 12 lines, is software selectable. Each character or all characters may be displayed in one of eight colors (or gray scales on a B/W display). The display background may be one of eight colors (or gray scales on a B/W display). There are 125 resident displayable characters or you can define your own characters—Greek letters and other foreign alphabets, graphic symbols, large graphics building blocks, playing card suits, unique character fonts, and "little green men." The reverse video feature creates visual emphasis on single or multiple characters, words, or lines.

The terminal communications interface is industry standard asynchronous RS232C or 20-mA current loop with six switch-selectable baud rates. Switch-selectable configuration control includes line/local, upper case only, full/half duplex, data word formatting, plus two control code options. A built-in tone generator, used for aural keypress feedback, can be programmed for end-of-line bell, error messages, or even music.

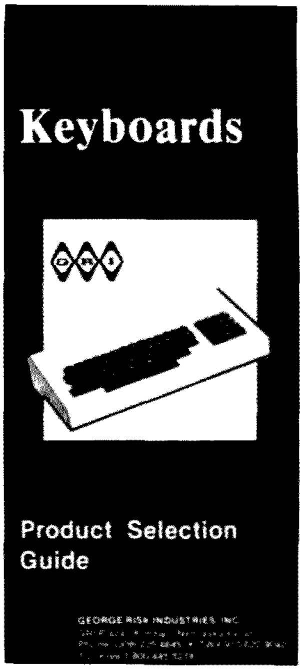
The terminal utilizes modern flexible-membrane keyswitches with a light positive activation pressure. Contact life is rated at greater than five million operations. A finger-positioning overlay combined with the positive keypress action gives good operator "feel." The unitized keyboard surface, impervious to liquids or dust particles, combined with high-noise-immunity CMOS circuitry, make this unit particularly suitable for use in hostile environments.

The base-band video output can be directly connected to a 525-line color or black-and-white video monitor or with an rf modulator to a standard color or black-and-white TV set. A wall-receptacle-type power supply is included.

For more information, contact *RCA MicroComputer Products, New Holland Avenue, Lancaster PA 17604; (717)-397-7661.* Reader Service number 485.

DOW-KEY'S HIGH-FREQUENCY TRANSFER RELAY

The Dow-Key Division of Kilovac corporation has announced the availability of a new high-frequency transfer relay. The Model 412 has four type N female connectors and carries up to 1000 Watts (CW) at



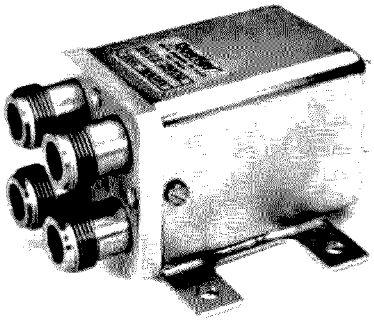
GRI's new keyboard catalog.

dc and 150 Watts at 4.2 GHz. The Model 412 is available in latching and non-latching versions, each with optional form "C" indicator circuit contacts.

The Model 412 has excellent rf characteristics: Minimum isolation at 1 GHz is −85 dB and at 4.2 GHz is −70 dB. Vswr is less than 1.1 at 1 GHz and 1.25 at 4.2 GHz. Insertion loss is −.15 dB maximum at 1 GHz and −.25 dB at 4.2 GHz. The relay was developed for use in Microwave systems to 4.2 GHz. It is ideally suited for transmit/receive switching between an antenna and a dummy load. The relay may also be used to bypass or insert a circuit element.

For further information, con-

RCA's VP-3301 data terminal.



Dow-Key's Model 412 transfer relay.

tact *Kilovac Corporation, PO Box 4422, Santa Barbara CA 93103; (805)-684-4560.* Reader Service number 487.

EZ CORD CONTROL™

Colton Creators, Inc., has developed a new product called the EZ Cord Control™. The patented new product provides an excellent means of holding and dispensing extension cords, coax, twin-lead, and all the other types of cable that have a way of accumulating in a ham shack. This cable organizer is available in three different sizes.

For more information, contact *Colton Creators, Inc., 216 East Second Street, Mineola NY 11501.* Reader Service Number 484.

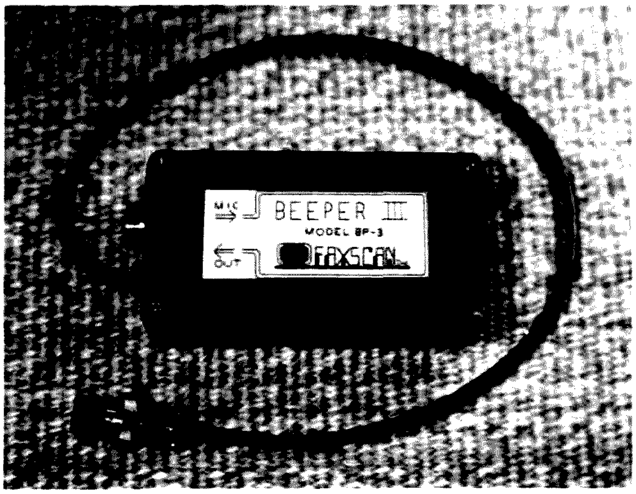
TRI-EX ROTATING TOWER

A new 120-foot guyed rotating tower has been released by the Tri-Ex Tower Corporation. This tower should be of special interest to contesters and other hams who wish to mount yagi arrays in various configurations on the sides of the tower. With this tower, though, these side-mounted antennas can be rotated in any direction just by turning the tower.

Despite its 120-foot height, the tower turns easily by hand, although it is more conveniently rotated by a motorized rotator. The rotator mechanism is mounted inside the tower at its base where it is easily accessible and is completely enclosed for weather protection, reliability, and safety. There are no exposed chain drives or gears which could be a safety hazard to people who enter the tower-site area.

Ball-bearing-type guy attachment rings are at the 30', 70', and 110' tower levels. A mast may be inserted at the top of the tower for additional antennas which can be rotated independently of the tower and its side-mounted antennas.

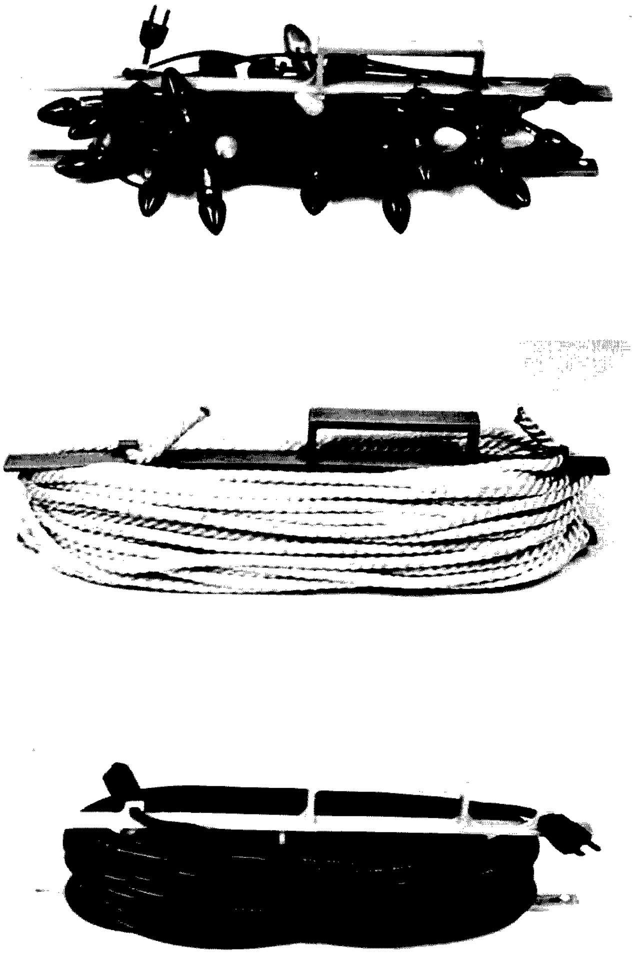
For more information, contact *Tri-Ex Tower Corporation, 7182 Rasmussen Avenue, Visalia CA 93291.* Reader Service number 488.

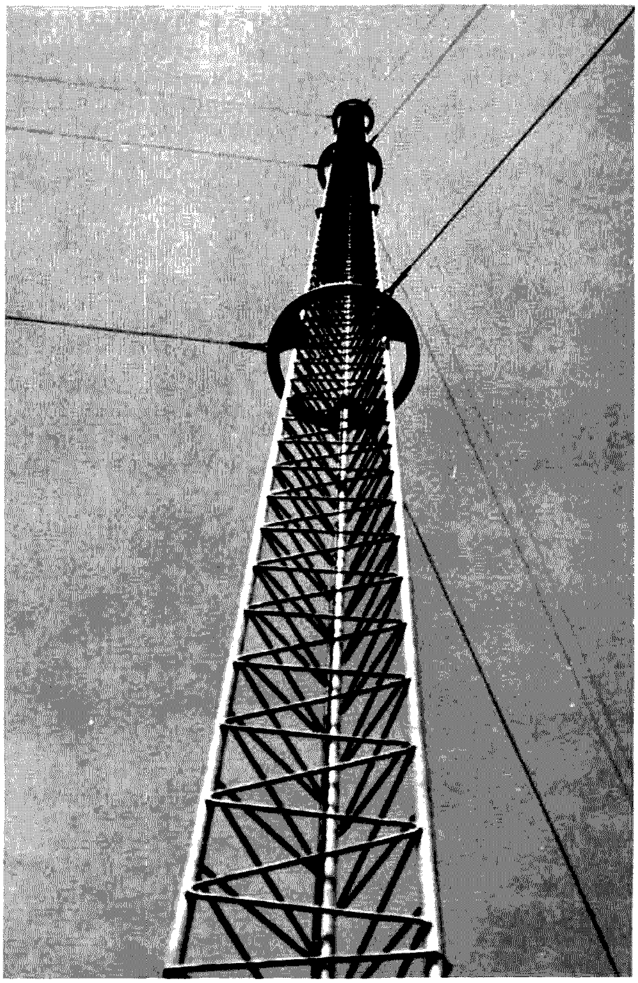


Faxscan's BP-3.

FAXSCAN'S MODEL BP-3 BEEPER

Faxscan, Inc., has announced their Model BP-3, representing the introduction of a new concept for amateur radio operating ease. The BP-3 is based on the idea used for years in commercial, military, and space communications. It provides a gentle beep at the beginning and end of each transmission by sensing the voltage on the PTT


The EZ Cord Control.


Tri-Ex's rotating tower.

line. Further, to differentiate between transmit and receive, the transmit tone has a higher frequency.

The purpose of the unit is to encourage a more natural conversation by eliminating the need to say "over" after each transmission. Under noisy or crowded conditions, the BP-3 virtually eliminates talk-over.

The unit can be directly interfaced to almost all modern gear. The only basic requirement is that the transmitter be keyed by grounding the PTT line and that the voltage at that point not exceed 24 V dc nor the current exceed 100 mA.

The construction is entirely solid state, with CMOS circuitry used to provide a unit that is virtually rf-proof. Current requirements are so low that a single 9-V battery (not supplied) will power the unit for up to one full year.

The BP-3 is perfect for use during nets or emergencies, or under noisy conditions. It is also great for VHF/UHF operation and makes a perfect repeater accessory.

The unit is available as "board-only" or encased. Both are fully assembled and tested. The "board-only" version, a mere 2" × 2", allows for custom installation.

The encased version comes complete with standard 4-pin microphone connectors, shielded cabling, and all interface wiring completed. It is designed for use with rigs using the standard 4-pin connector but instructions are enclosed to modify it for use with most modern gear. The unit is mounted in a "Faxscan gray" cast aluminum enclosure measuring 2-3/8" × 4-3/8" × 1-7/32" (W, D, H). Connection to most rigs involves plugging the mike into the BP-3 and the BP-3 into your rig's mike connector. Operation is totally automatic.

For more information, contact *Faxscan, Inc., 3148 Dorf Drive, Dayton OH 45418.* Reader Service number 483.

MODEL SDI-1150 SLIDE MOUNT

The new Model SDI-1150, quick-connection slide mount being introduced by Scientific Dimensions, Inc., will disconnect ten circuit leads plus coax. Designed for use with mobile two-way radios through the UHF band, this product will handle six more accessory leads than the Model SDI-1050 (which disconnects four circuit leads plus coax). The model SDI-1050 has been reliably used in the mobile two-way market for over five years.

The theft prevention and radio switching capabilities of the Scientific Dimensions line of quick-connection slide mounts have been applied to uses in construction, trucking, oil and gas, small service business, amateur radio, and utilities. The patented product line is sold to Motorola, General Electric, and professional land-mobile radio dealers nationwide.

For more information, contact *Scientific Dimensions, Inc., PO Box 26867, Albuquerque NM 87125.* Reader Service number 481.

HY-GAIN'S NEW DOUBLE ZEPP ANTENNA

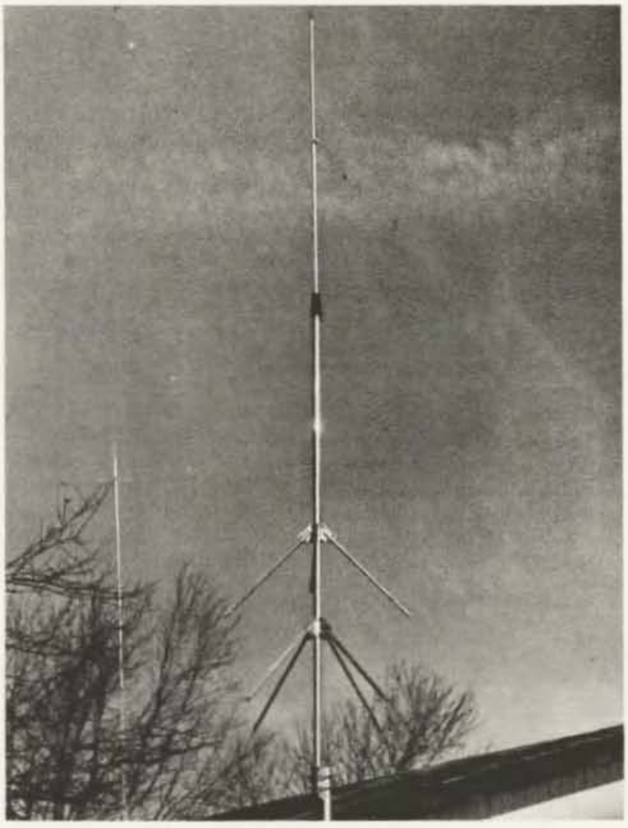
Telex Communications' new V-2 antenna is a 2-meter extended double zepp vertical consisting of two stacked 5/8-wave sections decoupled inside the antenna for complete weatherproofing. The decoupling system allows no rf on the coax feedline. The V-2 is a complete antenna that is easy to assemble and will mount on any mast up to 2" (50.8 mm) in diameter.

Two sets of 1/4-wave radials and a centered feedpoint produce an excellent radiation pattern that is very close to the horizon with a minimum of power loss into the sky. Radiation pattern testing was achieved on a ground-reflection range designed according to IEEE standard 149-1979; the test results of the V-2 and various competitive products are available from Telex/Hy-Gain.

The V-2 is designed to operate from 138 MHz through 174 MHz, obtains a vswr of less than 1.5:1 at resonance, and has a 2:1 vswr bandwidth of at least 7 MHz. The antenna's isolation from the supporting mast is 20 dB minimum.

For more information, contact *Hy-Gain, a division of Telex Communications, 9600 Aldrich Ave. So., Minneapolis MN 55420.* Reader Service number 486.

Scientific Dimensions' Model SDI 1150 slide mount.



Hy-Gain's V-2 double zepp vertical.

See page 117

HF5V-III *from page 34*

best. To tune the HF5V-III, you simply loosen a wingnut and slide the loading coil up or down. There are separate loading coils for 80 and 40, and adjustment of these coils has a negligible effect on the resonance point on 20, 15, and 10. Use a waterproof marker to mark the position of the bottom of the coil for the phone and CW segments and you'll be able to readjust the antenna without even getting near your swr meter!

The other reason I chose the HF5V-III is the obvious care that went into its design and engineering. Butternut designed this antenna to be as efficient as possible on each band. The following theory of operation is excerpted from the instruction manual.

"The HF5V-III operates as a slightly extended quarter-wave radiator on 15 meters, using a quarter-wave decoupling stub to isolate the upper sections of the antenna from the first quarter-wavelength of that band. On 20 meters, the entire radiator is active and functions as a 3/8-wave resonant vertical having much higher radiation resistance than conventional or trapped antennas with heights of one-quarter wavelength or less. On 10 meters, the HF5V-III operates as a 3/4-wave radiator with considerably greater efficiency than quarter-wave types. On 40 and 80/75 meters, the appropriate resonator circuits provide the inductive reactance required for resonance in conjunction with a slight top loading effect from the 15-meter decoupling stub. The L/C ratios of the 40- and 80/75-meter resonator circuits also determine resonance on 20 and 10 meters. Because of the higher than normal 20-meter radiation resistance, the feedpoint impedance on that band is in the neighborhood of 100 Ohms in a typical installation. Therefore, a quarter-wave matching section of 75-Ohm line is used as a transformer for the 50-Ohm impedance of the main transmission line. This matching section has no appreciable effect on operation on other bands."

Power rating is two kW PEP on 40 through 10 meters, and 1.2 kW PEP on 80 and 75 meters. Bandwidth is quite good, covering the entire 40-, 20-, 15-, and 10-meter bands and approximately 100 kHz on 80 meters. With the optional 160-meter attachment, bandwidth is considerably narrowed on 80 and 40 but still covers the entire 20-, 15-, and 10-meter bands. Wind load is 1.5 square feet; overall height is 26 feet. Shipping weight comes in at 12 pounds, and DXpeditioners may be interested in the special version that allows the antenna to be packed in a relatively small package, with no change in operating characteristics.

Installation

Both roof and ground mounting are straightforward and uncomplicated. It takes less than two hours working at a leisurely pace to assemble a Butternut HF5V-III. The parts fit well and needed no remedial hacking or drilling. Both antennas I built required no adjustment beyond setting the 80- and 40-meter coils for the desired portion of the band. The instruction manual is very well done, with clear assembly instructions and diagrams. There are lots of hints on installation and ample detail on ground systems and their necessity. For the roof-mounted antenna, I used the excellent tuned radial kit that Butternut offers. A system of non-resonant radials resides beneath the ground-mounted antenna, with several wires in excess of 350 feet.

If you are interested in a vertical antenna and can't decide whether to mount it on the ground or on your roof, you should know that indications are that the roof-mounted antenna will be the superior performer. In any case, laying the required radial system for a ground-mounted vertical can be extremely time-consuming. I calculate that the time I spent installing the radials for my ground-mounted vertical would have easily paid the difference between a vertical and a small tribander to mount on my roof!

One has to be very cautious when comparing a vertical to random wire or dipole antennas. Initial comparisons between a 100-foot random wire and the HF5V-III were not particularly encouraging. I used a coax switch to flip back and forth between the antenna tuner for the random wire and the vertical, and the wire seemed to run about one S-unit higher on receive. Surprise! The low angle of radiation of the vertical made itself known when we started tuning in DX stations—DX signals were definitely stronger on the vertical!

Conclusion

The HF5V-III goes together easily and is definitely one of the best of its breed. A vertical antenna is no match for a rhombic, yagi, or quad, but for those of us with limited real estate and funding, it represents an alternative worthy of serious consideration.

For more information, contact: *Butternut Electronics Co., PO Box 1411, San Marcos TX 78666.* ■

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
4006 Winlee Road
Randallstown MD 21133

Last month I promised you something to read and something to help you write. No liar I, here we go with some summertime treats.

As I have mentioned before, one of the popular sidelights of having a RTTY machine in the shack is scouting around for non-amateur RTTY signals. The airwaves are full of such beasties, not all of which are decodable, which represent news services, government radio, and other exotic radio stations. A guide to these signals is always welcome, assuming that it is accurate and complete.

A few months ago I reviewed such a guide: Oliver Ferrell's *Guide To RTTY Frequencies*, published by Gilfer Associates, Inc., at $8.95. This month we shall take a look at another entry, a book entitled *World Press Services Frequencies*. Written by Thomas Harrington W8OMV, the book claims (Mr. Ferrell's work notwithstanding) to be the "only one of it's (sic) kind, up to date," and to lead to "exciting news from the far corners of the world." Pretty tall order; let's take a look.

The book's format is in the large, 8½" by 11" size that most electronic magazines have adopted, in contrast to the 9" by 6" size of the Gilfer book. However, the typography is wide open and large, with generous margins and spaces between lines, accompanied by a cute logo of the world on each page. This severely limits the content of each page.

The opening section of the book is a brief, two-page introduction to RTTY, giving the basic "way in" to reception. It appears to be oriented for the non-amateur, or at least for the amateur not involved with RTTY. Next comes a short discussion of time zones, shift, speed, and Baudot (sic) vs. "Ascii" (sic)—as opposed to Murray vs. ASCII code. The codes, however, are not explained—only mentioned. Two pages of photos of several modern receivers are featured, along with mentions of the Info-Tech, iRL FSK-1000 (reviewed here a while back), and HAL ST-6000 converters. A brief mention of printers and whiz-bang readers concludes the first section.

Information on transmitting RTTY stations is presented in several lists. About 225 entries are for world press stations, listed in order of transmitting times. A second list contains about 150 entries, describing these same stations in order of frequency. A third list shows International Telecommunications Union press stations in frequency order, showing about 250 stations.

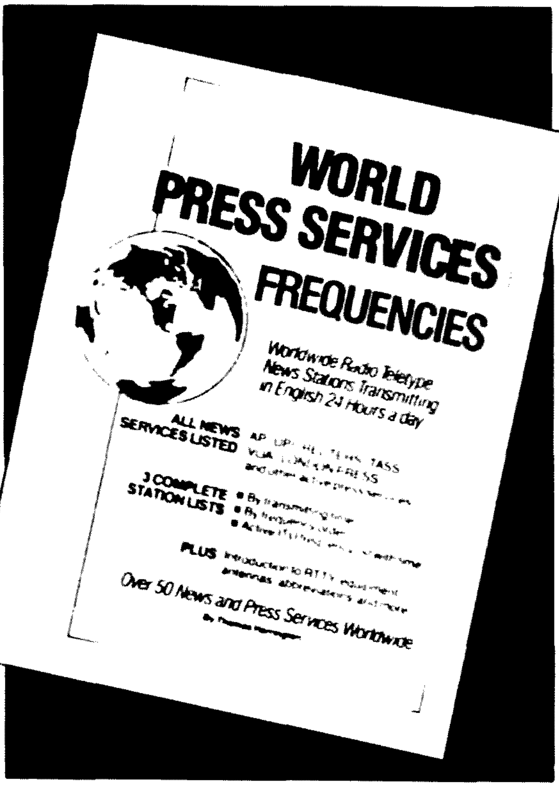


Fig. 1. The Harrington book.

The author indicates his intent to update the information in his book periodically and mail updates to registered individuals. This is an ambitious undertaking and would certainly do much to keep the information current. I should note that this book states, as does the Gilfer one, that all stations listed have been monitored and that this is not just a compilation of stations from a frequency log.

World Press Services Frequencies is available for $5.95 from Universal Electronics, Inc., 1280 Aida Drive, Reynoldsburg OH 43068. It does not have all the listings presented in the Gilfer book, but it may be entirely adequate for the amateur interested in listening in to world press services.

Of course, the other half of my promise, something to write with, is a printer. I have got to tell you about one of the hottest new printers around—one you may have heard about already. Let's take a look at some of its features.

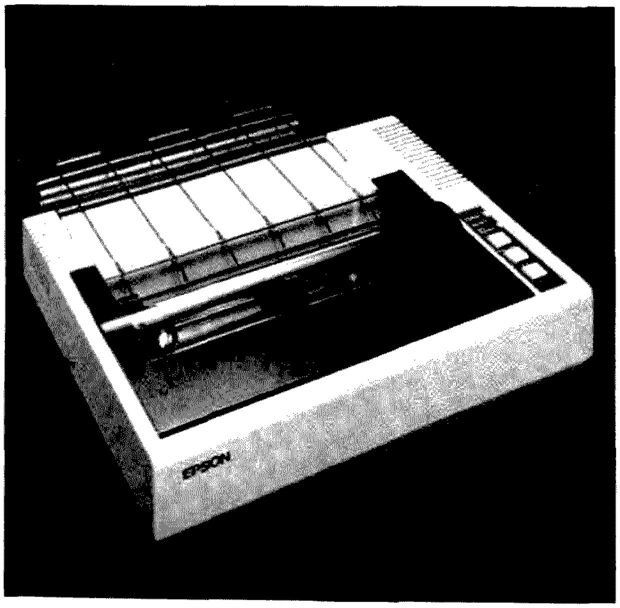


Fig. 2. The Epson MX-80.

This is a dot-matrix printer that supports the full ASCII character set, numerics, symbols, and upper- and lowercase. The print line is a maximum of eight inches and can be configured with character sizes yielding 40, 66, 80, or 132 characters per line. Furthermore, while standard line spacing of six lines per inch is the default condition, the printer may be switched to eight lines per inch (1/8 inch per line) or a tight 7/72-inch spacing. The resolution may be controlled even further to give one-dot vertical spacing or twenty-four-dot double spacing, all under program control.

Like more? The lower case g, p, q, and y all have descenders that make them look more like the letters we are used to. And a double-strike mode is available to fill in the gaps between dots and approach what is commonly referred to as "letter quality."

Like to see a sample? Fig. 3 is a sample printout, set up for 132 characters per line and eight lines per inch. The justification, by the way, is provided by my 6800-based computer. I think this is quite acceptable, don't you?

How about graphics? Well, the standard TRS-80™ graphics character set is supported and usable by even the non-TRS-80 user. Speaking of character sets, flick a DIP switch inside and you can get any one of several foreign language character sets. French, complete with accents, British (the pound sterling, you know), or German, mit der Umlaut, are all available. Not only that, but an entire Japanese Katakana character set may be substituted for the TRS-80 graphics, again, at the flip of a DIP.

Still not impressed, huh? Would you like a vertical format unit that supports vertical tabs? You got it. How about a built-in beeper/bell to sound off for fun, or to tell you something's wrong? That too. Let's add a standard parallel interface that will plug in to just about any computer, and see what we've got.

At a list price of $645, but being sold at considerable discounts, we have the Epson MX-80 printer. Quite a bundle, I'd say. But before we conclude, let's look at some problems. First off, the MX-80 has a one-line buffer for input. One of the nice things about a printer with at least several hundred bytes of buffer is the ability of the printer to "follow" the computer. The computer can dump its output to the printer quickly and then proceed with processing while printing is going on, neatly overlapping functions. With a one-line buffer, this rarely happens, so the computer sits and waits for the printer to finish.

Furthermore, if the MX-80 is used in the serial mode, the user must be aware that the printer will not accept input while the carriage is returning or other functions—such as graphics—are going on. This necessitates the addition of nulls into the data stream, somewhat slowing the printer throughout.

A minor problem is that the platen cannot be moved manually while the printer is energized. Thus, if a slight adjustment is needed, say to place print on a form, the printer must be turned off and any conditions set up in the printer's memory are lost.

All things considered, however, the MX-80 is a gem of a printer. Several new accessories, including full dot graphics and friction feed, broaden the horizon of this versatile unit. At least one manufacturer of a microcomputer-based RTTY station, Microlog, features the MX-80 as a companion to their unit. If you are looking for a printer, take a long look at the Epson MX-80.

Now, every few months I feel I must repeat this request. If you write me or any other author whose works you enjoy, please enclose a self-addressed, stamped envelope if you expect a reply. Also, remember to mention RTTY Loop and *73 Magazine* to those companies whose products you read about in these pages. They appreciate the feedback.

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   A   few  months  ago  I
reviewed   such   a   guide,
Oliver  Ferrell's  "Guide To
RTTY Frequencies", published
by  Gilfer Associates, Inc.,
at  $8.95.   This  month  we
shall  take  a  look at another
entry,   a    book   entitled
"World     Press     Services
Frequencies", costing $5.95,
from  Universal Electronics,
Inc.   Written   by   Thomas
Harrington,  W8OMV, the book
claims, Mr.  Ferrell's  work
notwithstanding,  to  be the
"only  one  of  it's   (sic)
kind,  up  to  date," and to
lead to, "exciting news from
the   far   corners   of  the
world."  Pretty  tall  order,
let's take a look.
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Fig. 3. Sample printer output.

Speaking of feedback, we will have some next month. Look for it in RTTY Loop!

LETTERS

THE FIRST COAX?

In his article "Inside Coax" (*73*, May, 1981, p. 78), Dr. Jenkins states that "Prior to World War II, coaxial cable was unheard of."

In 1940, Rex Bassett sold me 50' of coaxial cable at his factory in downtown South Bend, Indiana. He used some kind of rubber as the dielectric. By today's standards, and I think Mr. Bassett will agree, it wasn't too efficient. But it was coaxial cable and I used it to feed my 10-meter antenna for over a year before WWII shut down ham radio.

By coincidence, on page 37 of the same issue, I see Rex Bassett is still in business some 41 years later, having moved his plant from South Bend to Fort Lauderdale.

Robert H. Pearson KH6AKW
Aiea HI

A SNAP

You can chalk up another ham as a direct result of your code-practice tapes. The FCC 5-wpm exam really was a snap after working with the 6+ tape.

So, now I am on to the 13+ and an Advanced license. Thanks for making the code test easy!

William B. Schneider
Technician (no call yet, but passed the test)
Jacksonville FL

LESS IS MORE

Just two weeks ago, I had a rare privilege. Upon arriving at the home QTH, my son informed me that my new *73 Magazine* had arrived in the mail.

That event was like a cool breeze on a warm day. Finally, I could once again be in contact with my hobby through the auspices of your very fine magazine.

Keep up the fine work and to Mr. Wayne Green, even if you are wrong a fair amount of the time, Wayne, you are upholding a fine north-American tradition of saying your piece in a free press. Stay in there and keep on slugging.

I might add that I was slightly sorry to see a magazine which, while it is up in price, is down in thickness and we therefore seem to be receiving somewhat less for our money. Will be looking forward to receiving future copies.

L.E. Babcock, Sr. VE6BAQ
Edmonton, Alberta
Canada

GETTING HIGH

I rarely write to a magazine, however the article in the June *73*, "Repeater at 102,000 Feet!" by VE4FK, certainly was outstanding in all ways. Give us more like this!

Kenneth C. Haas K2YKE
Buffalo NY

MOUNTAINTOP PARTY

On August 1, 1981, there will be an Amateur Radio Mountaintop VHF Party. From the lowest to the highest, pick your favorite peak. Bring yourself, a friend, your two-meter portable FM station, and go for the top. The official time will be Saturday, from 1000 to 1500, local time. The official frequencies will be 146.55, 6.58, 147.51, and 7.57. The WA6GUO/WA6SUW team will be looking for stations on mountain peaks from the top of 14,000 ft. Mt. Shasta, in northern California. For further information, call Dave Bermann WA6GUO at (916)-877-5606. This is not a contest, just a big party.

David A. Bermann WA6GUO
Paradise CA

IN COHERENT CW

This a note from an amateur, HS4AMI, 420 km, seven hours northeast of Bangkok. When I came here in September, 1980, the ARRL said they would ship my amateur club a couple of their Friendship transmitter kits—but nothing arrives. Oh, well, "drinking" executives can't do everything.

I am teaching amateur radio as an extra course to science and engineering students. We are progressing through tuned circuit to antenna theory.

My coherent CW experiments have been a great success: 559 both ways to California with 1 Watt, on 10 meters. We are going for 100 mW over 10,000 km, at 10 baud, with 24 dB gain and *no* filter. We will be happy to hear if our 10-100 mW are heard on the east coast.

Our format is at a 10-baud, crystal-controlled rate. We send

dots for tuning and then ident on 14,049,000 Hertz ± 1 Hz at 1500 and 2300Z every day.

The transmission can be heard on any receiver. The big gain is when you have the digital filter.

George Collins HS4AMI
Khon Kaen University
Khon Kaen, Thailand

SPREAD THE WORD

I just read Wayne's editorial in *73* in the June, 1981, issue and found it very interesting. You say Japan has twice as many hams as the USA. I can believe this. I'm 51 years old, no kid, and have reasonable intelligence, but it took me 11 months to find out how I could become a ham. After all that time, I get to go to my first lesson for my Novice tonight.

I'm really excited because I think it's a great hobby and will probably invest approximately $2000 for equipment. But what a shame it took me so long to find out how to start. The problem is that you guys are like a secret organization.

I checked all over on clubs and how to get started, (Radio Shack, local electronics parts' houses) and all I got was (at Radio Shack) the advice to read a book. I didn't want to read a book, I wanted to talk to someone. I couldn't check antennas on roofs because CB and ham antennas look alike to me.

So maybe if you folks would put out signs at Radio Shack, etc., about clubs and classes it would help build up amateur radio. I don't mean to be a wise guy, but if you folks did more to promote the hobby, more of us would find out about it. There may be 1000s of people out here just trying to find out where to start.

Robert W. Simpson Sr.
Glen Mills PA

SEEING-EYE HAM

I would like to see a "thank you" printed in your magazine. I drive a semi truck and was directed to the heart of New York City, New York, by a person that did an excellent job. I didn't make one wrong turn and was led by the hand via 2 meters for about four hours without a letup.

I found out later that Butch N2CGQ was blind!

I didn't think much about that because if a person lives in a place many years, he could direct you around town from his QTH. But I just found out yesterday that the fellow only knew New York by what had been described to him. So, Butch put his Seeing-Eye dog aside to help me find my way.

Thank you, Butch, for your assistance and keep up the nice work.

Leo Mercer
Albert Lea MN

ANOTHER POLL?

After having thoroughly enjoyed John Edwards' poll in the June, 1981, issue, I decided to conduct a survey of 20-meter CW. The following results were tabulated:

90% think they have keyers that stick.
2% think I have a receiver that chirps.
87% of those calling CQ are named Noah (why else would they sign with ARK?).
100% think that even though I am hundreds of miles away I am concerned that it is raining there.
67% are quick to point out that they have no problems when I tell them I have TVI.
45% think the band is in bad shape.
13% just got home from school.
12% are just leaving for work.
8% think the QSB is very bad and could I help by slowing down.

I am ever willing to add to the fund of ham radio knowledge.

James F. Reid W8LWS
Laurel MD

GOOD OLD RAY

I am writing to try to clear up a problem I've had ever since I was assigned the call letters W2YI in 1977: I've received many QSL cards from the bureau, dating from 1971 through 1980, for "W2YI, Ray, New Jersey."

To begin: Dear fellow radio amateurs, please accept my apology for any inconveniences you've been caused by this fellow, Ray. He is not assigned the callsign W2YI and, as the FCC has told me, he never was. They have assured me that I am the only person licensed to operate an amateur radio station with that callsign. I am sorry you've been duped by this person.

I would appreciate hearing from any amateur who has any information about good old Ray from New Jersey. He prefers to operate CW on 14 MHz and has worked mostly Europeans. I do have a few QSLs from his expeditions to 40 and 80 meters also.

The FCC has begun a monitoring program, and is fully aware of Ray's activities. It has assured me that I will not be held responsible for Ray's illegalities.

I feel Ray should get off his duff and study for his own Extra class license, since it is not that difficult. It seems he is already a licensed radio amateur, holding a General or Advanced ticket, who is too lazy to take the time to study and upgrade. Another theory holds that he is an ex-military CW operator who likes to DX a bit, but doesn't want to take a test.

And now to Ray: Ray, I am not angry or spiteful about your actions. The FCC understands that I'm not responsible for any problems that may arise as a result of your operations. I do wish to hear from you, though. Please drop me a letter, and enclose a check to cover the costs of maintaining those envelopes at the second call area QSL bureau, courtesy of the kind folks at the North Jersey DX Association.

Jeffry M. Blackmon
The Real W2YI
7714 Lindbergh Avenue
Niagara Falls NY 14304
(716)-283-8346

LOOKING WEST

Bill Pasternak WA6ITF
c/o The Westlink Radio Network
Suite 718
7046 Hollywood Blvd.
Hollywood CA 90028

TOTAL OVERHAUL NEEDED

This will not be a normal Looking West column. That's not to say that you should bypass it, though. In fact, I hope that this month we will attract a far greater cross section of the amateur populace than usual. The reason will become evident as we progress.

Simply said, there's something wrong behind the so-called "Codfish Curtain." For those of you who have never heard the term before, I refer to the upper echelon at Newington. First, there was the Central Division Director's race. This is still in dispute as far as the Indiana Radio Club Council is concerned, and I suspect that Wayne will be covering this in depth. On this one, I bow to our fearless leader.

Now, on the heels of this controversy there erupts yet another. One that hits at the very foundation of amateur radio. For the people involved are considered to be the upper crust of amateur radio, the Big-Gun DXers. Why should a group of these people band together for the purpose of undermining the ARRL's DXCC program? In case you were not aware, that's what has happened. As you read on, I think that the rationale for their actions will become quite clear. If not, then tune in the low end of 20 meters and listen to a few pileups. It will become quite self-explanatory at that point.

I should preface all this with a few remarks. First, I neither condemn nor condone the action taken. I can understand the frustration of those involved. Yet I have to say that nothing has ever been accomplished by "burning down a house because you don't like the furniture inside." Second, I am not a DXer. In fact, I don't really fall into any particular category of amateur except possibly that of observer.

As the latter, I come into contact with hundreds of amateurs annually. With some, I share common interests. With others, there is no commonality. Somewhere in between there is another group: Those with whom I

became friends on a social level, while finding commonality of interest in amateur radio.

It is because of this latter involvement that I can relate firsthand the story which is about to unfold. It is based directly on a taped interview with a very well-known DXpeditioner, Dave Gardner K6LPL. Also, there will be some supposition on my part, but the supposition itself will be based upon the fact that I spent about 50 hours editing the audio tapes of Dr. Gardner's ill-fated 1979 DXpedition to Palmyra. A trip that almost cost Dave and those with him their lives.

I think that the best way to begin is to explain the situation as of this date: the 27th of May, 1980, and then present, verbatim, my interview of the 23rd with "Dr. DX." Here we go:

Westlink Newscast #193 for the week of May 25th, 1981, story item number 4: An amateur has been disqualified from DXCC, and another has quit the program as a result of a bogus QSL card scheme now roaring through the DX community. On April 23rd, the League disqualified Robert Findley W6NZX from DXCC because they allege that Findley submitted forged and counterfeit QSL cards for DXCC credit.

Now, hot on the heels of Findley's disqualification comes word that Dr. Dave Gardner K6LPL has tendered his resignation to DXCC, at the same time stating his part in what appears to be a worldwide attempt by some leaders of the DX community to effect what they feel are needed changes to the DXCC program. [At this point we inserted a 33-second sound bit with Dr. Gardner explaining what transpired and why. This will be reprinted later on, so there is no reason to duplicate it here.]

Gardner told us that the idea began at last year's Fresno International DX Convention, and that 14 well-known DXers were involved, ten of them being Honor Roll members. In our interview, Garner stressed what he felt were three key points. First, that this was not an attempt to discredit either the League or its DXCC program. Second, that all the cards involved, possibly as many as 25,000, were all pre-1975 vintage. [Ed. note: As explained later, the date was chosen to not influence those currently trying to climb the DXCC ladder or affect their standings.] Third, that his three QSL managers, W7PHO, W6AHU, and N6AHU had no knowledge or involvement in what Gardner termed to be an organized protest to point out the greed and avarice of many hams.

What action the League will take from here is unknown. A DXCC Advisory Committee member we spoke with declined to comment officially on the matter. He did say that there was no machinery set up to accept the resignation and that any action taken would be precedent setting.

OK. There you have the capsule version. Your basic one-and-a-half-minute news story. But, there is far more to it than what appears on the surface. This I learned while talking to Dave Gardner. Here is our conversation:

Q: What do you know about the bogus QSLs running around in DX circles?

A: At the 1980 Fresno International DX Convention, 14 hams were engaged in a rap session about improving the sorry state of DXing. We decided we had to get the attention of the amateur community to bring the hobby of DXing back to that which would generate some international goodwill and good times instead of this terrible race for QSL cards which has led to greed and avarice and foul language, etc., on the bands. The way we chose to do it was by flooding the world with pre-1975 QSL cards. These cards were given by the 14 members of our group, 10 of whom are Honor Roll members, to amateurs around the world. Our estimate is that about 5,000 of these cards have made it to DXCC headquarters thus far.

I do want to say that his action was not anti-League or anti-DXCC. It was designed to capture the attention of the world so that we might once again bring amateur radio DXing back to what it was before, a hobby instead of an addiction for QSL cards.

Q: What do you think will happen now?

A: I don't really know. Pre-1975 QSL cards are floating into the DXCC office [ARRL headquarters]. I hope it will help the league reassess its position about DXCC and help to take some of the violent competition out of DXing, and also help eliminate some of the bad feelings all over the world in the DX community. It's impossible for a rare DX station to get on and rag chew with a friend. He's completely smothered by people wanting QSL cards. This forces people onto lists, and that's just like reading out of the telephone book. It's certainly not DXing. All it amounts to is getting the QSL card. While I have not been anti-list in the past, I now see this as being another effect of the whole craze for QSL cards.

Q: Do you blame the DXCC program for all these problems?

A: It's not just the DXCC program. It's partly DXCC's fault, but I think the people at DXCC are well intentioned. I don't think them to be evil people trying to do bad. I do think that their policies, among other factors, have led to a general deterioration in the quality of amateur radio, and amateur radio DXing in particular.

Q: Why this route rather than the political one, i.e., lobbying for change with the DX Advisory Committee?

A: The DX Advisory Committee really has no power. They can only make recommendations to the General Manager [Note: currently Dick Baldwin W1RU] who takes it upon himself to decide what *is* a country and what *isn't*. He's a fine gentleman, but he has been unresponsive to the DX community. I just think that the League's emphasis is so far away from improving the DX conditions (operating standards) that I do not think they really care all that much. We didn't think the League would be responsive at all, because they have not been in the past.

Q: What action have you taken as a result of this so-called scandal?

A: I've personally resigned from DXCC. I know of several others whose resignations are also imminent. My resignation was tendered well before this "scandal" broke. We hope that in the future people will have a bit of a question in their minds: "Is that QSL card really necessary and is it worth the price of my own personal pride I will have to pay?"

As to my own future plans? I will continue to work my DXpeditions in the same way I have in the past. All of my own QSLs are handled by QSL managers and they were not in any way a part of this operation. I should also state that the operation is over. No more cards are going out. No more will go out. We feel we have made the point we had to, and now it's time to go on and try to improve conditions in amateur radio DXing.

There you have it! Right from the source. Dave did not name the others involved. In a subsequent conversation, he explained that it was for each of the people involved to come forward of his own accord if that person felt he wanted to. But there is something far more important than who did what involved here. In the view of this writer, it again points out the inability of League headquarters to deal with the problems of "today's" amateur radio scene. When a group of the world's top DXers has to band together outside the ARRL and try to force change, because headquarters has been unresponsive to their ongoing call for change, something definitely is awry. I think that "unresponsiveness" is the key word here and it's not just in dealing with the DXCC program and the problems some feel it creates. Let's look a bit closer to home.

On the two-meter band, there has been an ongoing call for more years than I can remember that the Board of Directors enact a specific band plan in regard to the 146 through 148-MHz repeater subband. Thus far, there is still no true standard. The east runs repeaters every 15 kHz right-side up; the west runs them every 15 kHz inverted and the Pacific northwest opted to totally recoordinate on 20-kHz centers to match the 144.5 through 145.5-MHz subband. Instead of taking a stand one way or the other, the Board continually postpones making a final decision.

OK. Most of us are lucky enough to have synthesized radios these days and most, though not all, will work under all conditions. Am I being picky? I think not. Keep in mind that several parts of the nation are currently becoming involved in what amounts to a "squeeze play." Inverted systems moving toward them from the west, and non-inverted from the east. One of these days, there may be one heck of a looped lockup when the two forces meet. And who

will suffer? The poor ham caught in the middle. Yet, the Board fails to act. Fails to take a stand. I honestly think that they are unaware of the consequences their unresponsiveness may eventually cause. But, they're going to have to take a stand and they're also going to have to learn that you cannot appease everyone, that a nationally-standardized band plan for this spectrum is essential and whatever one they choose will be unpopular in some quarters. It will probably be met with some resistance. But, choose they must.

I think that Gardner has hit upon something important, perhaps the key to what the real problem is in Newington. If this is the case, and I happen to be a League member and supporter who feels it to be so, then maybe it's time that the rank and file, you and I, start taking some positive steps toward revamping "*our*" organization to what is needed to represent us in today's fast-paced society. I've always said that criticism brings with it a responsibility of alternative, so here goes.

First, I think it's time that the rank and file members of the League are given the opportunity to elect more than just their Division Director, Vice Director, SCM, and the like. We should also be the ones who elect the President, the Vice Presidents and other upper-echelon personnel. Maybe utilize a system similar to the Electoral College as used in our own federal government. Here, though, you would vote to "direct your Director" to cast his ballot for the candidate the majority in a given Division voted for, on a popular-vote basis. If it works for the USA, it can work for the ARRL.

Then there are the many Advisory Committees whose advice seldom is heeded it seems. Suppose they were no longer Advisory Committees. Rather, each was empowered to make decisions and implement them. Here, again, you would need a change in the structure. Right now, the members of these committees are appointees of the given current League president. What they should be are elected representatives of a given Division, elected by their peers to represent their views and ideals. For instance, those serving on VRAC should be active members of the mainstream of VHF repeater operation. In other words, be active on all local 2-meter repeaters, since that's where the bulk of today's activity is. They should be accessible to their constituencies both on the air *and* on the phone. If a problem arises, they should be there to take command and arbitrate a solution. I must ask how many of you know who your VRAC representative is or how to get hold of that person on an immediate basis if an emergency were to arise?

This should hold true of all members of all special-interest committees. If you can't reach the man or woman when they are needed, if they are not willing to express your views as your representative, then why bother having such a person in the first place. By the same token, if your representative or an entire committee is ignored time after time, then the committee structure holds no value other than surface political appeasement. I know a number of people who serve on various committees of this sort, and you have no idea how frustrating it is for them to work diligently for months on end, dedicating their time and efforts in the hope of making our amateur community a better place to be, only to have a group of politicos veto, shelve, or ignore their works.

If Wayne Green and I disagree on any one point it's over the ARRL. Wayne has often stated that in regard to the League, you vote with your checkbook. That is to say, if you don't join or "re-up," you have voiced your displeasure in a way anyone can understand: in their pocketbook. I take a different view. First, I believe we need a strong national organization. Right now, the ARRL is the only game in town, and as of this writing nobody has taken the initiative to start a new organizational effort. Maybe someone will. Right now, the League is it, for better or worse. In that vein, I believe that the only way to make the ARRL into the kind of organization we need is to become active in it. Become aggressive. Work toward change. Yes, you will get shot down by the "old guard." In politics, that's the name of the game. If you have the tenacity and the courage of your convictions and if you can garner the support of your fellow hams, you can and will make your voice heard. Nothing is impossible! It merely takes dedication and the willingness to fight it out.

Since I began Looking West, I have been a League watcher. As you know, I have a very simple way of dealing with them. When they do something that's right, proper, and beneficial to amateur radio, I will be among the first to laud them for their achievements. On the other hand, when something is wrong, I will also be among the first to cast criticism. Yes, I am lucky in that I have a national platform from which to be heard, but even if this were not so, my approach would not differ.

I do not remember who coined the expression "Codfish Curtain" in describing Newington. I heard it expressed at more than one convention of late. Unlike a curtain made of iron which can only figuratively rust and decay with age, one made of organic matter can take on a rather odoriferous characteristic if left to the elements. I do not want to see this happen to the League. Not to *my* League. Yet, one must wonder when even the DX crowd has to rebel. To figuratively take to the hills, grow beards, and wage a guerrilla-type of war to get the attention of Newington. Not that I can or will condone such activities or that of any form of terrorism in the world today. Violence only begets violence; hate only begets hate. There's enough of this in the world today without it seeping into the very fiber of amateur radio.

Maybe the 14 DXers were wrong, but it's evident that they were crying out for needed change only to be met with a deaf ear from League headquarters. They made their decision and must live with it. You and I might have taken a completely different route. Nonetheless, I think the point they were trying to make is the very same one I am trying to make right here and now. A simple message to Newington that says wake up, "the times they are a changing."

KAHANER REPORT

Larry Kahaner WB2NEL
PO Box 39103
Washington DC 20016

. . . IT'S ALL A BIG MICROPHONE

Washington press credentials ought to carry warning labels like the ones on cigarette packs. It should read: "Danger—Covering Congress or federal agencies may result in loss of perspective."

We of the Washington press corps tend to overdo it. Granted, what happens here at the center of the empire eventually affects your life, but we probe every speech from every bureaucrat and analyze every bill even though it stands less than one in a hundred chance of becoming law. What happens as a result of that massive coverage is that we succumb to the forest/tree syndrome. Amid our hunger for details and minutia, we may not see the issues or spot the trends.

Such is the case with reportage of the government's apparent changing attitude toward regulation of the airwaves. Congress, the FCC, and other lawmakers want to change the statutes, little by little, to restrict what we see and what we hear. They wish to deny access to monitor the electromagnetic spectrum, a rather amorphous, albeit quite real, natural resource.

For the past several years, the news media has reported isolated government actions in this area but so far no one has taken a step back and looked at the big picture. *Newsweek* hasn't strung it all together, splashed it on the cover, and pronounced it a trend. Nor has NBC Nightly News run a special report at a quarter past the hour and declared it Truth.

It's not that they're poor journalists, and it's not that they don't care. It's just that we're all too close to the action to see it

clearly and understand that it isn't just a lingering fragment of the '60s paranoia.

Since 1934, when the Communications Act was passed, the law was clear. If it were sent over the air, you could receive it. If you could pick it up, you could listen. Transmissions are regulated for the public good, but receiving is public domain. That's the basis of the Communications Act and, in larger terms, a philosophy that stems from common law.

Constraints exist, however. You can't divulge anything you hear to a third party (that doesn't hold for broadcast or ham communications) but that seems fair; we can live with that.

But we're in a new age and the Communications Act needs rewriting. It's moldy, out-of-date, especially in the area of technology. Last year, Congress tried overhauling it but didn't get very far. They're trying it again this year, but it probably won't go anywhere either. For one thing, the subject is complex and most representatives are afraid to tackle it. However, if you read the proposals, last year's and this year's, you'll notice that they both include prohibitions against receiving so-called pay-TV and other private, commercial transmissions. No one argues that pay-TV operators deserve some sort of protection from video vampires who seek to steal their wares and market them for half price, but that can be handled locally on a case-by-case basis as "theft of service." Growing national policy towards regulating what we may receive seems to be traveling a dangerous path.

In another instance, the FCC has decided to amend the rules to allow licensees in the Power Radio Service to use scramblers. Service members, which includes power companies, prompted the rulemaking to reflect their concern that terrorists and vandals might intercept transmissions and somehow use the information to disrupt a nuclear power plant or blow up a group of hydroelectric generators.

The FCC gave the OK, as it did when police and fire departments requested similar permission. Unless a petitioner convinces the Commission that scrambling is a dumb idea, it becomes law on July 22.

In addition, the FCC said it will allow scramblers in other sectors of the Land Mobile Service on a secondary, noninterference basis. There was even talk of letting taxicabs scramble transmissions.

We can go on. Many states rule that you may listen to police on your scanners at home but not in your car. You may use a microwave receiver at your place of business but not in your car, because then it would be called a radar detector.

The trend is clear. More and more restraints and regulation of the public's access to transmissions that use a public resource.

FCC Commissioner Joseph Fogarty, commenting publicly on the scrambler proposal for the Power Radio Service, recommended formation of a task force "to study the problem of maintaining the privacy and security of the telecommunications network in the face of the threat by the new technologies."

Sorry, Commissioner. The problem can't be solved. There's no way that any telecommunications exchange can be made secure or private, because by its very nature the electromagnetic spectrum is like a city street. If you walk in it, you relinquish your right to privacy, and it seems that everyone really knows that *except* those who try to legislate that security and privacy.

If you want privacy, try a handwritten note. There will always be some high-tech freak who wants to exercise his right to listen and watch while you're using his natural property. Or maybe he'll just do it for the sheer challenge of breaking the code. Nevertheless, no one ever promised that airwaves would be private—in fact, the FCC has historically maintained just the opposite—and to expect it now is socially unreasonable and technologically impossible.

Perhaps the Secret Service—whose field communications consist of simple handie-talkies on easily-found VHF and UHF frequencies—says it best. After the assassination attempt on President Reagan last March, I asked a spokesman if the Service was planning any new procedures to tighten security. He asked in what areas, and I mentioned the handie-talkies. I told him I knew the frequencies and even the code words; Reagan is "Rawhide." "Isn't that a security problem?" I asked.

He replied: "We don't use scramblers because you'll only figure out how to unscramble it. And we use code names because it makes things easier for us. Our philosophy is simple: 'Say nothing over the air that you wouldn't say into a microphone connected to the loudest PA system in Washington. The telephone, the radio; it's all a big microphone, and that's the way it's always going to be.' "

CORRECTIONS

Since my article "The Nicad Conditioner" was published in the April, 1981, issue of *73 Magazine,* I've had many letters from as far away as Honolulu complimenting me on it.

One reader did note a minor error in the diagram shown in Fig. 3 (p. 107). At the top of resistor R2, there should have been a dot to indicate a connection. Without this connection the timer module would not receive its trigger pulse.

Mitchel Katz W2KPE
Flushing NY

Re the article, "Mayday," on page 78 of the June, 1981, *73 Magazine*: After continuous operation for 7 months, we finally had our first Clegg 22'er equipment failure on the ELT detector. The failure was attributed to overheating of an audio loading resistor in the audio output stage. The problem was corrected by circuit changes and relocation of heat-generating components as detailed in Fig. 1.

The DF articles in the June issue were extremely informative and I hope will encourage further innovative advances in the state-of-the-art of DFing.

Ed Sommerfield W2FJT
Poughkeepsie NY

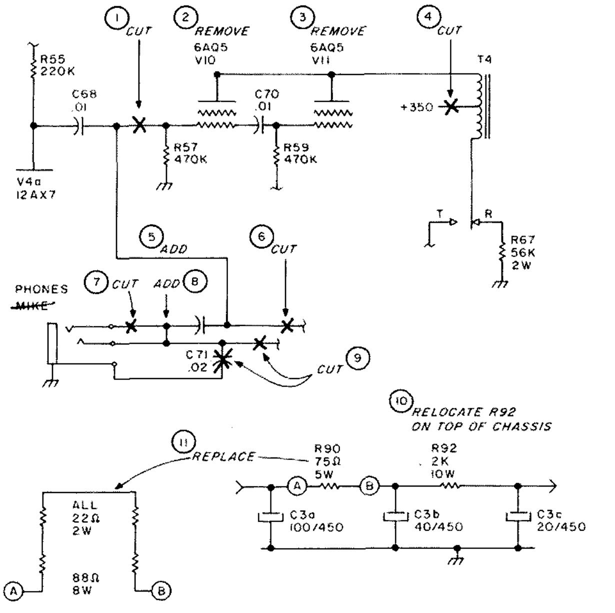

Fig. 1. 11 changes to the Clegg 22'er ELT detector to eliminate heat problems.

OSCAR ORBITS

Courtesy of AMSAT

The OSCAR satellites are subject to atmospheric drag, of course, and the present period of intense solar activity has accentuated the problem. During this period, our sun has been expelling huge numbers of charged particles, some of which find their way into the Earth's upper atmosphere, increasing the density (and thus the drag) there. It is through this region that the OSCARs must pass. OSCAR 8, in a lower orbit than OSCAR 7, is the more seriously affected of the two.

If the drag factor is not considered when OSCAR calculations are performed, long-range orbital projections will be in error. For example, by the end of 1979, OSCAR 8 was more than 20 minutes ahead of some published schedules. The nature of orbital mechanics is such that extra drag on a satellite causes it to move into a lower orbit, resulting in a shorter orbital period. Thus, the satellite arrives above a given Earthbound location earlier than predicted.

Using data supplied to us by Dr. Thomas A. Clark W3IWI of AMSAT, the equatorial crossing tables shown here were generated with the aid of a TRS-80™ microcomputer. The tables take into account the effects of atmospheric drag and should be in error by a few seconds at most.

The listed data tells you the time and place that OSCAR 7 and OSCAR 8 cross the equator in an ascending orbit for the first time each day. To calculate successive OSCAR 7 orbits, make a list of the first orbit number and the next twelve orbits for that day. List the time of the first orbit. Each successive orbit is 115 minutes later (two hours less five minutes). The chart gives the longitude of the day's first ascending (northbound) equatorial crossing. Add 29° for each succeeding orbit. When OSCAR is ascending on the other side of the world from you, it will descend over you. To find the equatorial descending longitude, subtract 166° from the ascending longitude. To find the time OSCAR 7 passes the North Pole, add 29 minutes to the time it passes the equator. You should be able to hear OSCAR 7 when it is within 45 degrees of you. The easiest way to determine if OSCAR is above the horizon (and thus within range) at your location is to take a globe and draw a circle with a radius of 2450 miles (4000 kilometers) from your QTH. If OSCAR passes above that circle, you should be able to hear it. If it passes right overhead, you should hear it for about 24 minutes total. OSCAR 7 will pass an imaginary line drawn from San Francisco to Norfolk about 12 minutes after passing the equator. Add about a minute for each 200 miles that you live north of this line. If OSCAR passes 15° east or west of you, add another minute; at 30°, three minutes; at 45°, ten minutes. Mode A: 145.85-.95 MHz uplink, 29.4-29.5 MHz downlink, beacon at 29.502 MHz. Mode B: 432.125-.175 MHz uplink, 145.975-.925 MHz downlink, beacon at 145.972 MHz.

At press time, OSCAR 7 was scheduled to be in Mode A on odd numbered days of the year and in Mode B on even numbered days. Monday is QRP day on OSCAR 7, while Wednesdays are set aside for experiments and are not available for use.

OSCAR 8 calculations are similar to those for OSCAR 7, with some important exceptions. Instead of making 13 orbits each day, OSCAR 8 makes 14 orbits during each 24-hour period. The orbital period of OSCAR 8 is therefore somewhat shorter: 103 minutes.

To calculate successive OSCAR 8 orbits, make a list of the first orbit number (from the OSCAR 8 chart) and the next thirteen orbits for that day. List the time of the first orbit. Each successive orbit is then 103 minutes later. The chart gives the longitude of the day's first ascending equatorial crossing. Add 26° for each succeeding orbit. To find the time OSCAR 8 passes the North Pole, add 26 minutes to the time it crosses the equator. OSCAR 8 will cross the imaginary San Francisco-to-Norfolk line about 11 minutes after crossing the equator. Mode A: 145.85-.95 MHz uplink, 29.4-29.50 MHz downlink, beacon at 29.40 MHz. Mode J: 145.90-146.00 MHz uplink, 435.20-435.10 MHz downlink, beacon on 435.090 MHz.

OSCAR 8 is in Mode A on Mondays and Thursdays, Mode J on Saturdays and Sundays, and both modes simultaneously on Tuesdays and Fridays. As with OSCAR 7, Wednesdays are reserved for experiments.

OSCAR 7 ORBITAL INFORMATION FOR AUGUST

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
30698	1	0137:11	104.7
30710	2	0036:29	89.6
30723	3	0130:43	103.2
30735	4	0030:01	88.0
30748	5	0124:15	101.6
30760	6	0023:33	86.4
30773	7	0117:47	100.0
30785	8	0017:05	84.9
30798	9	0111:19	98.5
30810	10	0010:37	83.3
30823	11	0104:51	96.9
30835	12	0004:09	81.7
30848	13	0058:23	95.3
30861	14	0152:37	108.9
30873	15	0051:55	93.8
30886	16	0146:09	107.3
30898	17	0045:27	92.2
30911	18	0139:41	105.8
30923	19	0038:58	90.6
30936	20	0133:13	104.2
30948	21	0032:30	89.0
30961	22	0126:45	102.6
30973	23	0026:02	87.5
30986	24	0120:16	101.1
30998	25	0019:34	85.9
31011	26	0113:48	99.5
31023	27	0013:06	84.3
31036	28	0107:20	97.9
31048	29	0006:38	82.8
31061	30	0100:52	96.4
31073	31	0000:09	81.2

OSCAR 8 ORBITAL INFORMATION FOR AUGUST

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
17360	1	0029:13	69.3
17374	2	0033:51	70.5
17388	3	0038:30	71.7
17402	4	0043:08	72.8
17416	5	0047:47	74.0
17430	6	0052:25	75.2
17444	7	0057:03	76.4
17458	8	0101:42	77.6
17472	9	0106:20	78.8
17486	10	0110:58	79.9
17500	11	0115:37	81.1
17514	12	0120:15	82.3
17528	13	0124:53	83.5
17542	14	0129:31	84.7
17556	15	0134:09	85.9
17570	16	0138:47	87.0
17583	17	0000:14	62.4
17597	18	0004:52	63.6
17611	19	0009:30	64.8
17625	20	0014:07	66.0
17639	21	0018:45	67.1
17653	22	0023:23	68.3
17667	23	0028:01	69.5
17681	24	0032:38	70.7
17695	25	0037:16	71.9
17709	26	0041:54	73.1
17723	27	0046:31	74.2
17737	28	0051:09	75.4
17751	29	0055:46	76.6
17765	30	0100:24	77.8
17779	31	0105:01	79.0

OSCAR 7 ORBITAL INFORMATION FOR SEPTEMBER

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
31086	1	0054:24	94.8
31099	2	0148:38	108.4
31111	3	0047:55	93.2
31124	4	0142:09	106.8
31136	5	0041:27	91.6
31149	6	0135:41	105.2
31161	7	0034:59	90.1
31174	8	0129:13	103.7
31186	9	0028:31	88.5
31199	10	0122:45	102.1
31211	11	0022:02	86.9
31224	12	0116:16	100.5
31236	13	0015:34	85.4
31249	14	0109:48	99.0
31261	15	0009:06	83.8
31274	16	0103:20	97.4
31286	17	0002:38	82.2
31299	18	0056:52	95.8
31312	19	0151:06	109.4
31324	20	0050:23	94.3
31337	21	0144:37	107.8
31349	22	0043:55	92.7
31362	23	0138:09	106.3
31374	24	0037:27	91.1
31387	25	0131:41	104.7
31399	26	0030:58	89.5
31412	27	0125:13	103.1
31424	28	0024:30	88.0
31437	29	0118:44	101.6
31449	30	0018:02	86.4

OSCAR 8 ORBITAL INFORMATION FOR SEPTEMBER

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
17793	1	0109:39	80.1
17807	2	0114:16	81.3
17821	3	0118:53	82.5
17835	4	0123:31	83.7
17849	5	0128:08	84.9
17863	6	0132:45	86.0
17877	7	0137:22	87.2
17891	8	0141:59	88.4
17904	9	0003:25	63.8
17918	10	0008:02	64.9
17932	11	0012:39	66.1
17946	12	0017:16	67.3
17960	13	0021:53	68.5
17974	14	0026:30	69.7
17988	15	0031:07	70.8
18002	16	0035:44	72.0
18016	17	0040:20	73.2
18030	18	0044:57	74.4
18044	19	0049:34	75.5
18058	20	0054:11	76.7
18072	21	0058:47	77.9
18086	22	0103:24	79.1
18100	23	0108:00	80.3
18114	24	0112:37	81.4
18128	25	0117:13	82.6
18142	26	0121:50	83.8
18156	27	0126:26	85.0
18170	28	0131:02	86.1
18184	29	0135:39	87.3
18198	30	0140:15	88.5

HAM HELP

I need mint-condition ARRL *Handbooks* for 1947, 1952, 1955, 1961, 1962, 1966, 1967, 1975, 1977, and 1979. Top Dollar Paid.

Norton K. Earle
6421 Burgundy Way
Las Vegas NV 89107

I am looking for parts and cards for a Hickock Cardmatic tube tester. I have a Bell System model number KS-15874-L2 serial number above 900; the military model is AN/USM-118 and the commercial version is 1234 commercial 4. The test cards can be used with any unit. Thank you.

Karl D. Burket
PO Box 790
Payette ID 83661

I need a schematic and/or manual for a Measurements Model M-216 signal generator. I will pay copying and mailing costs.

Oliver Wayne
514 Park Ave.
Hoboken NJ 07030

Would someone who has a copy of a Hallicrafters S-27 receiver schematic let me borrow it or send me a copy of it? I will gladly pay costs.

Jules Vetter KH6YU
3657 Tantalus Drive
Honolulu HI 96822

Any amateurs with Sinclair Z80 or 81 or Micro-Ace microcomputers: Please write to me if you are interested in exchanging programs/ideas for ham use.

Paul L. Newman G4INP
3, Red House Lane, Leiston
Suffolk IP16 4JZ
United Kingdom

I am looking for a portable intercom circuit with the following features: one master station with power supply, up to 10 slave units small enough to wear as belt packs, three-wire connection between units, call light and call switch on each unit, individual volume control, and headset earphone/boom mike.

Fred Musgrave, Major
The Salvation Army
Special Projects Director
Suc 3 Cass 194
1403 Buenos Aires, Argentina

I need a schematic and/or an alignment procedure for a Hallicrafters SX62A general-coverage receiver. I will pay for copying and postage or I will copy and return.

Dick Roux N1AED
25 Greenfield Dr.
Merrimack NH 03054

✓See List of Advertisers on page 114

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The Southwest's most progressive communications company stocking Kenwood, ICOM, Yaesu, MFJ, B&W, Astron, Larsen, Cushcraft, Hy-Gain, Bearcat, and more. Would like to serve you! **Power Communications Corp., 1640 West Camelback Rd., Phoenix AZ 85015, 241-Watt.**

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Complete lines ICOM, DenTron, Ten-Tec, Mirage, Cubic, Lunar, over 4000 electronic products for hobbyist, technician, experimenter. Also CB radio, landmobile. **Fontana Electronics, 8628 Sierra Ave., Fontana CA 92335, 822-7710.**

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Smyrna GA

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Terre Haute IN

Your ham headquarters located in the heart of the midwest. **Hoosier Electronics, Inc., #9 Meadows Center, P.O. Box 3300, Terre Haute IN 478003, 238-1456.**

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The ham store of N.E. you can rely on. Kenwood, ICOM, Wilson, Yaesu, DenTron, KLM amps, B&W switches & wattmeters, Whistler radar detectors, Bearcat, Regency, antennas by Larsen, Wilson, Hustler, CAM. **TEL-COM Inc. Communications & Electronics, 675 Great Rd., Rt. 119, Littleton MA 01460, 486-3040.**

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Your company name and message can contain up to 25 words for as little as $150 yearly (prepaid), or $15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the October issue must be in our hands by August 1st. Mail to 73 Magazine, Peterborough NH 03458. ATTN: Nancy Ciampa.

PROPAGATION

J. H. Nelson
4 Plymouth Dr.
Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14A	14	7	7	7	14	14	21A	21A	21A	21
AUSTRALIA	21	14A	7A	7	7	7	7A	14	21	21A	21A	21A
CANAL ZONE	21	14A	7A	7	7	7	7A	14	21	21A	21A	21A
ENGLAND	14	7	7	7	7	7A	14	14	21	21	14A	14
HAWAII	21A	14	7A	7	7B	7B	7	14	14	14	21	21
INDIA	14	7A	7B	7B	7B	7B	7A	14	14	14	14	14
JAPAN	14A	14	14	7B	7B	7B	7B	7B	7	14	14	14A
MEXICO	14A	14	7A	7	7	7	7	14	14	14	21	14A
PHILIPPINES	14A	14	7B	7B	7B	7B	7B	7A	14	14	14	14
PUERTO RICO	14	7A	7	7	7	7	7A	14	14A	14A	14A	14
SOUTH AFRICA	14	7B	7B	7	7	14	14	21	21A	21A	14	14
U. S. S. R.	7	7	7	7	7	7A	14	14A	14A	14	14	14
WEST COAST	14A	14	7	7	7	7	7	14	14A	21	21	21

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14A	14	7	7	7	14	21	21A	21A	21A	21
AUSTRALIA	21	14A	7A	7	7	7	7A	14	21	21A	21A	21A
CANAL ZONE	21	14A	7A	7	7	7	7A	14	21	21A	21A	21A
ENGLAND	14	7	7	7	7	7	7	14	14A	14A	14	14
HAWAII	21A	14A	14	7A	7	7	7	14	14	21	21	21
INDIA	14	14	7	7B	7B	7B	7B	7A	14	14	14	14
JAPAN	14A	14	14	7B	7B	7B	7B	7B	7	14	14	14A
MEXICO	14	14	7	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14A	14A	7B	7B	7B	7B	7B	7A	14	14	14	14
PUERTO RICO	14A	14	14	7	7	7	7A	14	14A	14A	21	21
SOUTH AFRICA	14	7B	7B	7B	7B	14B	14	21	21A	21A	14	14
U. S. S. R.	7	7	7	7	7	7B	7B	14	14A	14	14	7A

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7	14	14	14	14
ARGENTINA	21	21	14	14	7	7	7	14	21	21A	21A	21A
AUSTRALIA	21	14A	14	7	7	7	7A	14	21	21A	21A	21A
CANAL ZONE	21	14A	14	7	7	7	7A	14	21	21A	21A	21A
ENGLAND	14	7	7	7	7	7	7B	14	14A	14	14	14
HAWAII	21A	21	14A	7A	7	7	7	14	14	21	21	21A
INDIA	14	14	14	7A	7B	7B	7B	7B	14	14	14	14
JAPAN	21	14	14	14	7A	7	7B	7B	7	14	14	14A
MEXICO	14A	14	7	7	7	7	7	14	14	14A	14A	14A
PHILIPPINES	21	14A	14	7	7	7B	7B	7A	14	14	14	14A
PUERTO RICO	21	14	14	7	7	7	7	14	14	14A	21	21
SOUTH AFRICA	14	7B	7B	7B	7B	7B	14	14	14A	21A	14A	14
U. S. S. R.	7	7	7	7	7	7B	7B	14	14A	14	14	7A
EAST COAST	14A	14	7	7	7	7	7	14	14A	21	21	21

First letter = day waves Second = night waves
A = Next higher frequency may also be useful
B = Difficult circuit this period F = Fair
G = Good P = Poor * = Chance of solar flares

AUGUST

SUN	MON	TUE	WED	THU	FRI	SAT
						1 F/P*
2 F/F	3 G/F	4 G/F*	5 G/F	6 G/G	7 G/G	8 G/F
9 G/F	10 G/F	11 G/F	12 G/G	13 G/G	14 G/G	15 G/G
16 G/G	17 G/G	18 G/F	19 G/F	20 G/G	21 G/G	22 G/F*
23 P/P* 30 G/G	24 P/P* 31 G/G	25 F/P	26 G/F	27 G/G	28 G/G	29 G/F

September 1981 $2.95

73 MAGAZINE FOR RADIO AMATEURS

73 MAGAZINE sept. 81


Be Prepared!—26


Free PR—50

Cover: Photo by Robert C. Diefenbach WD4NEK, Atlanta GA.

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

CONSUMER PROTECTION

A flyer being passed out at some Chicago area hamfests is a case where it is not always the customer who is right. In point of fact, I've found that in a surprising percentage of the complaints I've received, it has been the ham who has been the real troublemaker. In this case, we have a flyer, unsigned, but allegedly being perpetrated by K9SOA. The flyer is based upon distortions and innuendo.

I talked with a dealer recently who ran through some of his recent battles with hams. One brought in his rig to be fixed. He was given an estimate of the cost of repairs. The rig was repaired and the bill was close to the estimate. The chap then beefed about how much it cost and asked for something which took the salesman out of the room. The ham grabbed the rig and ran out of the door with it, refusing to pay anything. It took a judge to make him pay up.

Another customer brought in a rig with intermittent output. With final transistors at $85 a clip, he was aware that the bill could be heavy. The serviceman (ham) tried a new final, but that didn't do it. Then he switched the final board with a brand new one. Still no go. Next he tried a brand new master board. That fixed it. Upon checking the faulty board, he found that a coil was causing a short when it heated up...so he fixed that. Rather than taking another hour and running up the repair costs even more, he left in the brand new boards.

The ham came in for his rig while the repairman was out. He asked for the bum part. The salesman went to the repair bench, spotted the final transistor, and gave it to the customer. When the repairman came in and discovered the $85 transistor missing, he had the store owner get in touch with the ham and ask for it back. The ham insisted that the transistor had his call engraved on it and that it was from his rig. The owner explained the whole situation and that the part had the date on it of manufacture, which was quite recent. The ham told the store owner where he could stick it and hung up. The call of this ham had an FAO in it, I understand. Is it any wonder that more and more ham dealers are giving up on even trying to make repairs? They find the customers making every effort to screw them...the repair techs are making so much that often the dealer has to swallow part of the repair costs, and so it goes.

Oh, there are sharks out there among the manufacturers and dealers, too, but very few...and I generally hear about them as soon as they start causing trouble. I've been able to put a lot of these turkeys out of business.

One recent rip-off ended with the ham pulling the stunt being convicted. This is not the first time for him. Knowing his history, I have never accepted ads from him. The first time, he got a lot of *QST* readers through his ads in that magazine. This last trip he stung quite a number of *Ham Trader* readers.

This was the same chap who appeared at Dayton in 1980 and was selling memberships in a national amateur radio organization out of a booth there. I was in Europe at the time, so I didn't hear about it until I arrived in Wiesbaden to give a talk at a hamfest and met a chap who had been to Dayton the previous week. I was suspicious immediately. How can any group even think of trying to start a national organization without at least talking with me? They can't get anywhere without a publication...and *HR* is totally tied up by the ARRL, which doesn't leave a lot.

When I got back, I looked into it and lo, there was our ham from the *QST* rip-off fame, now in Connecticut. His pitch was that a group of ten wealthy hams had gotten together to form a national ham group, each putting up $15,000 in seed money. I knew that had to be hogwash. That wasn't likely to happen without me hearing about it. I wrote about the scam in *73* and did not get sued, further confirming it as a caper. The ham quickly left Connecticut and reopened in Virginia, where the *Ham Trader* rip-off came from. Well, he's been convicted...again...so let's see what is next.

Even prison doesn't stop the truly dedicated bunco artists. In the computer field, we have a chap who ran two rip-offs and was convicted and sent to prison for both of them. The first time he crawled under the fence and escaped, only to turn up in Tulsa a few months later with another way to cream computer hobbyists willing to believe they could get something for almost nothing. This chap turned up a third time recently, this time operating from prison with the help of a guard. There's no stopping a truly dedicated man.

ETHICS

Yes, surprisingly enough, an ethical question has been causing some storms in DX clubs. The question raised is this: How much is it ethical to charge a fellow club member for the date and time you worked a rare station using his call?

Sure, there was a time when

W2NSD/1 ON-THE-AIR SCHEDULE SEPTEMBER, 1981

1	20-40 CW
8	15-20 Phone
15	20 RTTY
22	15-20 Phone
29	15-20 Phone

Response to our 15- and 20-meter phone sessions has been especially strong, so we have scheduled additional time on these two bands. On both phone and CW nights, look for us in the first 25 kHz of the General portion of each band. We'll be on the higher frequency band first, starting at 7:00 pm eastern time.

WE HAVE WAITED LONG ENOUGH!

73 has waited patiently for the past couple of years; we are not waiting any longer. We are taking up the TVRO challenge.

Amateur radio's innovation capabilities are enviable. It is time that we donned our collective thinking cap and began to produce some workable systems at reasonable costs. This not only will get us in on the satellite TV fun, but, more importantly, will sharpen our skills for use in the neglected areas in which much of ham radio's future lies—the microwave region and worldwide communications via satellites.

We are interested in complete systems, in individual components (receivers, low-noise amplifiers, etc.), antennas and antenna mounts, and everything it takes to produce an operational system. So, get writing! If you have any questions, get in touch with us. And don't forget: *73* pays on acceptance—you can build or improve your TVRO station at our expense.

something like that was done for pure friendship, but leave it to some hams to get commercial about their hobby. For many years we've seen some of the DX clubs swapping lists of needed countries..."Hey, if you hear an XZ on, work him for me, okay?" So the big signal corps often gets in there and whips off a dozen or so contacts, making sure that friends and club members have the new country nailed down.

Ten dollars for the date, time, and frequency-of-your-choice contact seemed reasonable for quite a while, but now inflation has hit and friendships are being debased with demands for more cash. $20 is a more acceptable "gift" for a new one, with some rumors of $50 being asked. What is amateur radio coming to? I think that anything over $25 is outrageous.

MENTAL INCOMPETENCE

With the recent court decision to deny K6EOA his license on the basis of mental incompetence, many feel that things may have gone too far. Indeed, it has been reported that amateurs in southern California are in a panic, with many barricaded in their homes against a possible FCC onslaught.

Much of the mail in the last few weeks has expressed legitimate concern over this situation, bringing up again that old and unanswered question: Which comes first? Amateurs want to know whether normal people lose their sanity when they get ham licenses...or whether licenses are only issued to mental cases. It has apparently leaked out that amateurs must travel in pairs to get two oars in the water.

Frankly, I think this is a tempest in a teapot. I say that before judges rule on *our* sanity, someone should rule on *theirs*...and we would be in a standoff immediately. Remember that most judges started out as lawyers. I rest my case.

MORE RADAR NEWS

Hardly a week goes by without some reader calling up to say that he's been nabbed for speeding...and what should he do. In all of these cases the ham was transmitting as he went through a radar speed unit and the ticketed readers feel that

Continued on page 133

Well...I Can Dream, Can't I?

by Bandel Linn K4PP

I found the trouble! I had to rip out quite a few parts but—lucky for you—I'm only charging you three dollars for the whole ball of wax!

Hugh D. Jaeger K4ESQ
20185 Cottagewood Avenue
Deephaven MN 55331

10,000 Contacts from Easter Island

—four Minnesotans make a dream come true

Easter Island, Isla De Pascua in Spanish, is positioned 2,500 miles west of Santiago, Chile, in the South Pacific, one of the most remote inhabited islands in the world. The island is substantially triangular in shape, 13 miles in length by four miles wide, and has three inactive volcanic formations.

The soil of the island is primarily of red volcanic dust which constantly found its way into the equipment, clothing, and the skin of the operators.

A group photo while sightseeing in the cave area. We are standing in front of Moai that face toward the town. From left to right, Hugh K4ESQ, Dick WØRIF, Father Dave CEØAE, George KØDHI (Steve's father), and Steve NØNO.

The island is accessible either by twice-weekly air service or by ship which sails one or two times a year.

Easter Island is governed by Chile and is assigned the call prefix CEØ. The island has not been active on the air for the past two years—from May, 1979, to February, 1981—as the station of Father Dave, priest of the Catholic Parish Parroquia, had been out of operation due to a storm in May of 1979.

Easter Island is noted for the Moai religious carvings which are positioned on the island, with numerous theories behind the some 600 statues as to who carved and erected them.

Steve Boller NØNO of Lake Minnetonka, Minnesota, and George Boller KØDHI (NØNO's father), Dick Linder WØRIF of Winona, Minnesota, and I operated the Easter Island DXpedition from February 17 to 24, 1981.

Thanks

While most articles give the "thanks" at the end of the article, it is particularly noted that this DXpedition would not have been possible but for the help of the following:

Burghardt Radio provided transceivers and accessories with expert follow-up advice on equipment repair while we were on Easter Island. It was discovered that one of the transceivers developed a receiver problem during operation and no courtesies are extended to the manufacturers of the transceivers who were very reluctant to assist in this DXpedition.

Butternut Electronics supplied their HF5V-III vertical, which performed perfectly and was an ideal antenna to transport as check-on baggage. Heathkit provided an SB-200 linear amplifier on loan, which worked marvelously. Sid Kitrell WØLYM at Telex/Hy-Gain assisted with a TH3 Mark II triband beam. Hiawatha Electronics of Winona furnished coaxial cable at cost. Lan-Chile Airlines and Braniff Airlines transported the four operators and all of the associated equipment including the triband beam, as discussed later, from Minneapolis to Easter Island by way of Santiago.

Patricio Fernandez, CE3GN, of Radio Club de Chile, assisted with the licensing procedures through the Secretaria de Telecommunications of Chile who graciously issued each operator an individual license. It is interesting to note that the Chilean licenses are considered a work of art, contrary to the computer-generated licenses issued by the Federal Communications Commission in the United States.

Finally, and most important, thanks goes to Father Dave CEØAE, whose accommodations for the operators and assistance with the many other important facets of this operation are deeply appreciated.

Preparation

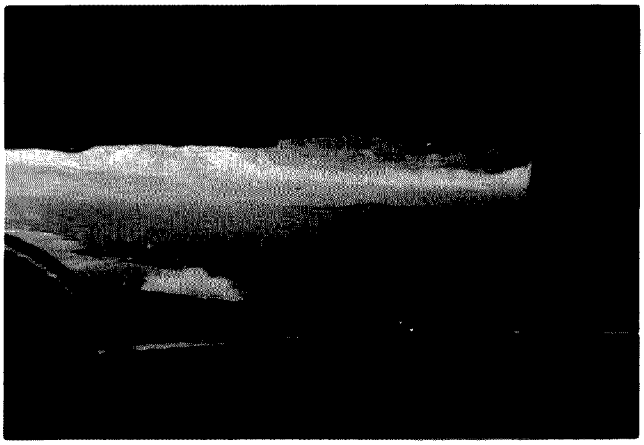
The first objective for a DXpedition is to determine the location, feasibility of operation, transportation, availability of power, lodging, food, and licensing for operation. Fortunately, Easter Island provided a superior location in the South Pacific during the middle of their summer, which was during the middle of the cold Minnesota winter, thus providing a major incentive for the operators.

Easter Island is accessible by transportation on Lan-Chile which flies two flights a week out to the island, using Boeing 707s. The island provides essentials of dependable electrical service and adequate housing facilities which made for an enjoyable trip and encouraged over 10,000 contacts in less than a week's time. The government of Chile granted reciprocal licensing to US amateurs with the assistance of the Radio Club de Chile.

Once the location of the DXpedition had been chosen and licensing procedures instituted by executing the documentation and forwarding the documents to the Radio Club de Chile, preparation of airline reservations was undertaken, along with the securing of equipment for operation. The airline reservations were particularly important because of the fact that there are only the two flights a week to the island, so, consequently, extra time was allowed for incoming and outgoing flights to prevent any scheduling problems.

The planning for the DXpedition began in September and was seriously undertaken in December, including the licensing procedures. Numerous discussions were conducted over "DX juice" (pitchers of beer), laying the groundwork for the operation and drafting lists for operating equipment and supplies. During these discussions, it was decided that two stations would be utilized, that the stations would be identical for interchangeability in the event of equipment failure, and that each group traveling to Easter Island would carry an operational station. Each group could operate independently of the other in case of separation of the parties and if only one party made it to the island.

In late December, with the licensing underway and airline reservations con-



Flying in on approach to Easter Island. This shot was taken by Steve NØNO from the cockpit of the Boeing 707.

Take-List for Easter Island DXpedition

FL-200 coax input single wire relay	Lights (7½ Watt)
SB-200	Miscellaneous wire goods
Transceivers (2) w/filters	VOM
Pwr supplies (2)	Wire nuts
Memory keyer	Screwdrivers—regular and phillips
Standby keyer	Diagonal cutters
Microphones (2)	Needle nose pliers
Paddles	Pencils
Logs	Tape—black plastic and cloth
SB-200 spares	#14 wire and connectors
Small speakers	Fuses
2 Verticals	Fans
Beam	Crescent wrenches
Dipole wire for 40 and 80	Vise grips
Coax—300' RG-8X	Travel Plugs
Radials	Flashlight
Fishline	Strapping tape (fiber)
Assorted coax connectors, male and female	Hose clamps
Swr bridge	Foot switch
Nylon cord for beam	Scrap paper
Beam mount	Swiss army knife
Insulators for dipoles	Spare SB-200 tubes
T-connectors	Ground radials
20,15,10m stubs	Aspirin
Soldering iron and solder	Band-Aids™
220-110-volt stepdown trans	Thermometer
Extension cords	Motion-sickness pills
	Gum

I had to go up on top of Father Dave's church to do antenna repairs for Father Dave in order to place his station back in operation. The church roof was rather rusted, so one always had to watch where he stepped.

firmed, contact was made with manufacturers and suppliers regarding any sponsorship and assistance for the DXpedition. It was noted that all of the manufacturers and suppliers were willing to cooperate by providing equipment at the lowest possible cost or on loan, which was graciously accepted.

All of the manufacturers and suppliers previously thanked were very cooperative in the spirit and brotherhood of amateur radio, with the exception of the manufacturer of transceivers who unfortunately not only did not reply to our requests but when contacted by telephone had a lack-of-candor problem in acknowledging assistance. This would not have upset the DXpedition as much except that the equipment suffered operational problems on Easter Island. As many an amateur can realize, there is no local radio store or supply house down the street to run to pick up a replacement i-f transformer for the receiver, or other parts.

Spare parts were taken along, but working on solid-state equipment in the middle of a remote island is not the most ideal situation, especially lacking the sophisticated testing equipment required. In spite of all this, repairs were made to a receiver i-f transformer by removing the opened transformer and using a capacitor as a substitute, although this resulted in reduced receiver sensitivity.

When the receiver problem was recognized in the middle of the week of operation, stateside amateurs in Ohio and California assisted by telephoning Jim Smith WBØMJY of Burghardt, who came up on frequency on 15m to diagnose the problem. Burghardt immediately identified the problem after being informed of the symptoms and instructed in disassembly of the transceiver to reach the opened transformer.

Disassembling a foreign-made transceiver to reach a circuit board below another circuit board can be a jigsaw puzzle on first-time disassembly. Burghardt advised on disassembly and stood by on frequency for advice on successful repairs. The operation continued for the week with little downtime.

Most important to the DXpedition after securing the licenses and equipment was drafting lists and dividing equipment prior to departure for equal weight distribution as well as independent operation of stations. The individuals traveled in groups of two and divided all equipment, including antennas, *prior* to departure to avoid any last-minute preparations.

The DXpedition was publicized in *The DX Bulletin*, the *Long Island DX Bulletin*, Geoff Watt's, and other DX bulletins as well as foreign publications, advising of operation and QSL procedures. This was undertaken a month prior to departure.

Final Travel Arrangements

While it is not an absolutely mandatory requirement, every DXpedition should have an airline pilot who knows his way around airlines. Our airline captain, Steve NØNO, prepared preliminary letters of introduction on company letterhead, not only in English, but also in the foreign language needed, which in our case was Spanish, just in case the letter was required for customs or for airline identification. The letters we had proved to be invaluable, especially the Spanish letters, when Lan-Chile was waiting for lost luggage to arrive from the Minneapolis airline.

Our travel arrangements were further expedited and secured by Steve, who was instrumental in obtaining transportation for the 12-foot-long beam package and masting from Minneapolis to Santiago and Easter Island, as well as meeting the other operators on arrival at customs in Santiago, where a Chilean customs pass allowed access and movement through the customs area. Finally, Steve coordinated the arrangements with Lan-Chile, who were most hospitable and accommodating to the DXpedition.

Travel

The two groups departed a couple of days before leaving for Easter Island on separate flights when Steve NØNO and his father George KØDHI left for Santiago from Minneapolis by way of Dallas, New York, Buenos Aires, and Santiago. Dick WØRIF and I departed the following day on a Minneapolis-based carrier to Miami, where that carrier managed to misplace the vertical antenna at the change-over in Chicago. This required numerous phone calls after arrival in Miami to not only track down the antenna but to expedite its shipment to Miami for departure on the Miami-Santiago flight of Lan-Chile.

Due to the short time between flights, it was necessary to secure the antenna in Miami, as otherwise the antenna undoubtedly would not have followed the group to Easter Island, making operation rather

difficult with only a beam and wire antennas. Fortunately, Lan-Chile was most cooperative in securing the antenna from a third carrier, Eastern Airlines, which transported it from Chicago to Lan-Chile in Miami.

It was found that the Lan-Chile personnel understood the urgency of the matter by reading the Spanish letter prepared by Steve on his airline stationery and made a special effort to locate and secure the antenna prior to our departure for Santiago. WØRIF and I proceeded to Santiago via Lima, Peru, with an extra long stopover due to the hydraulic failure in the DC-10. On our arrival at Santiago, NØNO was at the airport to assist in going through Chilean customs.

Going through customs is interesting, especially when one is carrying brand-new communications equipment through a country where possession of such equipment is a sensitive matter due to prior political considerations. It always helps to have someone in the group speak the language of the country and, fortunately, three of the operators were fluent in Spanish, although it was interesting to observe that the customs individual didn't want to discuss the matter in Spanish but preferred to discuss it in English. After the mission and purpose were explained to customs and the documented paper work, including licenses, was shown, the operators were waved through customs with only a cursory inspection. However, we learned that it is best not to show any papers or documents unless requested, to avoid prolonged questions and delays.

Layover

After spending over a day in the air between Minneapolis and Santiago and transferring through airports with the weight of the equipment, which was all carried on as hand luggage to avoid its being lost, let alone being banged around by the "baggage monkeys," everyone was ready for a good meal, hot shower, and a good night's rest before departing for the operation point at Easter Island. It also gave everyone a chance to have a final checkout of procedures and make final arrangements with the airline, Lan-Chile, for the five-hour flight to Easter Island.

After breakfast the next morning, we discovered on our trip out to the airport that our flight was to be delayed six hours, to late afternoon, so everyone decided to return to Santiago for more sightseeing. The tour was held by the senior member of our crew, George KØDHI, who had previously been to Santiago. Later, everyone returned to the airport for the afternoon departure on Lan-Chile. Fortunately, Steve had arranged to leave all of our baggage at his airline operations office, eliminating the need to carry the equipment between the airport and the hotel, let alone worrying about security of the equipment.

On boarding, Lan-Chile was most gracious in serving DX juice to the group to motivate our operational spirits and provide in-flight briefings in the cockpit by the Lan-Chile captain to our captain. The five-hour flight was rather uneventful, very enjoyable, and provided for interesting discussion up in the wheelhouse due to the professional courtesy of one airline captain to another captain. Thus, NØNO had the first view of Easter Island.

Arrival

The biggest asset to the DXpedition was that, by coincidence, the local amateur on Easter Island was also the priest of the only church on the island and a very highly regarded individual. Father Dave CEØAE, with his Jeep, awaited our arrival at the airport, dressed in his DX hat, T-shirt, shorts, and work boots. He had arranged accommodations for the group and assisted with the transferring of luggage (numerous trips) between the airport and the residence where we were to stay. Situated on an upper portion of the island, the residence afforded a beautiful view of the South Pacific. Father Dave had made arrangements for our group to have three rooms: two for operating and one for sleeping. This plan made operations on a twenty-four-hour basis possible.

These Moai statues on the hillside were carved and left standing before having been moved to the other side of the island. Many were still buried under the ground and some may have been washed out to sea.

The first introduction to the house, which I am sure by Pasquinian standards is upper middle class, was rather surprising to all of the operators. Fortunately, the majority of the homes have running water, electricity, and the infamous flushable toilets, and the climate is such that one can stay very comfortable both day and night.

Our first requirement was electricity for the rigs. Besides using a three-prong 220-volt plug which looked like a socket out of a 1920 radio set, it was noted that our house was wired with lamp cord, which obviously would have caused problems for our linear. After discussion on what to do, the decision was made to take one of the heavy-duty extension cords, cut off the plug, and wire directly into the knife switch of the 220-volt fuse box. The box was interestingly constructed, with fuses which looked to be something out of the 1920 era of ceramic fuses. The whole thing had obviously seen much use, and our questions as to the electrical system were many. Our fears proved to be true the following morning when the fuses blew and, as seems to be the custom on the island, one places a number of strands of lamp cord wire across the fuse instead of replacing it!

As a goodwill gesture to our host family, the group compensated them for all electricity used during the week, which also included *their* electricity. The total bill turned out to be about $40, or $10 per person for the week, certainly not unreasonable, considering that the electric power on the island is generated by

Everywhere Father Dave's Jeep went, a cloud of volcanic dust followed. This cloud eventually covered all of us with the red powder.

diesel-electric equipment with four generators, two running and two on standby. All of the fuel is brought in by ship once or twice a year and therefore the cost is much higher than elsewhere.

As a matter of fact, a majority of everything is brought in by ship. If you have ever thought that a can of Coke is expensive out of a machine, wait until you have to pay $2 for a can of Coke on Easter Island. You can't appreciate the real convenience of those 35-cent or 40-cent machines nowadays until you've bought a can on Easter Island.

Now back to the electrical system. It was jerry-rigged and served the group well when we ran an extension cord directly from the knife switch of the fuse box into the operation shack. We soon found that extension cords were invaluable pieces of equipment, as were multi-socket switchboxes, both of which we should have brought more of. Also, small step-down transformers of 220-110 were invaluable for powering extra cooling fans on the linears, soldering irons, and other accessories.

Operations

The transceivers were easily put into operation with the vertical antenna going up first and the tri-band beam following the next morning due to the late arrival of the plane at the island and rainfall that night. Numerous contacts were made the first evening with the Butternut five-band vertical, including our pipeline back to the Twin Cities. We had almost a daily schedule with Joe KBØCO, who operates from the notorious radio hill in Minnetonka and provided assistance and attended to some of the errands.

Included on page 1 of the logs are the calls of the Twin City DX Association, whose meeting adjourned just in time to get in on the opening volleys from CEØA. Numerous other amateurs provided phone patches to the members of the operators' families, including my patch home to Delaware at no cost, which we are so grateful for. Our other needs, such as getting Burghardt on the air the morning when we discovered we had receiver problems, also were attended to. Burghardt was able to remedy the situation in the field with the components which we had on hand, subsequently ensuring continuous operation of the stations.

We operated almost around the clock, usually stopping at 2 or 3 in the morning and then starting up early in the morning on 80 and 40 meters. The JA runs on 80 were a lot of fun, to say nothing of working the boys back home. Prior to departing home, Stig LA7JO called NØNO on the landline to arrange some 80-meter schedules. What a surprise it was when he talked for 15 minutes, at long-distance rates, just to get zone 12 on 80 meters. For two or three nights 80 meters was salvoed by S7 static and we thought we would never get in touch with Europe. We finally hooked up late one evening and made about 40 European QSOs before the sun rose there.

We operated contest-style for the most part and ended up with 10,000+ QSOs for the one-week operation. That's an average of one per minute, which includes sleeping time thrown in. We usually had two kWs in operation simultaneously and were saved from crossband interference by 1/4-wave stub traps which were connected to the output of the kWs with a T-connector. Without them the crossband interference was intolerable. That is a handy idea for Field Day operations.

All in all, most operators were courteous—with the usual exceptions. Our pet peeve was ops who would consistently, time after time, call out of turn when we had to resort to working call areas. There weren't many, but we feel that the "phantom" logger jotted their calls down in the list of bad guys. Maybe lists aren't that bad after all.

We also could not have existed without our outboard vfo's. We felt sorry for those who were unable to work split from the home front, but then again there probably weren't too many at home who felt sorry that we had spent mega-bucks to put Easter Island on the air. In other words, if you're really going to be serious about DX, buy yourself an external vfo.

In the dark of one of the evenings, one of the operators, in trying to rotate the antenna, thought he had the rotating line and just couldn't understand why the beam wasn't rotating—until he discovered that he had one of the guy lines and was trying to rotate the whole beam with the guy wire.

Credit has to be given to Hy-Gain for constructing a beam which performed very well under the conditions of erection as well as operation and rotation. Special thanks go to Sid Kitrell for assisting us with arrangements on the Telex/Hy-Gain beam.

Operation was smooth, and the operators had time to assist Father Dave in placing his station back on the air. I ended up on the roof of the church working on the vertical antenna, which gave me the opportunity to experience religion above the church as well as in the church. Father Dave's station was placed in operation within days after our arrival on Easter Island, and it is now being operated on a daily basis, time permitting, due to all of his other church duties on the island. While we were operating, Father Dave was sometimes able to stop in at the shack and do some operating himself, although being the only priest on the island places many demands on his time.

It is a custom on the island that blessings can be obtained from the church for such things as the tourist buses, the landing craft used to bring goods in the yearly visits by the ship to the island, fishing boats, and any other things for which the Pasquinians may want to receive blessings. It is interesting to note that

The picture above shows the operating home, which is in the upper portion of the village, the Butternut vertical, and the Telex/Hy-Gain beam. The road is made of red volcanic dust; the vegetation just grows wild. The small shack behind the large home houses a family of three.

Father Dave operating the station with the Kenwood TS-130S and Heath amp. Note cooling fan.

while we were there a fishing boat was blessed. The boat was blessed independently of the motor, which then was also blessed.

We sometimes thought that if we had observed proper customs and had had each piece of our equipment blessed, we may not have experienced some of the transceiver problems we encountered. We therefore concluded that it is very important to observe the local customs on the island and advise all others proceeding to Easter Island that they might want to undertake the blessings of the church on their equipment before beginning operation.

Father Dave took time to spend free moments with the operators individually, which was a rewarding experience for each of us, and he also spent time with us as a group, which included swimming at the beach, picnicking, and a very extensive tour and discussion of the past history of Easter Island. For a priest, Father Dave drove a four-wheel vehicle better than most people. He had no qualms about cutting through the ruts in the road and endured the red volcanic dust which permeated our nostrils and vocal cords, in addition to turning everyone a very particulated red color —that of volcanic dust. By the time of our departure, the operators, equipment, clothing, and baggage were all thoroughly saturated with volcanic dust.

One of the lighter moments of the trip occurred one evening when an operator came wild-eyed into the bedroom where another operator was sleeping. He had a panic-stricken look on his face, scanned the room with a flashlight, and in sheer terror pushed a stone up against the door. When questioned by the now-awakened operator as to what the hell was going on, he excitedly announced that he had seen a rat. I surmise that that operator may have had too much DX juice, which was strictly for medicinal purposes and for putting one into the proper frame of mind to secure the DX contacts. But the operator still swears to this day that the animal he saw was a rat.

It is possible that it may have been a little cockroach or a salamander, but if he says it is a rat, we'll let you decide for yourself. Later on in the evening when the "rats" were running through the ceiling, another operator banged on the ceiling to quiet them down so he could pull in some of the rarer DX locations and the "rat" person rose out of bed with that sheer panic-stricken look of terror again written across his face.

Pileups

Unfortunately, the group was not able to work all of the stations who wanted to work us, yet we were enthusiastically received by amateurs worldwide. Everyone participated in the spirit of amateur radio and brotherhood in an orderly manner, and the operators were QSLing those with SASEs to beat the new postal rates. Not one of us seemed to have thought of this, but a lot of the other stations who have QSLed have thoughtfully taken this into consideration and we graciously thank those who had more foresight in this area than we.

Incidentals

On every Dxpedition, the operator should consider taking along items which would have meaning and promote friendship among the individuals with whom we spend time. Fortunately, the operators took along some of the necessities which are not always readily obtainable at an economical cost on the island: soap, cigarettes, and articles of a radio nature for Father Dave.

When you consider putting seven people plus four amateur radio operators in one home, you can just let your imagination run wild on how most people would get along in an average American home. Fortunately, there was never a problem in spite of what little TVI or RFI we caused, and there were always pleasant words exchanged from early morning to late evening. We even performed babysitting duties and a little bit of emergency first-aid when one of the children of our host family cut his hand on a piece of broken glass. We used bandaging in the form of good old black electrical tape, which provided for a clean wound until the child could get down to the hospital and receive stitches by the doctor.

It is interesting to note that Easter Island, while being so remote, has a hospital with two doctors able to perform surgery and take care of any emergencies or illnesses. The hospital was prefabricated in Florida approximately ten years ago and shipped directly out to Easter Island. It includes all the modern conveniences of our hospitals, with x-rays, laboratory facilities, and

Here we are ready to leave, with the beads of the island around our necks. From left to right, Hugh, Steve, Father Dave, George, and Dick. Father Dave was prepared to pick up the new Mother Superior who was arriving on our departing flight.

dentistry. It was good to see, too, that there was a tennis court on the hospital grounds.

Toward the end of the week, the operators were beginning to become DXed out and beginning to think of home, especially with the wish to take hot showers, since none of the facilities on the island had showers except for the motels.

You can only do so much operating before becoming DXed out. Toward the end of the week and approaching 2,500 contacts per operator, operations were becoming more difficult due to lack of sleep and the constant pileups.

Departure

Leaving was much easier to do than arriving, but certainly was one of the sadder moments of the trip. Prior to the night of departure, we were visited by the English-speaking daughter of the local police sergeant who had previously stopped by a day earlier to ask what all of the shiny new antennas were for and to inspect our license documentation. It certainly was important to have proper documentation of the licenses issued by the Secretaria de Telecommunicationes of Chile, and upon presenting those to the sergeant, the only word from him was "perfect." Had we not had our licenses in order, God probably would have had us operating our DXpedition behind bars. It is important to observe the proper international regulations and laws of the host country.

The following night the sergeant dropped over with his daughter, so she could practice her English with our group, and it made for a very enjoyable evening. Our hosts and the operators exchanged gifts, took pictures, and hugged one another before an early bedtime. As the plane flight was oversold by *only* thirty seats, it was important to plan on an early arrival at the airport for seat selection.

Driving to the airport with Father Dave, I expressed to him that I really wouldn't have been disappointed if the plane had not come for another couple of days, as I would have happily continued operating. Unfortunately, the Lan-Chile flight arrived right on time, which, considering the five-hour flight across the ocean to Easter Island, was amazing. The group loaded into the plane and bade farewell to those who had come out to the airport to see us off. This is quite a custom and included decorating our group with native-made necklaces. We were to depart for home by way of Santiago.

W4PRO and W4GSM and their stations arrived on the same aircraft that we left on. They were met by Father Dave, who was picking up the new Mother Superior, which naturally had to take preference over the arriving amateurs. The other amateurs were to continue operations for the next month and also were to share operations with Chod Harris who was arriving on an archaelogical expedition.

Santiago Festivities

Arriving at the airport, I continued home to my patent law practice in Minneapolis, while the other three operators laid over in Santiago and went to a steak fry the following evening at the QTH of Patricio CE3GN. The Radio Club de Chile overextended their courtesies and provided for a fitting end to a DXpedition, which included gracious hospitality by the amateurs of their city and the country of Chile.

Chile is a very European country which exhibits very interesting French Provincial architecture along with people who are the most caring I have ever seen. You cannot really appreciate their hospitality until you spend time in their cities or fly on their airline. The hospitality was really overwhelming.

Tying It Up

On arriving home, all of the operators found stacks of QSL cards, and the first thing my neighbors said to me was that they knew we were busy down there because they had a large grocery bag stuffed full of QSL cards. Equipment had to be returned, accounts had to be divvied up between the operators, and equipment repairs had to be undertaken for our transceivers which were brought home in a state of makeshift repair. Fortunately, all of these were small matters, but all these things take time, including the unpacking of bags, returning of equipment, washing and cleaning of clothes, and processing all of the photographs that had been taken, including those that appear here.

After being home a week, thank-you notes were still being written and requests from others are still being undertaken and fulfilled. We tried to beat the postal rate hike, but then there's the processing of other cards which are expected to arrive over the next year or two, possibly from the bureaus.

Conclusion

As far as the operators were concerned, the DXpedition was a success, and people in Chile as well as others along our route have a much better feeling for amateur radio and what amateur radio is. The group was very careful to leave behind the true reputation of the spirit and brotherhood of amateur radio so that others will be welcome in the future, whether it be on Easter Island or at some point in between. Truly, it was a remarkable experience for all the members of the group and for the others who came into contact with us. It is something that will be remembered for the rest of our lives as being very rewarding and highly fulfilling. The members of our DXpedition strongly encourage those who are able to to undertake such an DXpedition should the opportunity ever arise. ■

Jocelyn O'Donnell WB2CMB
RD #2, Box 17
Wellsburg NY 14894

A Very "Special" Weekend

—hams help New York's Special Olympics run smoothly

The motto of the 1981 New York State Special Olympics was "Let me win, but if I cannot win, let me be brave in the attempt" and it had a very special meaning to the Rookies Amateur Radio Association of Elmira Heights, New York. This is our story of a weekend for all to remember and the part amateur radio played in this unprecedented event.

I suppose one might say it all began with the 1980 Summer Games held in Elmira, New York. The amateur radio community was approached to provide communications for the event. After much planning and hard work, the 1980 games went on without a hitch. In fact, the state committee was so pleased with our communication efforts that they not only decided to make amateur radio a permanent part of the Special Olympics, but also elected to return to Elmira for a second consecutive summer. Never before in Special Olympic history had the event been repeated in the same town two consecutive years.

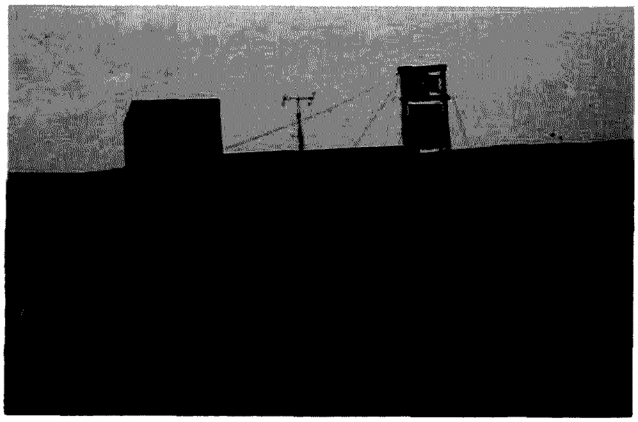
Special Olympians are really special.

Our goal now was not just to provide communications, but to provide *better* communications in 1981. In order to do this, planning for the June 13th weekend began in October, 1980. Every Wednesday evening for the entire winter, Frank Freeman WB2LMB could be found at Elmira College, meeting with the executive committee of the Special Olympics. Because an amateur was asked to be a member of the executive committee, this enabled us to provide more efficient communications. Information WB2LMB gained at these planning sessions was brought back to Jack Daugherty WA2DGS, who was in charge of organizing, assigning, and scheduling all volunteer amateurs and equipment for the Rookies and all area amateurs.

Our work for Saturday's event began Thursday evening, June 11th. There was much to be done. Assembling both two-meter net-control stations became first priority. A conference room in the college campus center was transformed into communications headquarters. Meanwhile, a crew was at Southside High School pitching a 20-man tent and tuning their new 80- and 40-meter bazookas. When all the groundwork was complete, a 32' tower and triband beam were erected. Late Thursday evening, all equipment was in readiness.

Friday morning came quickly to those who helped the previous evening, but by 7:30 am Bill MeadeKA2BED officially called the N3AQ .96/.36 repeater to Special Olympics traffic status only. By 8:00 am, 25 hams were at their assigned posts awaiting the arrival of buses from all 36 areas of New York State.

At the public address desk: WB2UOG, WA2FJM, KA2CLI, and WA3EBG.



A shot of the PA system, the low-band tent, and tower and beam.

Meanwhile, various amateurs were heard checking with net control concerning their weekend assignments and last-minute scheduling changes. It was really gratifying to see amateurs give so freely of their time to help, but to be staffed so well and running by noon Friday seemed really incredible, considering most had to find a way to be absent from their places of employment.

By 12:00 noon, along with bus arrival came K2GOO, a representative of a New York City amateur radio club. Since amateur radio is now to be a permanent part of the Special Olympics, an amateur representative from next year's host city was sent to observe our operation and the services that we provided.

By 1:00 pm, buses were arriving in a steady stream. Hams posted at the exit of the expressway stopped all buses and they were checked in with net control and assigned courtesy cars to follow through the city to the college.

At 2:00 pm, the 26 members of the executive committee had met with their personal amateur communicators. This enabled all members of the committee to be in constant contact with each other for discussions of hundreds of last-minute details. This chore took communicators to many areas, from Southside High School to the Chemung County Airport.

By 6:30 pm, most of the Olympians were settled into their living quarters and awaiting the evening's activities. By this time, roving Red Cross teams had been established and a communicator was assigned to each team. A second net was established on the .10/.70 repeater with net control at the college health center.

At 7:30 pm, the parade began to progress through downtown streets toward the main campus for opening ceremonies. Amateur radio operators ran at the beginning, middle, and end of the parade to provide information on the parade's progress through the city streets. Finally, the climax of the parade arrived—the torch bearer to light this year's Olympic torch. Close behind was his communicator, relating torch progress to net control. Although some of us had difficulty keeping up with our assignments, this had to be one of the most difficult.

At 9:00 pm, news from N3AQ, stationed at the airport, indicated that Governor Carey had indeed landed and would be rapidly proceeding by state-police escort to the site of the block dance on main campus. After a few words to the Olympians, he joined the band in a dance with his wife.

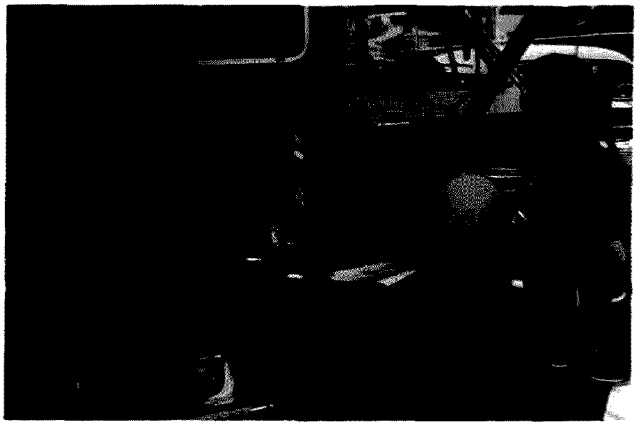
By now, approximately 65 radio operators were working in their assigned areas. As the music of the block dance rang in our ears and the children danced, our activity began to wind down. One exception, however, was the communicators with the roving first-aid crews.

By 11:30 pm, cleanup complete and all first-aid crews relieved by the Elmira Fire Department paramedics for their 11:00 pm to 7:00 am shift, the N3AQ Rookies repeater was released for normal use.

All in all, the first day went quite smoothly. One lost athlete was found quickly and there were only a few minor medical problems— bellyaches and pregame butterflies.

To most amateurs who worked Friday evening, Saturday arrived too quickly. At 6:00 am, personal communicators met with their assigned executive committee officials. KA2BED once again opened the .96/.36 repeater to official Special Olympics net traffic, for administrative messages. Meanwhile, the .10/.70 repeater handled a net for statistical data and various other traffic. Communicators aided in loading the many buses for the ride to the games' site.

9:00 am saw all contestants at the high school awaiting the torch bearer's arrival from the college. After a very touching ceremony and lighting of the



John N2AFW directing spectators to proper area.

Some of the crowd at the 1981 Special Olympic Games.

torch, the games officially began.

At this point, over 125 amateurs were involved in the event, providing communications with thousands of dollars worth of equipment. Of course, all this was at no cost to the Special Olympics and any cost incurred was absorbed by the Rookies as part of their community service.

Was it all worth it? After 6 hours out in the blazing sun, many may have wondered. This question was quickly answered with the smile of a winning athlete as he proudly ran up to you to show off the medals he won. It definitely was all worth it!

The 3:45 pm closing ceremonies were followed by the extinguishing of the torch until next summer in New York City. Bus loading began for the return to the college, and by 7:00 pm, all were reloaded for the trip to the victory dance at Elmira College's Murray Center, eight miles away. This dance was for the 1000 Olympians, 400 chaperones, and over 1500 volunteers. By 8:30, the victory dance was hopping. I personally don't know where they got all their energy. We again supplied security and first-aid communications.

By Saturday evening at midnight with all the buses back at the college, 85% of the Olympics were over. With nearly 4000 manhours of work behind us, we still had to secure the nets and get ready for tomorrow.

Sunday morning at 8:00 am, the .96/.36 net traffic resumed. Buses were checked out as they left the bus parking lot, loaded, and departed from the dorms. By 12 noon, all participants were on their way home.

What are our final thoughts now that it is all over? We would do it again without a doubt. This was a very satisfying and beautiful experience. Not only was it satisfying from a personal aspect, but also because of the banding together of all the amateurs from the southern tier of New York and the northern tier of Pennsylvania for a common cause. On a larger scale, you saw people from all walks of life in the community giving their time and individual talents to work together toward one common goal: providing the best Olympic Games ever for the children. Amateur radio operators were proud to have done their part for this common cause and to have served their community.■

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Getting Ready for the Real Thing

—emergency preparedness that works

We picked our way carefully through the staging area out onto the open road. Clusters of brightly-colored tents and campers dotted the field. Strapped in the passenger seat of the open jeep, I warned Dave WA3THB whenever motorcycles crossed close to us. It was a hot, dry Memorial Day weekend at Fort Indiantown Gap in southeastern Pennsylvania. During the seven years that we had provided ham radio communications for the motorcycle enduro, this was the best weather we ever had.

Photos by WA3REY

The 146.04/.64 portable repeater atop Second Mountain. Don WB3AXO (left) and Keith WA3UDJ.

Up ahead the road straightened out as we ran the length of the valley. A thick plume of dust followed us as Dave picked up speed. The dust blocked my sight of the ambulance following close behind. The quick rise and fall of the ambulance siren told me that they were still with us. Quick jabs of the siren pierced the dust. I held on tighter. I was on the edge of my seat watching the road and the front right wheel, some three feet away. My cameras swung wildly from their neckstraps as Dave turned onto Cold Springs Road. The front tire whined as we came out of the turn.

"It's got to be right up ahead," Dave yelled above the siren, pointing towards the base of the mountain.

"NCS, this is W3FEY," the portable repeater on top of Second Mountain came to life. "Request that they expedite that ambulance, Net Control." George, W3FEY arrived at the scene of the accident and gave us the location. We were leading the ambulance to a motorcycle and car accident that happened a few minutes earlier along the enduro route.

Up ahead, a tight knot of people surrounded a downed rider lying in brush along side the road. Dave ran the jeep into a field. The ambulance passed us on our right. Grabbing cameras and HT, I followed Dave and the ambulance crew to the injured rider. George was standing in the road with an HT.

"W3FEY, this is Net Control."

"This is W3FEY."

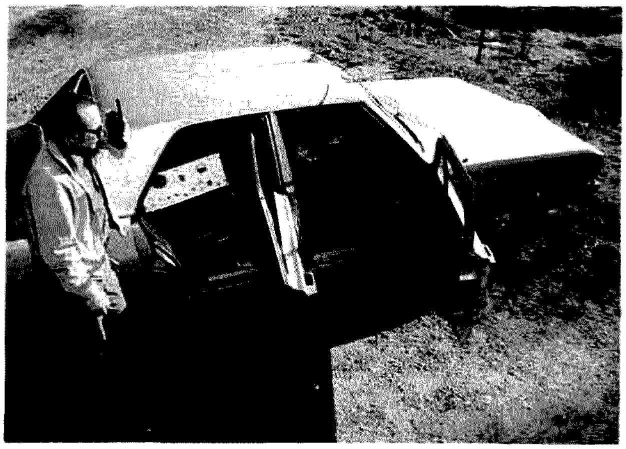
"George, we got a request to get somebody from the Trail Riders to go up the road and block traffic so we don't have any more trouble." Net Control's request was answered as George and a rider headed up the road.

"Hang in there, John, keep talking to me. Don't go to sleep, John," one of the EMTs was saying as they worked on the injured rider. "Keep talking to us, John. Don't go to sleep," the EMT kept repeating over and over again as they loaded the rider into the ambulance.

This was the first of five injuries on the enduro course that day. Ham radio directed each rescue.

Beginnings

In 1974, Jim Moore W3ASA, then president of



Frank N3RZ stands next to his portable repeater, a .70/.30 220 repeater linked to the main .40/.64 machine to extend coverage. The duplexer is in front seat, the machine and battery in the back, and the antenna is on the car roof.

Keith WA3UDJ at the starting line.

the Valley Forge Trail Riders (VFTR), persuaded a few hams to help his club provide communications over the 100-mile enduro route. The Moonshine Enduro takes its name from Moonshine Church, located next to the staging area.

The enduro trail starts from that staging area and snakes its way up mountains, across streams, and, in general, takes the most difficult, indirect route between start and finish lines. Jim repeatedly told us that the *enduro* is *not* a *race*. Instead, it is a course marked with paper arrows. Checkpoints dot the course. Riders have a specified time to travel from checkpoint to checkpoint. They are penalized for arriving early or late. The VFTR marks the riders' time cards as they arrive at each checkpoint. Hams have one basic job—communications. With 12 checkpoints along the route and between 300 and 500 riders, that means a lot of messages. Messages are either emergency or routine. The NCS directs the net from the staging area.

After seven enduros, I've come to some conclusions about things that have worked for us. A few of them are technical; some of them are operational. All of them are common sense. If you are at all interested in improving amateur emergency communications, stay with me. But don't limit these ideas to enduros only. They just might work during the next Hurricane Agnes or TMI.

Technical

The first two years, we attempted the impossible. We tried to cover two mountains and a valley on .52 simplex. The VFTR laid out 12 checkpoints over an area about 10 miles long and 5 miles wide. Not only was the enduro route tough for the riders, but it was rough on rf. At times, I've believed the VFTR purposely placed key checkpoints in the rf shadow of a mountain.

My main complaint with simplex operation over the enduro course is that all stations cannot hear each other all of the time. An early-morning situation might impact on stations later in the day. For instance, this year, course-direction arrows were maliciously removed early in the enduro. By operating through the repeater, all checkpoints were aware of the situation throughout the day. The other problem with simplex operation is the constant need for relays. This takes time. The NCS was located in the staging area. When operating simplex, a relay station had to repeat many of NCS's transmissions for outlying checkpoints. Solution: Replace the relay station with a repeater. Chances are very good that if you can get a ham into an area, then you can also put a portable repeater there. You might as well go first class and use the repeater as the relay. Put the ham somewhere else, where thinking and decision making is required, such as at a checkpoint.

People

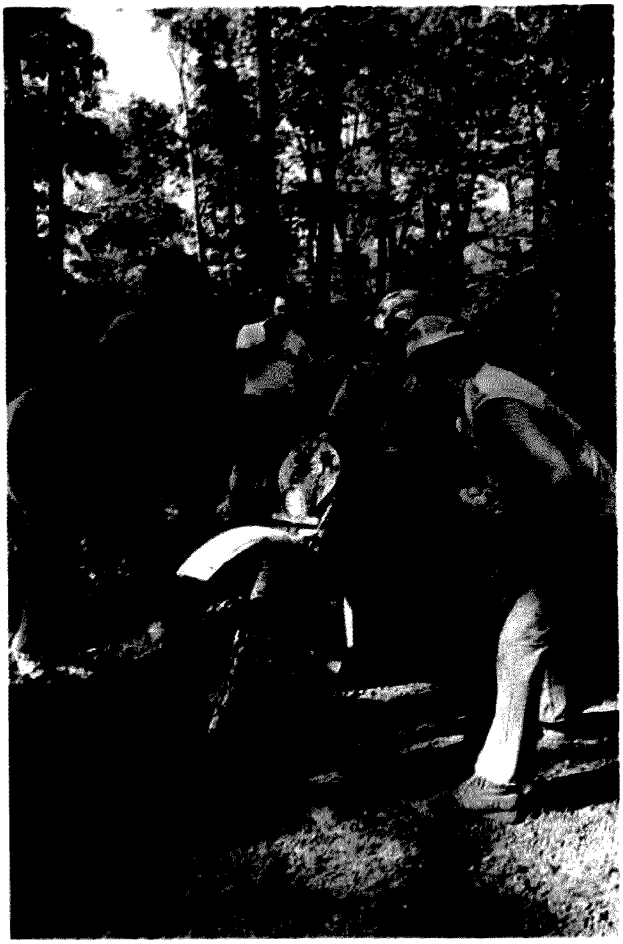
"People" also can be read as "volunteers." There are 12 checkpoints with, ideally, two hams to a checkpoint and the NCS, one ham for each of the ambulances, and one or two hams to ride dirt bikes into remote areas. That's at least 30 volunteers! Find me 30 volunteers, all hams, willing to give up one-third of their Memorial Day weekend. Sound impossible? It is, unless the event is really outstanding and you understand volunteers.

Ever wonder why the ARRL has so little participation in its simulated emergency tests or why the local radio club has a bad turnout for weekly RACES nets? And why does the local emergency coordinator have trouble filling out his yearly activity report? You've all heard them complain that hams are like everyone else. They don't want to get involved. They say that hams are complacent.

They are right.

Hams are complacent about simulated emergencies. Think about that. *Simulated* emergencies. Do you really get turned on by the idea of a simulated hurricane hitting Anytown, USA? If you do, I've got this nice piece of swamp land I'd like to talk to you about...

The problem is that there is very little that gets the adrenalin flowing during a simulation. That's why emergency tests and practice nets are failures. Why not give your volunteers the real thing—or at least a chance that the real thing might happen? If you can't find a motorcycle club with an enduro, then find a police chief up to his armpits in Halloween pranks. Or a citizens' crime watch patrolling the neighborhood with 100-mW CB HTs ("...Hey! Want to see how I can dial 911 through my Wilson HT?"). The idea just might catch on.



Ron K3TZJ, middle, with white shirt, watches from a safe distance as scores are marked by the checkpoint team.

I guess the greatest *simulation* of them all is Field Day. The club plans all year long how it's going to be tops in the *QST* listing. Everybody takes off that weekend for the country with emergency power from real emergency generators. I think you get extra points for that. Anyway, when the 24-hour emergency is over, everybody packs in the KWM2, the tribander, and the empty beer cans and heads home. Terrific emergency preparedness.

The first thing I don't understand, and I'm sure someone will help me, is why are all those hams running to the country when the emergency strikes? The other thing I can't quite figure out is if it's such a great emergency exercise, why didn't all those prepared contesters help us back in 1972 when Hurricane Agnes flooded the east coast during Field Day weekend.

Let's face it. Field Day is a great contest, but it's really only a simulation.

OK. You've got your enduro or crime watch or public transportation Guardian Angels and you are ready for the real exercise. Now you need people, pronounced, "volunteers." Two things are important here. First, don't limit your exercise to club members only. Find volunteers both in and outside of clubs. Just because a ham isn't a joiner doesn't make him a bad communicator. In the event of an emergency, the guy is a volunteer first and a club member second. During TMI, the only prerequisite was a valid ham license. ("I've got this great shift for you in the Hershey Sports Arena watching TMI evacuees from midnight until 3:00 am! You can join the club later.")

Now for the second thing about volunteers. There is no faster way to turn off a volunteer than to persuade him to leave work early and lose half a day's pay. Then, when he arrives on the scene, let him stand there with nothing to do. If you request volunteers, make sure that there is meaningful work for them to do or you probably just lost a future resource.

Estimating the number of people needed to do a job is difficult. During TMI, I estimated wrong. I was a local township CD director and I requested five more people than I actually needed to help me evacuate a nursing home. When the five volunteers arrived, the fire company had almost finished carrying bedfast residents into waiting ambulances. The county CD director saved me. He suggested that I find substitute work for those five people that were kind enough to lose a half-day's wages. Those volunteers did a great job cleaning, carrying, and loading cots from the nursing home onto waiting trucks destined for the mass care center. The task was modified, but they donated 15 valuable manhours during the emergency.

Operations

Our enduro taught me one lesson I won't forget. If you are assigning hams to checkpoints, give the guys a break. Assign two-man teams whenever possible. Many times, such as in an enduro, the terrain will be unfamiliar and two hams will work better than one.

Case in point: Three years ago, at one of the enduro checkpoints, the nicest-looking 100-pound female checkpoint crew person was run over by 450 pounds of enduro bike and rider. This happened on one of the many trails that crisscross the area. It wasn't too difficult to find the macadam road and to flag down the ambulance. The hard part was finding the right turns to take to lead the ambulance back to the injury. The trails all looked the same to me!

After trying three wrong trails, I called for help. Don WB3AXO saved ham radio's and my reputation that day. He rode his dirt bike along the enduro route until he found the accident. Then he talked me and the ambulance into him. The lesson is simple. Teams of two hams in unfamiliar territory work better than one ham alone.

Let's assume you've got your teams and you are ready to begin. Our operation isn't much different than everyday repeater operation. The big difference is that the repeater is closed. The NCS courteously tells stations outside the event that the machine is closed for the duration of the project. All stations request permission to communicate with other net stations. This is about the only formality needed to control the net.

There are only two kinds of traffic: emergency and routine. We don't use ARRL message forms, nor do we use standard texts. Sorry, this is the real world. It's much faster saying it and, if required, repeating it, than sitting down at a checkpoint and composing a message, counting the words, assigning the priority and handling instructions, etc. That stuff is great for 75 phone nets but it sure isn't needed on a 2-meter FM repeater.

And remember, good ham operation is measured by only one thing, effective

Accident! Dave checks location on map (WA3THB in center).

Accident! Dave WA3THB, holding blue bag and HT, as ambulance crew prepares to load.

communications. From the beginning, everyone is briefed on the mission. We are there for one reason and that is to communicate. We don't put arrows up on trails, pick up wrecked bikes, or mark score cards. The same thing applies to other activities. If you are working with a crime watch, you don't apprehend criminals. That's police work. In short, we are communicators.

Have Fun

I'm afraid to this point I've been pretty serious about injuries and nets and things. But there is a fun side to it all. Whatever event you choose, it just has to expand your life. Seven years ago, I thought dirt-bike riders were troublemakers—a little lower than the Hell's Angels and a little higher than Pagans. Wrong again. They're family people. And they have fun. That's the other nice thing about these activities. For one day, you mix with all kinds of people. There's time to swap ham stories and time to learn about motorbikes. But when it's all over, the best thing is that good feeling from a job well done that comes back to you every time you remember last year's enduro. ■

✓See List of Advertisers on page 114

Paul Grupp KA1LR
73 Magazine Staff

The FRG-7700 General-Coverage Receiver

—a first-rate rig for the shortwave bands

Yaesu has been producing shortwave general-coverage receivers for some time now, and their latest offering, the FRG-7700, obviously benefits from that experience. This machine represents a serious attempt to produce a receiver that is free of the shortcomings that plague many similar units, an attempt which largely appears to have succeeded! With no further ado, let's look at what the Yaesu has to offer.

The Features

The FRG-7700 is a PLL synthesizer-controlled receiver, boasting upconversion to a first i-f at 48 MHz. It covers the entire spectrum between 150 kHz and 29.9 MHz in one-MHz steps. For convenience, there are ten additional positions on the bandswitch for the ham bands. Both digital and analog readouts are provided and bandspread (tuning rate) is good for a receiver of this type. The tuning knob covers about 40 kHz per revolution, and all tuning is accomplished with a single tuning knob—gone are those irritating secondary controls that plagued early general-coverage receivers.

One of six bandpass filters is diode-selected by the bandswitch, allowing Yaesu to dispense with preselector and peaking controls. A 12-frequency memory is available as an option, which allows frequencies to be dialed up with the main tuning knob, stored with the push of a button, and recalled at will with the 12-position rotary M CH switch. A fine-tuning control with a range of about four kHz is provided for these memory channels.

A rotary switch selects mode: FM, LSB, USB, and AM. Three levels of selectivity are provided in the AM mode—2.7, 6, and 12 kHz at the −6-dB points. Selectivity in the SSB modes is rated at 2.7 kHz, and for FM it's 15 kHz. CW signals are tuned in either of the sideband modes, using the 2.7-kHz filter.

Other useful items found on the front panel include rotary attenuator, noise blanker on/off switch, volume and tone controls, agc fast/slow switch, panel-light dimmer switch, squelch for FM, two audio output jacks, and a speaker.

A 12-hour clock is included in the 7700's circuitry, and a number of front-panel switches are devoted to its various functions. These are clustered in the upper right-hand corner, and provide for setting the radio's on and off times. A countdown "sleep" timer allows you to program the radio to shut down after a period of up to 59 minutes. Time is displayed with the same readout as the frequency display, and a switch selects display of either one. Since the clock display can be left on while the rest of the radio is shut off, the FRG-7700 is an exotic but practical substitute for the more mundane AM/FM clock radio.

Rear-panel options are

Continued on page 121

The FRG-7700 general-coverage receiver.

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Two Meters Getting A Little Boring?

—maybe you need to try crossband DXing

I was enjoying "the best cup of coffee in Pine Grove," according to Denny Gibson K3SLG. It was one of those cold January mornings when you drink 3 cups of coffee just to put off that inevitable walk to the truck. Lehman's Luncheonette was warm and friendly in the small Pennsylvania coal region town. Denny and I talked about converting the Regency high-band transmitter on the table in front of us to use in the Palmyra repeater. After the third cup of coffee, I picked up Denny's Icom IC-2AT HT and looked it over closely.

Denny K3SLG shortens a CB antenna to 10 meters.

"Dial up 145.25 and try it," Denny suggested. The thumbwheels clicked in place showing "5.25" on top of the HT. A full-quieting kerchunk came back in reply to the Icom push-to-talk switch.

"So where's the new repeater?" I asked, a little puzzled. For as long as I had operated 2-meter FM, Pine Grove was famous for having one of the best repeaters in the area. The 146.64-MHz machine had been operating on nearby Blue Mountain for the past 7 years. Denny was the owner of that repeater and was responsible for putting Pine Grove on many a ham's map through the repeater's reliable service and friendly operation. Now there apparently was a new subband repeater somewhere close by and my curiosity was growing.

"Where's the new machine, Denny?" I said impatiently.

"Across the street in my basement," he smiled. "It's all clip leads and parts lying on the bench right now, but I want to package it and put it up on the mountain alongside the .64 repeater."

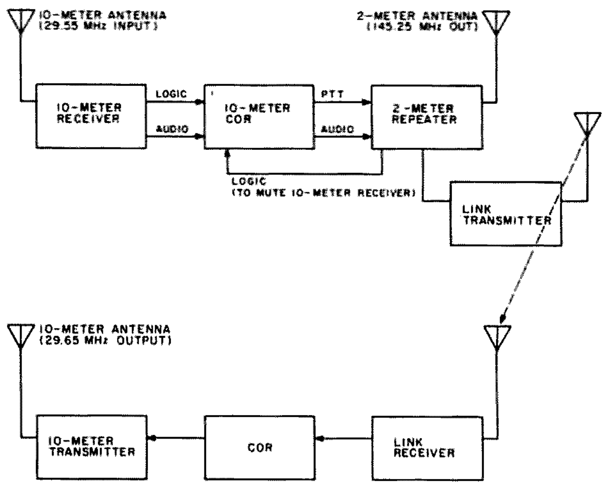
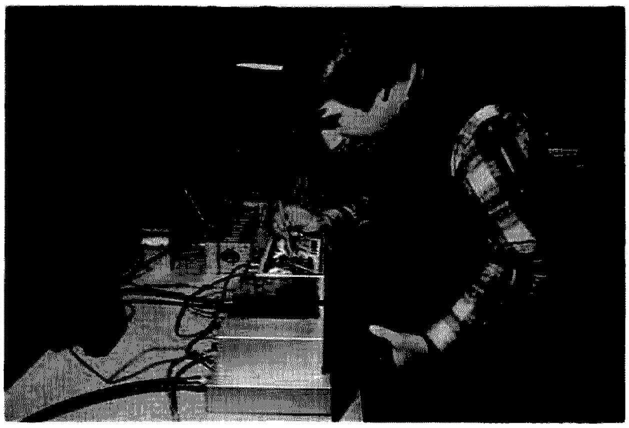


Fig. 1. Pine Grove 2/10-meter crossband repeater.

Denny K3SLG checks 10-meter FM with an Azden rig.



Close-up view of the 10-meter receiver and the Standard repeater with K3SLG.

Denny went on to explain that it was linked to a 10-meter repeater and had been on the air for about a week.

Somewhere in the back of my mind I remembered Don Yorty WB3AXO talking about converting a lowband RCA Supercarfone to 10-meter FM.

"The output is down at Don's house. He's using a Carfone on 29.65 MHz into a cut-down CB antenna," Denny added. "It runs about 100 Watts from a pair of 6146s."

Don lives a few miles east of Hershey, Pennsylvania, about 15 air miles south of Pine Grove.

"I have the receiver strip from the Carfone on my workbench. We're using my tribander for the 10-meter receiver antenna." Denny went on to describe the rest of the equipment. The 10-meter receiver was tied into a Standard 2-meter repeater and duplexer.

"We worked Germany, Sweden, England, and the Scottish Highlands through it since it's been on the air," Denny answered. He must have been reading my mind, I thought.

As we talked, the Icom 2AT kerchunked randomly on what sounded like noise bursts.

"That's something on the 10-meter input," Denny explained. "It comes and goes when the band is open."

But so far I didn't hear any Germany or Sweden. Just a sweeping carrier going across the 10-meter input. Oh well, I thought, to each his own or something like that. I guess it's the variety that makes ham radio interesting. No sense in getting all excited about DX on a 2-meter repeater, I concluded as I handed the HT back to Denny.

I picked up the Regency transceiver and headed across the street in the cold January morning. Turning my truck around I picked up Interstate 81 and started the long drive home. What the heck, I thought, I might as well dial up the new repeater and see how far out on the interstate I can hear the machine.

On 145.25 MHz the static bursts were replaced by a QSO. WA3YMU was working a station in Scotland. The Scottish GM4 station mentioned how glad he was to hear that our 52 hostages had been freed. He talked about how closely Europe had followed the whole ordeal.

Somewhere out there on the interstate, that QSO sparked new interest in me. Things had been going downhill in my ham radio hobby ever since my Novice days. I can still remember how exciting it was to work stations using CW with my old DX-20 and HR-10 receiver back when I was a WN3. After I got the Advanced ticket, my new TS-520, and some FM gear, things began to cool down.

But here I was again, feeling just as pumped up as when I was working stations on the Novice bands. This was something *really* different. Ham radio was unique again. Here was the chance of working Europe from my Datsun truck on the interstate. Or maybe even taking my Wilson HT to work some morning and sitting down at my desk and monitoring 145.25.

I'd be cool about it. I'd just let the HT sit there on my desk and wait for the band to open. The guys in the office would ask where that station was from and I'd say, "Oh, that's Tom over in Aberdeen, Scotland." Or maybe it would be Klaus in Denmark. Anyway, I'd pick up the HT and work Sweden or Denmark or Scotland right there from my desk.

I woke up at the next exit and turned around, headed back to Pine Grove. I wanted to learn more about this new crossband repeater.

A Closer Look at the Repeater

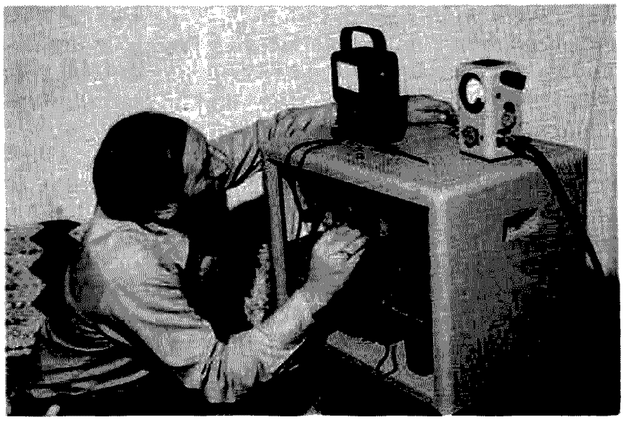
A glance at Fig. 1 shows what I learned about Pine Grove's 2-meter/10-meter crossband repeater. The equipment at the top of the diagram is located at K3SLG's home in Pine Grove. The 10-meter receiver is an old tube strip from an RCA Supercarfone. The 2-meter repeater is a Standard repeater with a duplexer connected to a 2-meter antenna on Denny's backyard tower. A link transmitter sends the signal to be repeated on 10 meters to Don WB3AXO, whose station is 15 miles away.

The 10-meter output at Don's home is quite simple. A link receiver picks up the Pine Grove signal and couples it through a COR into the 10-meter transmitter. Don converted the transmitter strip of the lowband Carfone to 29.65 MHz. The transmitter antenna is a $22 Channel Master 1/2-wave CB antenna cut down to 10 meters. It stands on top of Don's TV antenna tower.

The entire 10-meter transmitter package is about 2 feet high and sits neatly in a cabinet in the corner of Don's living room about 4 feet away from his wife's TV set.

Don invited me to his house one evening to show me the package. As he tuned up the transmitter, he pointed to the needle on the wattmeter as it came to rest on the 100-Watt mark. Don's wife sat next to him watching Buck Rogers' latest adventure on the TV, oblivious to the whole tune-

"Communications via 10 and 2 FM," 10-meter Carfone receiver, Icom 2AT.



Don WB3AXO with 10-meter Carfone transmitter.

up procedure. Obviously the 6146s caused no TVI.

Back to the top of Fig. 1, the block marked "10-meter COR" is the heart of the Pine Grove repeater system. The 10-meter COR looks into the 10-meter receiver squelch circuit. When it sees a 10-meter signal it closes a relay. That relay does 2 things.

First, it turns on the 2-meter transmitter by grounding the PTT line in the 2-meter repeater. The relay also couples 10-meter received audio into the 2-meter repeater transmitter.

When the 2-meter repeater receiver picks up a signal, the 2-meter repeater COR turns on the 2-meter repeater transmitter. At the same time, the 2-meter repeater COR sends a logic signal back to the 10-meter COR. The relay cuts off audio from the 10-meter receiver. This prevents random noise from being repeated along with 2-meter audio. The action of the 2 CORs gives priority to 2-meter signals over 10-meter signals in the Pine Grove system.

The 10-meter COR used at Pine Grove was taken from a GE Master Pro 4-channel scan head. Any similar COR could be used that turns on when the 10-meter receiver sees a signal.

Problems on 10 FM

Back in Pine Grove, Denny told me about some of the misadventures he ran into while putting the new machine on the air.

Finding a 2-meter frequency was relatively simple. Denny searched the 2-meter band using his Kenwood 7800. It was obvious that the only choices fell in the new repeater subband. Denny called Joe WA3GMS, the area frequency coordinator, and talked over a list of 4 proposed frequencies. They agreed on 145.25 MHz for the 2-meter output with a standard input down 600 kHz. Finding the 10-meter pair was a little more difficult.

At the suggestion of a local ham, Denny and Don chose 29.64 MHz for the repeater output with a standard input down 100 kHz on 29.55 MHz. The crystals were ordered for both repeaters and tune-up and testing began in early December. The repeaters were linked and on the air for 2 days when Denny remembers a short QSO he had with a veteran 10-meter FM user.

"It was our second day of operation on crossband. This W7 came on just as I was signing clear with a local station through the 2-meter side of the repeater. I asked the local to pick up the W7 because I had to get to work.

"The W7 said, '. . . No, I want you, K3SLG.'

"So I asked what I could do for him. He told me in no uncertain words. I can still remember. He said, 'Hey, old man, where are your brains?'

"I asked him if he'd care to explain what he meant. He said, 'I don't know where your brains are . . . You're on a well-established repeater frequency. Since you guys came on we can't work through the Metroplex repeater.'

"We told him we understood now after some 10-meter operation that 29.64 MHz is probably the most crowded 10-meter frequency and that we planned to move . . . that we were only testing. But that really didn't seem to satisfy him."

It was clear early on that finding a good 10-meter pair was going to be much more difficult than finding frequencies on 2 meters. For one thing, Denny found no rigid band plan as on 2 meters.

There are 2 acknowledged simplex frequencies on 10 FM, 29.5 and 29.6 MHz. Four repeater pairs round out the band plan: 29.62 MHz, 29.64 MHz, 29.66 MHz, and 29.68 MHz with respective inputs 100 kHz down on .52, .54, .56, and 29.58 MHz. But with a little more listening, repeaters were also found on 10-kHz splits.

"The repeater pairs given in the band plan were too crowded already for us to fit in . . ." Denny noted. "So it was like using a shoe horn. We squeezed in on 29.65 MHz and have been having good luck there."

Denny looks at coordinating 10 FM as pretty much an impossible job because of the band conditions.

"What you probably wouldn't tolerate on 2 meters you shrug off on 10-repeater overlaps, heterodynes and simplex operation on the repeater inputs. Coordination on 10 meters has been set at 1500 miles. That's half way across the country. If you take 4 repeater pairs like they have set up and spread them across the country, that gives you very few repeaters.

"That's why we moved to 29.65 MHz," Denny concluded.

The new crossband repeater's problems didn't end with the new frequency. A carrier sweeping across the 10-meter band keys up the repeater on a random basis. Denny and Don found that not only Pine Grove but also other east coast repeaters were being hit by the carrier.

Denny described it to me as "...an erratic series of transmissions like someone coming on frequency with multiple key-ups. The carrier remains there for a second or so, then disappears. Sometimes it sounds like a gunshot."

K3SLG calls the sweeping carrier the repeater's number one problem. Tom GM4HIG in Aberdeen, Scotland, hears it in Europe and terms it "a propagation phenomenon." Operators aren't at all sure if it is related to the Russian woodpecker. Ski W5MYH in Truth or Consequences, New Mexico, reports hearing the sweeping carrier on other east coast 10-meter repeaters.

Denny has considered building a delay into the repeater to prevent the key-ups but concluded that the variable length of time the carrier stays on frequency would probably make the delay useless.

Equipment for 10 FM

Listening to stations using the 10-meter side of the repeater reveals quite a mix of rigs. I've heard many Yaesu FT-901s, especially from Europe. The Azden PCS-2800 is another very popular rig used here in the states. The preprogrammed −100-kHz offset makes the rig as easy to use as my Clegg FM-28 on 2 meters.

I've heard of some hams in the York, Pennsylvania, area that have made a club project of 10 FM. It looks like the Pierce-Simpson Tiger 40A is the rig they like to convert. One of their members has a kit available to convert the 40-channel CB rigs to FM. I understand that the kit includes FM limiting and improved squelch action. More about the conversion as it becomes available.

For the present, I plan to operate through the 2-meter side of the repeater by using my Clegg FM-28. I can't forget my Wilson HT either. I have a set of crystals ordered. As soon as they come I'll be working Europe from my desk at work...

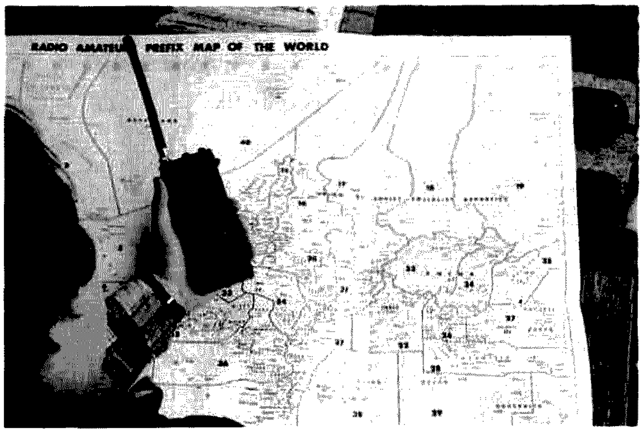
What's Ahead

Denny tells me that the next step in the crossband repeater's growth is getting it out of his basement and up on the mountain alongside the 146.64-MHz repeater. When that happens, the 145.25-MHz subband repeater and the 10-meter receiver will be housed on the mountaintop.

The final move will bring the 10-meter transmitter from WB3AXO's home up onto the mountain. Denny is negotiating for space at a site about a mile east of the present .64 repeater. He believes that should provide enough horizontal separation between transmitter and receiver to avoid desense. The two sites should be close enough, however, to provide a balanced 10-meter repeater for local hams working through the 10-meter side.

The whole system has been designed with simplicity in mind. The crossband repeater is open. No special tone control is required to use it.

In K3SLG's words, the crossband repeater "...gives the 2-meter hand-held or mobile operator the capability to work the world. It really gives ham radio an edge when compared with other radio services."■



Icom 2AT works Europe through the crossband repeater.

Left to right: Denny K3SLG, Don Melnicove, and Dave Lehman WA3ZEG gather in Lehman's Luncheonette to discuss 10-meter DX through the crossband machine.

✓See List of Advertisers on page 114

Ralph G. Swanson WB6JBI
506 Hilda Court
Anaheim CA 92806

A Lot of Hot Air

—keeping balloons aloft

If you are wondering what the relationship between hams and balloons is, read on.

It all started in 1979 when Dr. Tom Heinsheimer, an aerospace scientist with a sincere love of ballooning, according to Nate Brightman K6OSC, decided to revive the once-famous Gordon Bennett International Cup Race. The race continued with great popularity through the years 1906 to 1938. World War II quenched the race and nothing was done until 1979 when Dr. Heinsheimer caused its revival. Enter amateur radio!

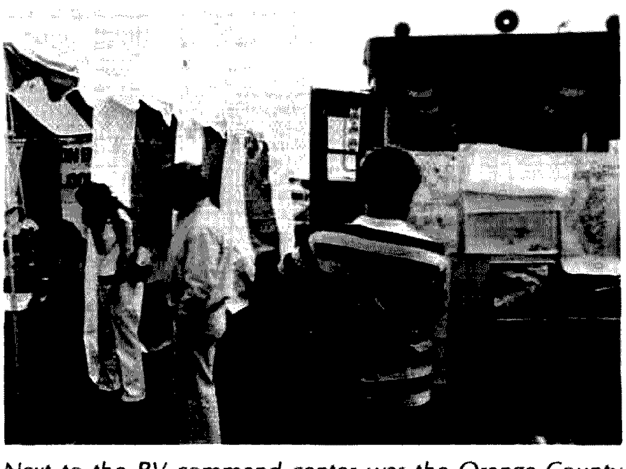
Nate was approached by Dr. Heinsheimer to provide help with the logistics. Keeping track of eighteen balloons that might go anywhere strongly suggested a widespread communications group. The Associated Radio Amateurs of Long Beach (ARALB) was challenged to the task and the wheels were set in motion. The Queen Mary W6RO, was the Net Control Station. W6RO is also the club station of the ARALB. Ron Boan AK6Y, the Emergency Coordinator of the Long Beach section of Los Angeles County, organized many volunteers to help with the tremendous number of tasks to be done. Since Mile Square Park in Orange County, an old Marine Corps Air Station, was chosen for the launch site for the 1980 race, the Orange County amateur radio clubs filled many of the positions as launch control checkpoints, net control operators, and observers.

This year, 1981, the race expanded under the leadership of Ron Boan, myself, and Joe Brown W6UBQ, SEC of Riverside and San Bernardino counties ARES groups. Two objectives were put to the test. The first objective, of course, was to provide communications for the race. The second was to handle the traffic, assign the personnel, etc., in the format of an ARES drill.

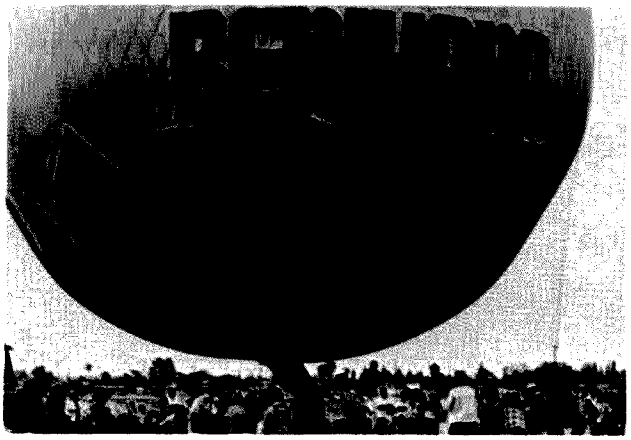
Mile Square Park was the starting point of the communications. Their assignment was to report via 145.52 simplex the actual time of launch of the balloons, or if there was a malfunction and delay, to report that also to net control. Since the balloons were to start launching at about 0900 on Saturday, April 25, everybody was in position and ready to start communications at 0600.

Some of the operators that helped at Mile Square Park on Saturday morning were: Al KA6IIJ, Glenn N6AFZ, Carol KA6JMW, Walt WB6RQT, Bob KE6C, Hector WB6WLB, Scott KE6B,

Launch-site communications for the Gordon Bennett International Cup Race were headed up by Ron AK6Y from his RV.



Next to the RV command center was the Orange County Sheriff's Department who maintained contact with the hams for emergency coordination.



The eventual winner, Benihana, *from Japan. Each balloon used an individual launch pad.*

Sandi WA6WZN, Herm K6TSM, and Jim W6PGM "manning" two meters.

Activity at the Orange County Communications Center.

Chuck KD6BX, Rosie WD6ERM, Jim KB6EX, John WA6HIJ, Chuck WB6ZAL, Dan WD6AWG, George N6AWF, Bob KA6CSS, Herb WB6USF, Paul N6DWR, Ken N6CCE, Bart W6CKT, Frank WB6JBV, Chuck WB6QKW, and Bob K6PHE. Ron AK6Y headed up the park operators from his RV. The various support groups, such as the Orange County Sheriff's Department, kept in constant touch with the hams in case of unexpected landings in the nearby area.

I might mention at this time that the Keller Peak Repeater, WB6FUB/R, which has a fantastic coverage of southern California, was turned over to the Balloon Race to provide the widespread communications link out of the park to net control and the observers. WB6FUB/R repeater is basically an ARES machine and its use provided an exercise in its coverage and the discipline of its users.

Net control, which interfaced Mile Square Park to the rest of the world, was located at the Orange County Communications Center located in the City of Orange, California, some 8 or 9 miles east of the Park. From this point, the launch information provided by the Park, such as balloon colors, markings, and headings, were transmitted through the repeater to the observers. They used both repeater frequencies of 146.985 and 223.80 MHz.

The hams manning net control over the weekend were: Don WB6GBW, Tom KA6MZN, Willis WB6WHT, Alex W6RE, Bob WA6SKE, Judi WB6SKE, Maggy KA6CVQ, Tom W6HT, Sherwood WD6CZE, Ed N6AEY, Fred K6KNC, Bill KB6HK, Judy KA6FBI, Gerald W6PCI, Frank KA6BUX, Bob KD6CF, Gordon W6SGI, Bob KD6DA, Rosemarie N6BCY, Mark KJ6H, Pat KA6ENG, Bob WB6FCP, Archie WD6CSL, Al KA6BNI, Lyle N6LB, Esther WA6UBU, and Bill W6TNR.

Since the balloons were intending to travel long distances, contact between our net control in Orange County and California's neighboring states was essential. The amateur radio station of K6RTR has a phenomenal "hot spot" for a straight shot to the Kingman, Arizona, repeater, WR7AEL. Del K6RTR, along with Ernie WA6FOW, Robin KA6HNY, and John KA6HRK provided this link to net control.

The prevailing winds across Orange County are marine onshore breezes from the Pacific Ocean toward the east. Since the balloons can be controlled only up and down, they are at the mercy of the wind direction. This means that the balloons must gain sufficient altitude in a relatively short distance to clear the tops of the Chino Hills and eventually the San Gabriel mountains. The San Gabriels reach 7,000 to 10,000 feet in certain locations. The chance that a balloon might not clear a hill or mountain made it mandatory that observers be stationed at the high points to watch for unscheduled landings.

Observers were stationed at strategic high points throughout Orange, Riverside, and San Bernardino counties. The following hams headed for the hills with their mobile units using portable beams, quads, or whatever it took to get into WB6FUB/R: Ted KB6IW, Jim WB6UIG, Oscar KA6GJI, Charlie WB6LKW, Roger WB6ARK, George W6LJK, Randy WA6WVJ, Sterling KD6Z, Jim WB6BZW, John KB6PT, Larry N6BNM, Dale WAØNKE/6, Gary WB6GCT, Clancy WA6HNQ, Lloyd WB6ULU, and Sid N6AQC. Fortunately, no balloons came down in the southern California area so no rescue operations were needed.

The winning balloon was the *Benihana* of Japan, traveling 1,346 miles to Millarton, North Dakota. Second was the US *Rosie O'Grady*, which landed 634 miles away in Myton, Utah. Third was another US balloon, *Ghost Rider*, landing in Nephi, Utah, 458 miles away.

Next year's Gordon Bennett balloon race will be on the weekend of April 24, 1982, and of course there will be hams and balloons once again.■

Paul Grupp KA1LR
73 Magazine Staff

The DS2050 KSR RTTY Terminal

—top performance at a bottom price from HAL

For those of us who have only become interested in RTTY and are looking for equipment, there are only three alternatives worthy of serious consideration. The first is to build the equipment yourself. Sure to earn you the admiration of your friends, building is time-consuming if you want your station to enjoy the sophistication that is now taken for granted in commercial RTTY products.

The second alternative is to buy a microcomputer, some software, and an interface designed to mate the computer with your ham equipment. The advantage to this approach is that you have a computer that will play games with you or even do serious work when you aren't on the air. The disadvantage is that such systems are still comparatively expensive.

The final alternative is a dedicated system that is designed specifically for RTTY. The dedicated terminals available now offer a high level of sophistication at a very reasonable price. You take one out of the box, plug it into the rig, and you are on the air. If the manufacturer provides a cable set for your rig, you can unpack the stuff and be done with your first contact in less than twenty minutes! The HAL DS2050, an excellent example of such a terminal, is the subject of this review.

For those really new to RTTY, a little history is in order. HAL has been producing the DS2000 terminal and the ST5000 demodulator for several years; the pair sold in such quantities that it seemed only logical to put them in a single enclosure. Since there was plenty of room in the DS2000 for another circuit board, the DS2050 KSR was born. At a list price of $649.00, it offers a lot of RTTY performance at a relatively low cost. What will it do? I thought you'd never ask!

The Features

The DS2050 is essentially a Z-80-based electronic data terminal and a RTTY demodulator in a single package. Transmit and receive text is displayed on a video monitor (available from HAL), so the various noises associated with mechanical RTTY are blissfully absent. The DS2050 is capable of communicating in three different modes—Morse, Baudot, and ASCII. It will transmit Morse at speeds from one to 175 wpm (Morse at one wpm is good for a couple of laughs!). Baudot is supported at your choice of five speeds, 60, 66, 75, 100, and 132 wpm, and ASCII will zip along at either 110 or 300 baud. Morse also can be decoded and displayed on the screen if the Morse-receive option is installed.

The DS2050 was designed with convenience in

Continued on page 120

The DS2050 KSR RTTY terminal.

Paul Grupp KA1LR
73 Magazine Staff

The Welz SP-300 Swr and Power Meter

—a little digging for this meter is worth the effort

Behold, there are swr meters thick upon on the Earth, but a truly great one is as rare and elusive as a camel without bad breath. So says a ham friend of mine from SU-land, and, you know, he's right! There must be at least a thousand different swr meters available, but of all these, I can count the ones which do everything well on the fingers of one hand.

It seems that there are two basic varieties of swr meters. The most common is the box with a two-position switch marked forward and reflected, and a sensitivity control. You flip your rig into the transmit mode, set the switch to forward, and adjust the control to full-scale. Flip the switch to reflected, and you can read swr directly. Neat, except that the thing is only good for relative measurement of power output.

I can think of several situations in which I need to measure absolute power output, and for this, I need a meter with a calibrated scale. Such meters have the same switch as the first example, but they dispense with the sensitivity control. The meter tells you how many Watts are going out, and how many Watts are being reflected. Theoretically, you still have the little chart that came with the meter, so you look up the two values and, bingo, you know what the swr is.

This method gets old fast when you are using the meter to set an antenna tuner, particularly when using a solid-state transmitter, since output of these varies with swr. You will be misled unless you look up the swr on the stupid chart every time you adjust something.

There are a few meters that offer the best of both worlds, and one of these is the Welz SP-300. Now, I won't feel bad if you've never heard of Welz, since their products haven't been available in the US until recently. The Welz meters enjoy a sterling reputation in Europe and Japan, but the only US distributor that I know of is NCG Company of Anaheim, California.

Welz offers a wide variety of meters, and the SP-300 that NCG imports is their best model. As you can see in the photograph, it doesn't look that much different from any other meter, but don't let that fool you. This meter is first cabin all the way. The first hint I got of its quality was when I pushed the buttons and rotated one of the pots. I'd forgotten how good expensive controls feel! The all-metal construction gives the meter a satisfying heft, which, aside from feeling good, keeps it from disappearing over the back of the table, as lightweight meters in my shack are wont to do.

I popped off the cover and was rewarded with a view of a lot of serious shielding—the meter, swr

Continued on page 146

The Welz SP-300 power and swr meter.

Robert C. Diefenbach WD4NEK
2402 Lauderdale Drive, N.E.
Atlanta GA 30345

Free PR for Ham Radio!

—how to cooperate with the news media

We hams do a lot of good for our communities. All too frequently, though, people don't hear about our deeds. Whether through modesty, apathy, or simply from not knowing how to avoid it, hams' civic contributions are often anonymous. That is unfortunate at best and, considering the fact that our regulated hobby needs all the help it can get, probably foolhardy to boot.

We need more favorable publicity to impress the public with the positive impact of amateurs' public service efforts. The few negative impressions ham operators have made, largely unintentional through TVI and antenna squabbles, will fade to an appropriately insignificant proportion if the hobby begins to get more of the "good press" it deserves.

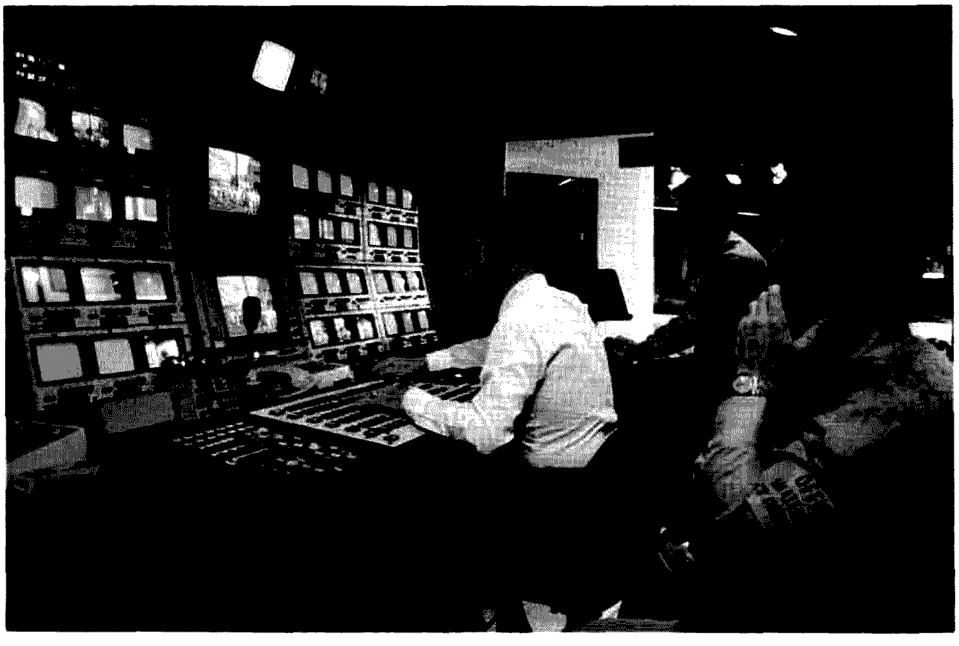
The ladies and gentlemen of the print and electronic media have an immense ability to focus public attention, but the news business is as competitive as pro football; it is a fact of life that reporting bad news usually scores more points than reporting good deeds. Editors, whose very jobs depend on the numbers of readers/listeners/viewers they attract and retain, will not ignore that fact without a good, businesslike reason. Listen up, gang, while I give you one.

The most hard-nosed editor will pay attention when you offer *free* expansion of his or her coverage of news events. Generally, the editor will be happy to reciprocate with just the kind of printed or broadcast publicity that ham radio wants and needs.

It works this way. When your ham group agrees to provide communications for a newsworthy event, invite the press to monitor your operation and to use what they hear as a part of their news coverage. I am referring to events planned in advance, not to emergency communications—except under controlled circumstances described later.

Now don't jump up on your soapbox and say "That's not legal!" According to what I have been told by an FCC official who should know, it *is* legal if you take a few simple steps in advance.

Amateur radio transmissions are protected as "private" by federal law despite the obvious vulnerability of that privacy to anyone with a receiver capable of tuning the ham bands. Under Section 605 of the Communications



John Snellen WD4FBG monitors operational frequency during an event and shares information with WTBS control room crew. Photo by Susan DeShazo, courtesy of WTBS Superstation, Atlanta.

Act, anyone violating that privacy by intercepting and divulging the content of a QSO could earn a criminal penalty of up to $10,000 and one year's imprisonment. Despite the long odds against being found out and prosecuted for eavesdropping, a news service would be crazy to risk even the possibility of running afoul of that law, by, say, repeating information picked up from a synthesized scanner in the newsroom.

It is nice to know that our transmissions are protected. But, for the purposes of getting publicity, it is also nice to know that we can shed that protection and openly urge the press to monitor our QSOs and use whatever they find newsworthy.

All that is necessary, according to FCC Associate General Counsel Lewis J. Paper, is for the hams to *agree in advance* to having their transmissions intercepted and their contents divulged.

Counselor Paper has confirmed, in an exchange of correspondence with me, that if amateurs give their permission in advance, the media or others can freely eavesdrop and make use of what they hear. This does not mean that radio or television stations can rebroadcast amateur transmissions as they happen, or live. That is banned by regulations governing commercial licensees. But insofar as use of the data contained in the ham transmissions is concerned, prior approval of the hams is all that is needed to avoid privacy violations under Section 605.

How do amateurs "give their prior approval" in a way which satisfies the rules? No clearcut way is given, but obviously it is best to use a method which can prove, if a challenge is ever made, that their permission to intercept was given *before* interception of their transmissions. When recruiting communicators for planned events like marathons, water events, or parades, it is a simple matter to make each operator's approval a condition of his or her participation. A clear caveat to that effect can be included in whatever recruiting messages you put into the mails or on the air and any communications plan you publish for the event.

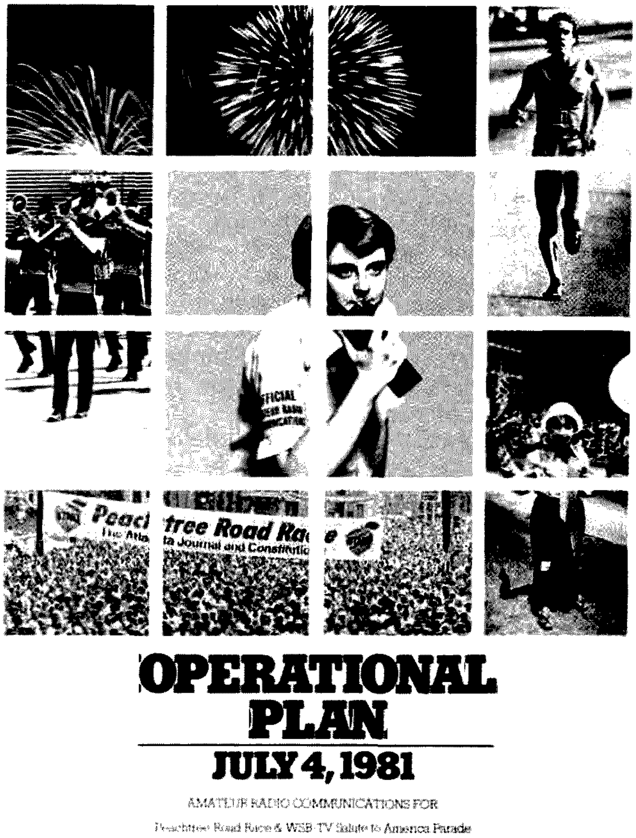
I realize that the communications which might attract the most media attention, and thus the most publicity for amateur radio, are those involved with emergency situations. But under most emergency operating conditions, asking and getting each communicator's permission for interception/divulgence could take so much time that the entire operation might be endangered. For that reason I would advise that amateurs not invite press coverage of their emergency communications except in cases of tightly organized and controlled local nets where all members have given blanket authorization for interception of transmissions whenever the net is called into session. Coordinators of local emergency nets whose members have agreed to being monitored can notify the media as an automatic part of calling up their nets for actual emergencies.

Just inviting the press to legally eavesdrop during amateur public service efforts is no guarantee they will accept the invitation. Even if they do, there is no assurance that hams will get the favorable credit they would like for material the media overhears and uses. Reaching that goal will take planning, sales ability, tact, and realistic caution. Here are some points to keep in mind:

● *Don't waste time. Your time and that of your media* contacts is too valuable to waste by suggesting that they monitor any amateur operation that common sense tells you couldn't interest them less. Before approaching an editor, make an effort to learn his or her organization's news interests. The organizers of the event you are working on probably will know from previous experience which media will cover it and can suggest those which might find it helpful to monitor your communications.

● *No time for shyness.* You cannot be shy or overly modest about asking the press to "plug" ham radio. Print space and broadcast time are for sale. The media rarely volunteer to give either away but, for a reason as good as yours—free expansion of media coverage—will usually be receptive to the idea when asked. You may find yourself the subject of a "sidebar" interview during a break in the activity reporters are covering. Be prepared, but be brief. The more you and your media contacts credit amateur radio overall rather than your ham club or group by name, the bigger the service you will be doing for your hobby.

● *Beware overselling.* Be honest. Tell editors accurately what their reporters can expect to hear if they *monitor your operations*. Don't try to sell the idea that only reports of serious traffic tie-ups will be heard on 146.82 MHz between seven and nine am when you know there will be rag chewing, too. The



This is the cover of the 16-page booklet that covers the monumental Peachtree Road Race and Fourth of July festivities. It provides in great detail the information required to successfully manage an event of this size.

Gene McCall WA4OAU, on board camera truck just ahead of the leaders in the Avon Atlanta Women's 10-km race, reports early changes in the lead.

WGST Newsradio sports reporter Steve Holman (in car) does an "on-the-scene" broadcast using information relayed by Gene Davenport N4AJL. Photo by Barry Milberg WD4DAA.

newsroom scanners will be programmed off that frequency, probably never to return, after the first minute's chitchat about swr or the next club meeting.

● *Be accommodating.* Chances are that only a few of the news organizations you approach will have receivers capable of monitoring amateur transmissions. You can accommodate those which don't by assigning hams to make their equipment available during the operation, wherever the editors ask. You should be prepared to provide this service at the scene of the event, in vehicles of any sort, and in newsrooms or studios.

Amateurs assigned this responsibility should be reminded that the news organization's business is collecting and reporting facts, and that messages on its behalf would thus have monetary value. Such messages are taboo. Even a simple request for another ham to repeat a missed message or to check a name could place *the amateur* in violation of FCC regulations.

Earphones are a must for operators assigned to radio or TV reporters who may need to go on the air themselves. Their stations don't want (and legally shouldn't have) background sound of ham transmissions rebroadcast on their own frequencies.

● *Caution: Don't accept payment.* Hams, as individuals, in clubs, or in other groups should remember that accepting payment of any kind for allowing the press to intercept and divulge their transmissions could result in suspension or loss of their licenses.

● *Think before transmitting.* Hams are morally, if not legally, responsible for the effect upon others of information which they transmit. When the press is known to be monitoring and to be free to use overheard information, the level of a hams' responsibility increases dramatically. A thoughtless transmission, possibly occasioned by overeagerness to please the media, could have unexpected and perhaps harmful results. The name of an accident victim or a guessed-at but false diagnosis could easily be reported on newscasts before the data are confirmed or families are contacted. If potentially alarming messages must be sent, hams should clearly state their source of information. "Officer J. D. Smith, badge number 1234, has talked with the doctor. Officer Smith says. . ." The ham would be wise to make a written record of the officer's name and badge number, just in case.

● *You can withdraw consent to monitor, but. . .* The amateur group's permission for the press to intercept and divulge transmissions can be withdrawn at any time—even during an operation if something urgent makes it necessary. A need could arise, for example, to transmit medical or security messages which should be kept as confidential as possible. Such messages, before their content is revealed, should be clearly identified as private and not intended to be divulged. But think twice before withdrawing the very permission you have gone to some effort to give and exploit. When there is a story in the wind, trying to keep the press away from it can be a very unpleasant experience. Your whole press relations program could explode in your face. Most aggressive reporters will ignore the prohibition against divulgence, anyway, figuring that this is a problem for the lawyers, not for them!

● *Explain. Don't threaten.* Early on, and for two reasons, editors, and reporters should be made aware of the privacy provisions of Section 605. Hopefully, they will be impressed with your group taking the initiative to help them expand

POSITIVE PUBLICITY

The author organizes communications in Atlanta, Georgia, for events like the huge (over 25,000 runners!) Peachtree Road Race. Thirty ham operators used two-meter equipment to work the annual Fourth of July race this year. They provided logistic, course, and medical communications.

Following the guidelines spelled out in this article, the Atlanta hams gained excellent national publicity for the hobby by allowing their QSOs to be monitored by commercial broadcasters, including the "Superstation," WTBS-TV. The race—and a lot of nice credit for amateur radio—was telecast into an unbelieveable 15,560,000 homes via satellite and cable. Viewers in all 50 states and Puerto Rico, more than had ever seen a road race before, saw The Peachtree and learned that ham radio played a major role in making it happen.

pand their coverage of whatever event you are supporting by allowing interception and divulgence of transmissions, and they also should be impressed with (but not scared off by) the fact that this is a privilege rather than a right, given for a specific time and purpose. At the risk of boring them with what many may consider bureaucratic trivia, you should be certain that the press understands that this privilege can be immediately cancelled at the amateurs' discretion and that there would be criminal penalties associated with willful violation of the hams' thus-reinstated privacy. A thorough, non-threatening explanation up front could prevent embarrassment or worse if something unforeseen comes up later.

This article deals with an interpretation of the regulations, and I must point out that I am not an attorney and am not intending to give legal advice to readers. I have no doubts at all, personally, however, that my correspondence with the Commission's associate general counsel confirms that hams can use this method to legally solicit publicity for the hobby. Based on Mr. Paper's letters, I intend to include cooperation with the press as an integral part of any ham communications effort I am asked to organize.

The FCC may have something to say about amateurs going after favorable publicity so aggressively, although to disagree with hams' right to do so would seem to dispute the Commission's own legal interpretation as stated by their associate general counsel. If any such dispute arises, I suspect that you will read about it right here in *73 Magazine*. ■

Harold Johnson W4ZCB
2617 Pinewood Drive
Dunedin FL 33528

Milton Lowens N4ML
248 Lake Dora Drive
West Palm Beach FL 33411

Tricking-Out the FT-901/902

—some competition mods from the Fox-Tango racing team

In the almost ten years that Milt Lowens has served as editor of the *Fox-Tango Club Newsletter*—at the beginning of which time he founded the International Fox-Tango Club for Yaesu equipment owners—literally thousands of suggestions for improving Yaesu rigs have crossed his desk. Among the best in terms of simplicity and effectiveness was one first written in abbreviated form by Harold Johnson for the November, 1980, issue of the *Newsletter*.

The first part of the following article is that 1980 piece essentially as written, but with some italicized parenthetic comments by Milton Lowens. The second part (written by Milt) gives generously illustrated instructions which should enable even a comparative neophyte to do the job. No irreversible changes are involved, no drilling or panel changes are needed, and no wiring changes are required except on one, easily unplugged, circuit board. Considering the reported effects of this modification and his own experience with it in his FT-901D, it is no wonder Milt rates it as a "winner"!

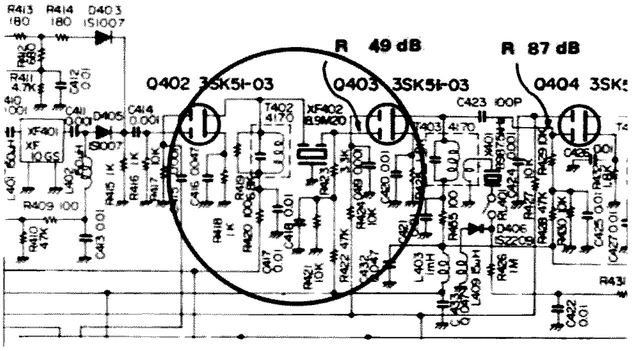


Fig. 1. Partial schematic of i-f board PB-1704 showing original connections of XF402 and related components.

Part I: Significantly Improving the FT-901/902 Receiver

In a continuing search for a replacement for my 20-year-old KWM-2 receiver, I have either purchased or borrowed almost every "new" radio that has come down the pike. It is a sad commentary on the state of the art that, despite fringe bells, whistles, and cosmetic changes, nothing I can find on the market has measured up to the 25-year-old design, at least in the receiver department. In the final analysis, I have been forced to the conclusion that, because of deficiencies in various parameters, the present solid-state radios cannot copy signals that are still solid on the KWM-2.

Of several makes and models owned and evaluated, the Yaesu FT-901DM [*and now the 902 with all the WARC bands and other improvements, including an excellent new true-reading digital display*] came closest to measuring up to the very stringent standards I had set. Besides, its bells and whistles included the 160-meter band, all of ten meters, FM, AM, and FSK operating modes in addition to the standard SSB and CW, memories galore, RIT tuning for RX, TX, or both, built in ac and dc supplies, true rf speech processing, an automatic Curtis keyer, true variable passband and rejection notch tuning, and a very fine audio peak filter (to mention a few!).

After the first blush of ownership pride, however, one major problem with this competition grade radio (as Yaesu calls it) was a total lack of ability to compete in the receiving department. In the presence of strong signals outside the receiver passband, readability of weak signals was degraded by reciprocal mixing and agc pumping. The radio actually was in my operating position three times and each time was replaced with "old grandad." The last time, I fully intended to get rid of it as another lost cause when I decided to try to cure the shortcomings since the fringe benefits were so great. Measurements taken on the radio prior to attempting surgery revealed an ultimate rejection of only 55 dB, and I began to realize that there was a task of some magnitude ahead if I were to effect a "cure."

It was assumed initially that there must be some leakage around the existing selectivity circuits in the radio, and the search for the path was on. Since the crystal filter was diode-switched, there was the possibility of inadequate bypassing and feed-around

occurring via the dc control lines. Twenty dollars worth of glass 0.1-μF caps at strategic spots on the filter board later, showed a total improvement of 0.

Reading of similar problems plaguing the TS-820 where the problem was in the noise-blanker circuitry, C225 on the noise-blanker board of the 901 was removed. This certainly opened the noise-blanker path but improved the ultimate rejection by not quite 1 dB. Hardly a dramatic improvement! Then noting that the i-f was passed around the filter in the FM mode, here was another possibility; diode D310 on the filter board was removed. Alas, life was not to be so easy. This simple cure netted only another 1.5 dB of improvement. Obviously, the engineers at Yaesu had cleaned up these paths right well! After all this I could see only two other possibilities: I figured I might as well tackle the cheapest one first.

That was the chance of cross-coupling in the common cabling under the pluggable board sockets. The filter board was pulled; the jumpers bypassing the optional (but not installed) CW filter were removed [*thus opening the i-f chain*]. Upon re-installation of the filter board, no difference could be determined between power on and power off in the CW mode. The radio was dead with 100,000 microvolts at the input. That experiment satisfied me that the ultimate rejection was really a function of the factory-installed filter; it just flattened out for me at −55 dB. Unfortunately, there are still lots of countries on the air that I need that are represented by signals lots weaker than 55 dB down from some of the W2s heard at the QTH.

A custom filter of at least 12 poles that would mechanically fit the filter board was a bit rich for my blood (about half the price of the radio), so an equivalent of the existing filter was ordered from the Fox-Tango Corporation for something less than $60.00. Although there was some delay at the time, this excellent filter is now available from stock. (See Parts List.) The filter was installed with diode switching at the input to the balanced modulator—after the i-f gain, as suggested by Sabin and Hayward. Skirt selectivity improvement was noticed, but since the agc amplifier is fed from a point ahead of the second filter, agc pumping from strong adjacent signals was still present and tended to mask or distort weak signal reception.

So I tried another approach (no one can accuse me of not being persistent, hi!). To obtain the band-pass-tuning feature, Yaesu up-down converts the 9-MHz i-f to 10.8 MHz with filtering at each frequency to permit a variable-width window of common passbands. This feature, first advanced by Bill Orr in the 50s, works superbly since using a common oscillator results in passband tuning with zero tracking error. After the dual-heterodyning process, a modest filter is required to rid the radio of mixing products. An extremely simple two-pole crystal monolithic filter, XF402, was utilized for this purpose (by Yaesu). See Fig. 1. While it cleans up these spurious products nicely, the filter is so elementary that it provides no help at all in enhancing the skirts of the main filter (XF302, 3, or 4).

Despite a disparity in impedance levels, filter XF402 was removed from the i-f board, the switching diodes and filtering on the added filter were removed, terminating resistors were changed, and the new filter was patched in in place of XF402. No attempt was made to add gain to the i-f amplifier to compensate for the insertion loss of the new multi-pole filter. [*Subsequently, Harold did devise a simple method for adding gain; it is described below.*]

The unconverted radio has an i-f gain such that a .7-microvolt signal gives 10-dB signal-to-signal + noise, and the MDS figure remains unchanged with the additional filter installed. I have cascaded filters in my KWM-2 and several "S" lines with spectacular results. Addition of this second filter to the FT-901DM [*and probably to the 902*] is no less startling. It turns this "competition grade" radio into a real contender.

In performing this surgery on two different radios (4 filters), the filters seem extremely well matched for center frequency with practically no effect on the "nose." The skirts, however, take a real nose dive. Ultimate rejection is beyond my ability to measure (in excess of 100 dB) and the agc system just doesn't respond to anything that isn't in the passband.

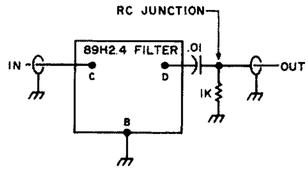


Fig. 2. Connections to new 8-pole filter YF89H2.4.

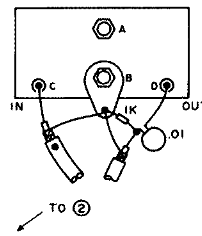


Fig. 3. Pictorial showing connections to new 8-pole filter YF89H2.4.

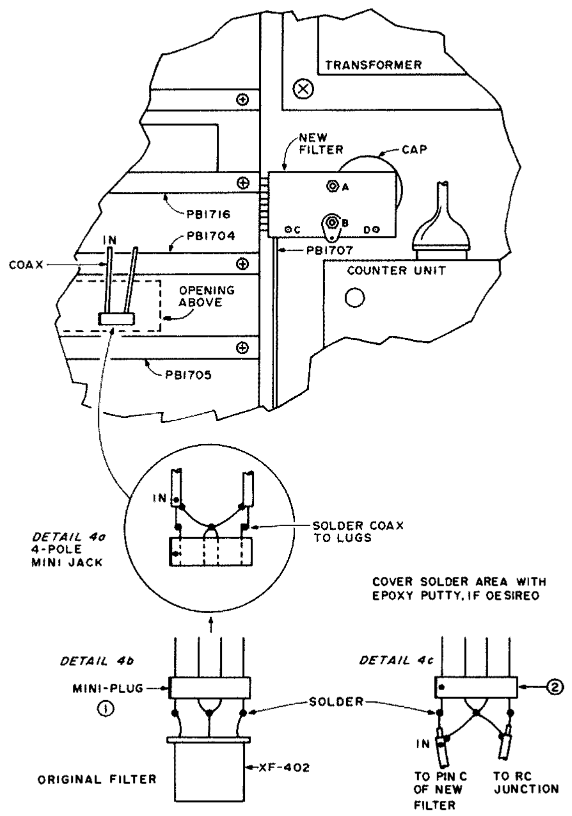


Fig. 4. Pictorial showing placement of new filter and its related connectors and cables.

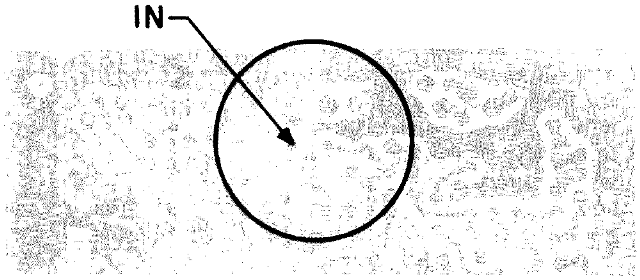


Fig. 5. Foil side of PB-1704 with detail showing required changes. Also see detail 8c.

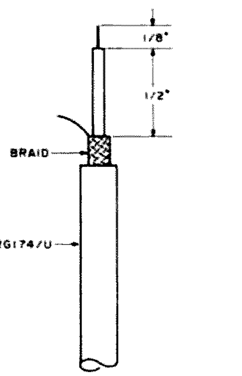


Fig. 6. Preparing the ends of RG-174/U coax for connection to PB-1704.

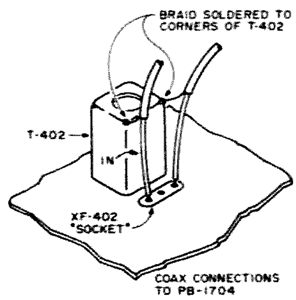


Fig. 7. Detail showing method of connecting coax to PB-1704.

Table 1 details the before and after bandwidths but cannot adequately describe the increase in depth and steepness of the skirts. You almost have to hear it to believe it.

Now, if someone would just figure out how to make the *backward* radio tune forward, I would be as happy as a clam with my "new" FT-901DM! [*Too bad you were a bit early, Harold. The new 902 model tunes, as it should, so that clockwise rotation of the knob increases the frequency.*]

Many Fox-Tango Club members besides the authors have tried this filter-cascading modification and have found it relatively easy to make and very effective. We would appreciate receiving your reports if you try it.

For the purpose of "before and after" comparison, tune your rig for maximum S-meter deflection with the CAL signal at 14,200 kHz and make a note of the reading.

Test Conditions and Instrumentation

Set-up conditions for Table 1 were Hewlett-Packard 608 signal generator through 5-dB pad, passband tuning at 0, USB mode, notch filter out, and agc off.

Effects of Filter Cascading In FT-901

Signal Level uV	dB	Bandwidth in Hz With Cascade Filter Out	In	Reduction
1	−6	2400	2050	350
10	−20	2500	2100	400
100	−40	2800	2400	400
1000	−60	3400	2600	800
10k	−80	12400	4200	8200
100k	−100	33000	15800	*

*Reciprocal mixing at this signal level.

Table 1.

Part II: FT-901/902 Filter Cascading

Harold mentioned two problems in the first part of this article which troubled me a bit: the impedance mismatch when inserting the new filter and the resulting losses. Even though neither of these had a significant effect in terms of day-to-day operations because of the inherent sensitivity of the 901, I realized that some purists might be unhappy. However, before I could even write Harold about the insertion loss problem, he solved it in a simple and ingenious way by changing the location of the output coupling 1k resistor so as to load down and slightly change the bias on the next stage, Q403. This increased its gain just enough to offset the filter insertion losses almost exactly. (See Fig. 2.)

The matter of improving the impedance matching seemed like a more difficult problem until a fortunate discovery was made. Fig. 1 shows pertinent portions of the original circuitry of PB-1704C, the i-f board. The basic idea of the modification was to remove XF402 (between Q402 and Q403) and to substitute the 8-pole, 2.4-kHz bandwidth Fox-Tango filter for it. Note that the input end of the original filter is attached to the upper end of the coil in T402 which, with its shunting capacitor, looks more like a simple resonant circuit than a transformer. *If it's a transformer, where is the secondary winding?* All the other "T's" had them! Maybe T402 did too! A study of the parts list in the service manual vindicated my hunch: T402 *and* T403 had identical part numbers and a step-down secondary winding—ideal for impedance-matching the new filter! I could hardly wait to examine the back of PB-1704C in the vicinity of T402 since the parts layout diagram (Fig. 5) showed what looked like a transformer pin not connected to anything.

Eureka! I had found the solution. A few checks with the ohmmeter confirmed the presence of the winding with one end grounded, just like T403. Prior to this discovery, I had made the modification in my own FT-901D and was pleased with its results. However, upon making the simple change to utilize the newly-found secondary winding, the maximum CAL signal indication increased several dB! Talk about gilding the lily—I was delighted since the selectivity also seemed even better than before. So the following detailed instructions include the use of T402's "invisible" secondary. (See Fig. 8.)

One thing more. As originally proposed, W4ZCB's mod eliminates the possibility of AM/FM operation, a serious loss since the FM, at least, is a very desirable feature in the FT-901DM and D models (even though the DE and SD models do not have it, and for them the first design was fine—except for that secret secondary). This problem was solved by, in effect, providing a "socket" at the end of coax leads connected to the points on the board to which the original 2-pole filter was soldered.

This new socket terminated under a small removable lid in the top of the cabinet so that, by using matching miniature plugs, either the original 20-kHz filter (very small) or the new 2.4-kHz filter (at the end of another short length of coax) could readily be plugged in when desired. Further, for special purposes, *any* filter could be plugged in at this point temporarily while resting on top of the cabinet as long as a mating plug was connected to it.

They say that one picture

is worth a thousand words, and there are lots of pictures so I'll try to keep the words to a minimum. Anyway, start by comparing Figs. 1 and 8 carefully, noting the differences. Then become familiar with the others—especially the details. Next, take off the top cover of the cabinet (don't be afraid) and remove the black plastic panel at the left, over the circuit board compartments. Using the markings on this panel, locate PB-1704, remove the two screws at the ends of its hold-down strap, and using a knife blade or thin screwdriver, wedge up first one end of the strap and then the other, a bit at a time, until the board comes out of its socket. Examine the board carefully, noting the location of XF402, T402, and R419. All components have their identifications printed on the board, and the photographs in your owner's manual will help further to identify the key components.

Turn the board over and note that a portion of the foil side is covered by a metal shield which makes it difficult to see or gain access to the three soldered connections of XF402. Using long-nose or small ignition pliers, bend up the obstructing corner of the shield temporarily and you are ready to begin. Practically all the work is done right on PB-1704, no wiring is changed under the chassis, and no changes are irreversible. So heat up your light-duty, fine-tipped soldering iron, clean and tin its point, and go to work.

Detailed Procedure

A. Modifying PB-1704.

1. Clearly identify the three soldered connections of XF402. (See Fig. 5.) Unlike a crystal (which it resembles), it is not plugged into a socket—it is soldered to the board. Its three leads are thin and usually bent over before soldering. Carefully remove the solder from the three points using de-soldering wicking or suction. Straighten the leads so that when the solder is removed, XF402 can be lifted from the board without using any force.

2. Study Detail 8c and locate the short trace (foil strip) which must be cut with a hobby knife or sharp blade. Use a strong light since the trace may be hard to see under the green varnish-like solder-resist which covers all of the board except the solder points. Use your ohmmeter to be sure the trace is actually cut.

3. Locate blank pin (S) of T402 and solder a short, thin, insulated jumper wire to it. Note that it connects to the IN connection of XF402, but do not solder it there until the coax is inserted. See Fig. 7.

4. Prepare both ends of the RG-174/U coax as shown in Fig. 6. Tin the exposed ends of the center conductor and insert them as shown in Fig. 7. Solder them to the foil side (as the filter was previously). Now connect the jumper wire from pin S. Next tin the upper corners of T402 and solder the braid tails to them for grounding and strain relief. Hold the braid tail with long-nose pliers to act as a heat sink to prevent melting the plastic insulation of the coax.

5. Optional: Locate R419 adjacent to the right side of T402. Since its solder points are blocked by the shield on the foil side, cut the resistor lead as shown in Detail 8a. The cut ends can be re-soldered if ever desired.

6. This completes the work on the board. After bending the shield back to its original position, more or less, re-install it in its socket temporarily and bring the coax loop toward the front panel. Drop the black plastic panel into place after slipping the coax through the large rectangular opening in the black panel. Cut the coax at the front end of the opening. (See Fig. 4.) It is important to identify the IN lead with a bit of white tape, paint, etc. Once again, take off the plastic panel and remove PB-1704 to simplify making the connections shown in Detail 4a.

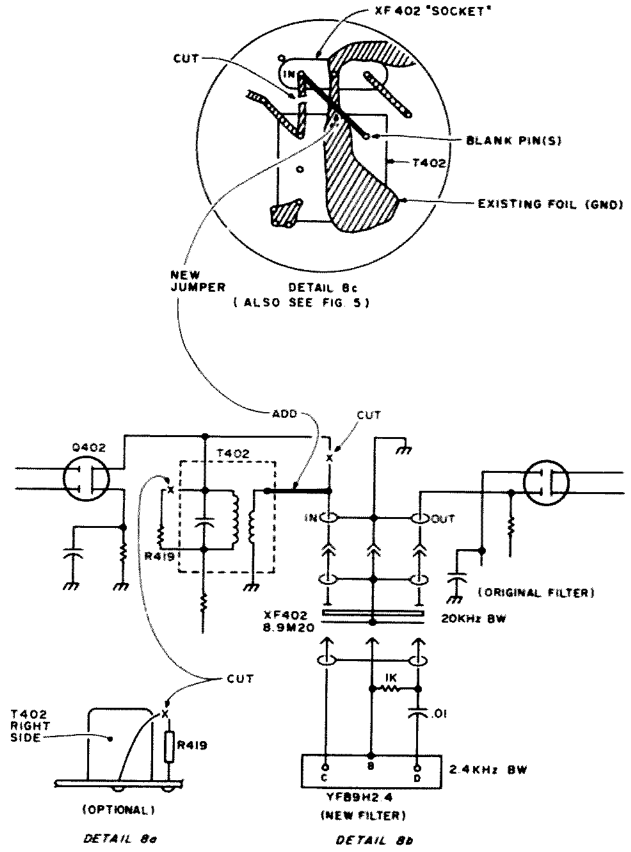


Fig. 8. Revised schematic showing essential changes involved in the modification (compare with Fig. 1).

B. Connecting the connectors.

1. Detail 4a shows a mini-jack; B and C are matching plugs. Though only three pins are needed, the four-pin type is used to make soldering of the braid tails easier and to help separate the input and output connections. The illustrations are practically self-explanatory; just expose no more of the unshielded center conductor than is necessary; tin the solder points and work carefully. The two inner lugs of the connectors are bent towards one another. A third hand to hold the connectors during soldering will make the work much easier. Use a light touch with the iron and work quickly. The leads in Detail 4c will be connected to the new eight-pole filter.

2. Re-install PB-1704, including its hold-down screws.

C. *Installing the new eight-pole filter.*

1. See Fig. 4. Mount the ground lug on filter stud B using the nut and star washer unless one is stamped into the lug itself. Rest the filter on top of the black cylindrical filter capacitor and slide it towards the left until it touches the metal shield of the circuit board compartment. It will be secured at this point later with special copper double-stick tape (for grounding the filter case) called a "Mount-It."

2. Solder the capacitor and resistor between filter post D and the ground lug as shown in Fig. 3. Note that the common point forms the RC junction to which the coax will connect. See also Fig. 2.

3. Remove the protective paper from the Mount-It (or use foam-type double-stick 3M mounting tape) and press it against the end of the filter nearest pin C (IN). Repeat step 1, resting the filter on top of the large capacitor and sliding it to the left until it contacts the shield. Press it firmly; the special adhesive grounds the filter case (if copper) and bonds more strongly with time.

4. Remount the black plastic panel and tighten its six hold-down screws. Bring the coax with connector 4a up through the rectangular hole. Mark the IN end with paint, brush pen, etc. Do the same for the end of the 4C connector to be chosen as IN. The two must always be connected so that the IN marks match. 4B can be connected either way. The area where the connectors and cables are joined can be covered with epoxy putty to make a neater and more secure job. Try plugging 4B into 4A. Then try 4C; its leads are longer than necessary to reach the eight-pole filter. Cut them to a suitable length with a bit of slack; bare the ends and connect as shown in Fig. 3.

5. This completes the modification. Note that the XF402 assembly (Detail 4b) can be secured to the black plastic panel at a convenient point with double-stick tape; the same is true of connector 4C. Thus, connector 4A (which is loose) can be shifted readily from one to the other. Turn on the set and test its operation. The S-meter deflection should be about the same as before or perhaps a bit greater. Adjusting the slug of T402 might improve matters a bit more, but since an extender board would be needed, it is usually not worth the expense and trouble. If desired, adjust VR401 on PB-1704 to get the original S-meter reading with the CAL signal.

6. Close the cabinet by remounting the top cover and test the connectors for accessibility by removing the small access lid. Connector A makes it possible to experiment with other filters in the future without removing the top of the cabinet. Just duplicate the 4c and Fig. 3 assembly, using clips at the filter end, if desired.■

Parts List

1 Ground lug
1 1k 1/4-Watt, 5% resistor
1 0.01 50-V disc capacitor
1 Female four-contact mini-connector*
2 Male four-pin matching connectors*
1 Mount-It (copper double-stick tape assembly)
1 3/4" square of double-stick foam-type tape
12" RG-174/U high quality coaxial cable
1 Fox-Tango 8-pole filter (2.4 or 2.1 kHz bandwidth; No. 2110 and 2009, respectively).

*Mini-connectors are made from sections of 36-contact header strips by AP Co., Nos. 929834-01 and 929974. The above Parts Kit 4J, including choice of filter bandwidths and complete instructions, is available for $60 from the Fox-Tango Club, Box 15944, West Palm Beach FL 33406. Airmail postpaid US and Canada. Overseas, add $5.00.

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received two months prior to the month in which the event takes place. They should be sent directly to Editorial Offices, 73 Magazine, Pine Street, Peterborough NH 03458, Attn: Social Events.

GEORGETOWN IL
SEP 5-6

The Illiana Repeater System will hold the 12th annual Danville Area Hamfest on September 5-6, 1981, at the Georgetown Fairgrounds, Georgetown IL. The gates will open at 6:30 am. Tickets are $1.50 in advance and $2.00 at the gate. There will be a flea market, forums, family entertainment, many prizes (including a Santec synthesized hand-held), and free parking. Talk-in on 146.22/.82 and 146.52. For more information or advance tickets, contact Lowell Wells WD9AFG, Hamfest Chairman, RR 3, Box 215, Danville IL 61832, or phone (217)-759-7560.

BLOOMINGTON IN
SEP 6

The Bloomington Area amateur radio hams will hold their 4th annual Hoosier Backyard Hamfest on Sunday, September 6, 1981, rain or shine, from 7:00 am until 5:00 pm at 2335 Vernal Pike, Bloomington IN. Admission is $2.00. Features will include door prizes, a swap 'n shop, vendors, free setups, balloon rides, a 50/50 drawing, refreshments, ATV demonstrations, and an Aptron ATV converter as the grand prize. Talk-in on 147.78/.18, 146.04/.64, or 223.26/224.86. For further information, contact Bob Myers K9KTH at 2335 Vernal Pike, Bloomington IN, or call (812)-332-2433.

UNIONTOWN PA
SEP 12

The Uniontown Amateur Radio Club will hold its annual gabfest on September 12, 1981, starting at noon, on the club grounds located on the Old Pittsburgh Road, just off Route 51 and the 119 bypass, Uniontown PA (about 40 miles south of Pittsburgh). The pre-registration fee is $2.00 each or 3 for $5.00. There will be free parking, free coffee, and free swap and shop setups (bring your own table). Food will be available at our refreshment stand. Talk-in on 147.045/.645 and 146.52. For preregistration and further information, contact UARC Gabfest Committee, c/o John T. Cermak WB3DOD, PO Box 433, Republic PA 15475.

AUGUSTA NJ
SEP 12

The Sussex County Amateur Radio Club will hold its third annual SCARC '81 hamfest on Saturday, September 12, 1981, from 8:00 am to 3:00 pm at the Sussex County Farm and Horse Show grounds, Plains Road off Rte. 206, Augusta NJ. Pre-registration for outdoor flea-market sellers is $4.00; at the gate, $5.00. Pre-registration for indoor flea-market sellers is $5.00; at the gate, $6.00. Other registration is $2.00. There will be door prizes and plenty of free parking. Talk-in on 147.90/.30 and 146.52. For additional information or preregistration, write Sussex County Amateur Radio Club, PO Box 11, Newton NJ 07860, or Lloyd Buchholtz WA2LHX, 10 Black Oak Drive, Vernon NJ 07462.

MONTGOMERY AL
SEP 13

The Central Alabama Amateur Radio Association will hold its 4th annual hamfest on Sunday, September 13, 1981, at the Civic Center, downtown Montgomery AL. There will be free admission, free parking, and 22,000 square feet of air-conditioned activities, including a flea market. Setup will be at 0600, doors will be open from 0800 to 1500, and a prize drawing will be held at 1400 CDST. Restaurants and motel accommodations are located within a short walk of the Civic Center. Refreshments will be available in the Civic Center. Talk-in on 146.04/.64 or 146.52; rag-chew on 146.31/.91, 147.78/.18, or 147.045/.645. For further information or market reservations, write Hamfest Committee, PO Box 3141, Montgomery AL 36109.

PORT JEFFERSON LI NY
SEP 13

The Suffolk County Radio Club will hold its ARRL-supported 4th annual Electronic Flea Market on Sunday, September 13, 1981, with a rain date of September 20, 1981. The site is the Odd Fellows Hall, Jane Boulevard, Port Jefferson LI NY. Walk-ins will be $1.50 and sellers will be $3.00. There will not be any charge for XYLs and harmonics of attending hams. Gates will open at 7:00 am. Bargains, prizes, food, and hamship will be available. Talk-in on .52, .94, and 223.50. For more information, contact Floyd Davis at (516)-234-9376.

TIVERTON RI
SEP 13

The Bristol County Amateur Radio Association will hold its annual indoor/outdoor flea market on September 13, 1981, from 12:00 noon to 4:00 pm at the VFW hall in Tiverton RI. Admission is $1.00 and flea market spaces are $6.50. Door prizes will be drawn. Talk-in on 147.63/.03 and .52. For maps, send an SASE to Ann M. Carro KA1DNB, 652 Old Colony Terrace, Tiverton RI 02878.

FINDLAY OH
SEP 13

The Findlay Hamfest will be held on Sunday, September 13, 1981, at the Hancock Recreational Center, just east of I-75 exit 161, on the north edge of Findlay, 40 miles south of Toledo. Tickets are $2.00 in advance and $2.50 at the gate. Tables are $2.50 per half. Setups on Saturday are from 5:00 pm to 9:00 pm and on Sunday at 6:00 am. Major prizes include a deluxe low-band rig, two hand-helds, a memory keyer, and more. For tickets, information, or reservations, send an SASE to PO Box 587, Findlay OH 45840.

PENNSAUKEN NJ
SEP 13

The South Jersey Radio Association will hold its annual hamfest on Sunday, September 13, 1981, from 10:00 am to 4:00 pm, at the Pennsauken High School Grounds, Remington Avenue and US Route 73, Pennsauken NJ. Features will include a swap shop, tailgating, games, and door prizes. Food and refreshments will be available. Admission is $3.00; tailgate space is $5.00. Talk-in on 146.22/.82, 146.52, and 147.48. For information and reservations, contact Edwin T. Kephart W2SPV, 4309 Willis Ave., Pennsauken NJ 08109; (609)-663-6710.

GAITHERSBURG MD
SEP 13

The Foundation for Amateur Radio, with the support of more than 50 affiliated clubs in the greater Washington-Baltimore areas, will hold the Gaithersburg Hamfest on Sunday, September 13, at the Montgomery County Fairgrounds, Gaithersburg MD. Gates open at 8:00 am; setup and talk-in begin at 6:00 am. Events featured include commercial exhibits, indoor flea market, tailgating, and ladies' activities. Admission is $3.00 at the gate; children under 12 admitted free. For further information, write Foundation for Amateur Radio, PO Box 523, Bowie MD 20715, or contact Stuart Meyer W2GHK, hamfest chairman, 2417 Newton Street, Vienna VA 22180; (703)-525-6286 (office) or 281-3806 (home).

KEW GARDENS NY
SEP 13

The Hall of Science Amateur Radio Club will hold its annual electronic hamfest on Sunday, September 13, 1981, from 9:00 am to 4:00 pm, at the municipal parking lot, 80-25 126th street, Kew Gardens, Queens NY. Featured will be free parking, door prizes, refreshments, a raffle, and an auction. Sellers' spaces are $3.00; buyers' admission is $1.00. Talk-in on .52. For additional info, contact Tom Doyle KA2DTB at (212)-351-6354 (days).

HAMBURG NY
SEP 18

The 10th annual Ham-O-Rama '81 will be held on Friday and Saturday, September 18-19, 1981, from 7:00 am to 5:00 pm at the Erie County Fairgrounds near Buffalo NY. Advance tickets (deadline: September 4th) are $3.00 and tickets at the gate will be $4.00. Children under 12 will be admitted free. The outside flea market is $2.00 per space and the inside flea market

is $7.00 per space. Features will include new equipment displays, computers, technical programs, ladies' programs, and valuable awards. Talk-in on 146.31/.91. For advance tickets, send an SASE to David G. Baco WA2TVT, 130 Vegola Avenue, Cheektowaga NY 14225.

GRAND RAPIDS MI
SEP 19

The Grand Rapids Amateur Radio Association will hold its annual Swap and Shop on Saturday, September 19, at the fairgrounds in Hudsonville MI. There will be door prizes, dealers, an indoor swap area, and an outdoor trunk swap area. Gates will open at 8:00 am for both swappers and the public. Talk-in on 146.16/.76. For more information, write Grand Rapids Amateur Radio Association, Inc., PO Box 1248, Grand Rapids MI 49501.

GRAYSLAKE IL
SEP 19-20

The Chicago FM Club will hold Radio Expo '81 on September 19-20, 1981, at the Lake County Fairgrounds, Rtes. 45 and 120, Grayslake IL, about 30 minutes north of Chicago and 45 minutes south of Milwaukee. The flea market is open from 6:00 am to to 6:00 pm and the exhibits are open from 9:00 am to 9:00 pm on both days, rain or shine. Tickets, good for both days, are $3.00 in advance and $4.00 at the gate. Features include seminars, a ladies' program, prizes, free parking, a new camping site with hookups, commercial ham and computer displays, and full food services. Bring your own tables and chairs to the indoor and outdoor flea market (or even tailgate). Space is free with a gate ticket. Talk-in on 146.16/.76, 146.52, and 222.5/224.10. For more information, call (312)-BST-EXPO. For advance tickets, send a #10 SASE to Box 1532, Evanston IL 60204.

PEORIA IL
SEP 19-20

The Peoria Area Amateur Radio Club will hold the Peoria Superfest '81 on Saturday and Sunday, September 19-20, 1981, at the Exposition Gardens, W. Northmoor Road, Peoria IL. Gate opens at 6:00 am; commer-

Continued on page 102

Martin W. Krey K7NZA
7037 E. Chaparral Road
Scottsdale AZ 85253

That They Might Communicate

—one group's efforts to get the vision- and hearing-impaired into hamming

Would you like to help another ham to break out of a silent, sightless world in which he or she perceives only through the senses of touch, taste, and smell? If you get the chance, you might have to slow down your code speed and sharpen your listening a bit, but when you are hit with the full impact of what you are helping another human to do, you just might shed a few tears of joy. Others have. You might even get hooked on the program to get the deaf and deaf-blind into ham radio, as members of the Scottsdale Radio Club have.

Unable to see well enough to read hand signs, J. C. Betner must receive Larry "Plato" Plate's (KA7JCJ) communications through "finger signing," wherein he "reads" the signs with his own sense of touch. Betner will soon be on the Novice bands, receiving code through one of Jack Lattin's (KA7BUT) vibrator boxes.

Led by Jack Lattin KA7BUT, Dottie Brown K7ESA, and Clyde Baker KB7BQ, a determined group of hams in the Valley of the Sun has constructed code "feeling" devices and purchased code viewers to instruct the deaf and the deaf-blind in learning Morse code. The hams have also set up a program for teaching radio theory and the practice of radio communications to the visually and hearing impaired.

You have only to visit the home of blind and deaf J.C. Betner and watch him receive coded messages through a fingertip to realize the value of this totally free program. Recently, in his silent, dark world, where he lives with three other vis-

ually and hearing-impaired people under the care of Irene and Louis Springgay, Betner was given the silent message that Jack Lattin and an article writer had arrived for his lesson in Morse code. Betner smiled, and in the measured, purposeful way of the blind, he walked from the living room to the kitchen and took a seat at the kitchen table, leaving the seat on his right for Jack Lattin.

A former accountant who was bom deaf, Betner has long been locked in a narrow world where the feel of sunshine and the touch of a human hand were his greatest pleasures. He could talk with sign language, but he could "receive" nothing but finger spelling from another person grasping his hand and with various finger movements and pressures, communicating ideas. He wears glasses out of hope, but his eyesight is so poor that he recently spent all night in a bus after the driver had forgotten to let him out at his stop and had parked the bus, thinking it was empty. Also without the power of speech, Betner couldn't even call for help.

Jack Lattin came into Betner's life a year and a half ago. Jack had learned sign language and finger spelling from Gilbert Leon, a deaf coworker at Airesearch, twenty years earlier. Shortly before he met Betner, Jack had constructed a code buzzer for the deaf from plans he had seen in a magazine.

"But it didn't work," he said. "The cone was absorbing all the power the speaker had, and the deaf couldn't feel the buzzer well enough to distinguish between dots and dashes."

Jack boosted the speaker power to eight Watts and the relatively high wattage output overrode impedance-matching problems. Then Jack cut away most of the cone of the speaker and glued a 5/8" starter button to

The blind quickly learn hamming through the Scottsdale Radio Club's program to help the handicapped. Here Cheryl Fitzwater KA7DWP enjoys operating her Heathkit rig built and provided free by SARC members. Cheryl's roommate, Cheryl Waters, who can see, tunes up the set and keeps the log.

the center of the cone for the deaf to feel, and he had a vibrator strong enough of the deaf to sense dots and dashes easily. Glued to the inside bottom of a margarine tub or a wooden box, and with a finger hole cut in either, Jack's vibrator was ready to go to work teaching Morse code to the deaf and deaf-blind.

It was one such vibrator box that he placed on the kitchen table in front of J.C. Betner when it was time for Betner's code practice session. Jack placed Betner's hand on the receiving box to get things rolling, and Betner stuck his forefinger through the vibrator hole and touched the button. Jack sent slowly-paced messages to Betner, telling about the good evening weather and important new events. After each letter, Betner gave the hand sign for the letter, and after each sentence, he signed the whole sentence.

Lattin kept on sending, and Betner's face broke into a grin like a kid's at a watermelon bust

"The deaf like humor," Lattin said to the writer. "I just told him how fat you are."

Clyde Baker WB7BQ, a telephone company marketer, arrived to check out the TVI from Cheryl Fitzwater's (KA7DWP) Heathkit setup which had been provided to her by the Scottsdale Radio Club, members of which had built the set. Cheryl is blind but hears well, so she has no trouble communicating with standard equipment as long as her roommate, Cheryl Waters, who can see, tunes up the transmitter.

While Clyde worked on Cheryl Fitzwater's TVI problem, Jack Lattin continued sending to J.C. Betner, the whole lesson lasting about an hour.

"J.C. has really come on fast the last six months," Lattin said. "It was very slow the first year or so when he had to learn the code, but he'll be on the air soon now."

The full significance of going on the air to blind, deaf, and speechless J.C. Betner has gradually been communicated to Jack Lattin with signs and smiles.

"It will be like giving him the whole human race again," Lattin said. "It will give the world back to him."

Lattin's method of teaching the deaf looks simple. He has a deaf student touch one of his vibrator buttons, and then he sends code and has it appear on a Kantronics code-reader screen. For the deaf-blind, the method of instruction is obviously more complicated.

"First of all, you've got to be a good B-S'er," Lattin said. "I tell them with finger spelling that I'm going to teach them a whole new communications method. That really gets them interested because for them it *is* a whole new method."

Then Lattin introduces the deaf-blind to his code symbol board, where letters and

Not permitted to use bolts on club roof to attach antenna base built by Jack Lattin, the four original members of they Valley Center for the Deaf ham club demonstrate how they intend to weight the corners of the base frame. The four "bags of sand" are, l to r, Alan Wilson KA7JCR, Jim Goodson KA7JCS, Bruce Weir KA7JBA, and Larry "Plato" Plate KA7JCJ. Shack is located in Phoenix Lions' Club Building.

numbers are represented by dots made up of brads driven into the wood, and dashes are represented by flat-top metal staples driven into the wood. Lattin takes one hand of a deaf-blind student and places the fingers on the brads and staples representing a letter, and he takes the other hand and puts a finger on the same letter on a braille card.

"They get the idea pretty fast," Lattin said. "Then it's just a matter of a whole lot of practice."

Once the deaf-blind have mastered the code, Lattin moves them on to the vibrator. They learn the use of the vibrator by placing the fingers of one hand on the brad and staple code board and a finger of the other hand on the vibrator button. Then Jack slowly sends code to them and moves their fingers to the proper brad-staple letters and numbers that correspond to the letters and numbers they feel through the vibrator. Jack said the deaf and the deaf-blind are better motivated to learn than is a person with all senses intact.

"They try harder," he said. "The deaf get the receiving part of hamming down pretty fast," he said, "and the deaf-blind learn it quicker than you might think. But both groups have trouble with the difference in dots and dashes when they are sending."

Lattin solved the sending problem for the deaf very quickly when he bought his first Kantronics code reader and had them send into it.

"It won't show a letter or number on the screen unless it is sent practically perfectly," he said. "That frustrates them for a little while, but it motivates them to send clearly different dots and dashes."

For the deaf-blind, the problem can be solved only with many hours of patient instruction and many hours of private practice. Recently, Jack bought a Universal Data Transceiver 170 automatic keyer into which he can type practice messages and have them come out at a variety of speeds to be taped for both the deaf and the deaf-blind to practice with. Provided with a tape that can be run in a keyer that actuates either the Kantronics code reader or the vibrator, both groups can practice as many hours a day as they like.

"These tapes will make it possible to give practice to a lot more students than if somebody were to send code to them by hand," Jack said, "and it will be perfect code for all of them."

To date, four deaf hams have passed their Novice code and theory exams and have formed the first ham club for the deaf and deaf-blind in Arizona. Al Wilson KA7JCR and Bruce Weir KA7JBA have joined with Larry "Plato" Plate KA7JCJ, director for the Valley Center for the Deaf in Phoenix, and with Jim Goodson KA7JCS to establish the nucleus of a communications group that will put the deaf and deaf-blind in daily contact with each other. With help from their friends in the Scottsdale Radio Club, they have set up the Dottie Brown radio room in the Valley Center for the Deaf.

"It's the first ham shack in the world for the deaf and deaf-blind," said Dottie K7ESA, after whom the shack is named.

Once skeptical of the aid offered by the Scottsdale Amateur Radio Club, the four deaf club members had a flyer printed up which they passed out at a recent carnival for the deaf, in which they said, "SARC (Scottsdale Amateur Radio Club) has been totally devoted in volunteering hours and in being patient in working with us."

"We can see," the report went on, "that in the future the deaf and presumably the deaf-blind will be able to use ham radio with Morse code or teletypewriter in substitution for audio conversation to people in all parts of the world."

The group had special thanks for Jack Lattin and Clyde Baker, giving Jack credit for using his ability to communicate with the deaf "to stimulate us to want to study," and thanking Clyde for teaching them electronics theory.

Behind every good man there is a woman, the saying goes, and according to Jack Lattin there is a great woman behind the radio program for the deaf and deaf-blind. That woman is Dottie Brown K7ESA, mentioned earlier.

"Without Dottie, there would be no program," Lattin said. "She raises all of the money and scrounges the parts to build the vibrator units and to buy transmitters, receivers, and viewers for the handicapped."

A former writer-photogra-

pher for a Bangor, Maine, newpaper, Dottie has transferred her drive from news gathering to fundraising, and with considerable success. By raffling off a pair of handheld transceivers, she netted $1200 which was used to help buy a Century 21 transceiver, a Kantronics Minireader, and a TRAC Message Memory Keyer. She picked up an additional $435 raffling off a frequency counter at a hamfest. When the $1635 didn't stretch far enough, Dottie noticed a refuse container full of aluminum cans in a friend's title guarantee office, and she got permission to collect and sell the cans. A young janitor in the title guarantee building increased the number of cans for Dottie by charging non-employees two empty cans for each full one taken, and a nurse in a hospital scrounged up hundreds more. The ever-loyal Scottsdale Radio Club members brought bags of cans to club meetings for Dottie, and eventually the equipment was bought and given to the Deaf Center radio shack.

"I found out that can collectors for charity get ten percent more from the reclaimers, too," Dottie said. "That will help us to buy more equipment."

Assisting Dottie in procuring equipment is the membership of the Thunderbird Council of Telephone Pioneers, whose retired and longtime members of the Telephone Company collect old radio and television parts. Chet McClellan K7HNM, Jack Fuller W7AVX, and Carl Wolford N7AJK handle most of the salvaging of parts and the building of vibrator boxes.

Special help, according to Jack Lattin, came from Field Engineer Earl Carpenter and his Long Beach, California, Federal Communications Commission staff in the area of instructing and licensing the deaf and deaf-blind.

At this point, the ham radio program for the deaf and deaf-blind is a winner. Jack and Clyde have completed the training of four deaf and deaf-blind instructors who are beginning the instruction of other hams-to-be. Two classes of deaf, ten to a class, are beginning their training, and four deaf-blind are being prepared for instruction.

It hasn't all been easy. There have been disappointments, such as Jack's spending six months trying to teach Morse code to a deaf-blind girl before he learned that she had learned only about six words in braille. It was impossible to teach her to use code until she was sent to a deaf-blind school where she will be taught a functional vocabulary by specially-trained instructors. She had apparently been one of the forgotten ones that nobody pays much attention to.

"She'll be ready for radio instruction after a while," Jack said optimistically. "Then we'll be able to teach her Morse code and ham radio."

There are encouraging signs that the program to teach ham radio to the deaf and deaf-blind could spread out from Arizona to the rest of the country and to other parts of the world. Jack has gotten calls and letters from people as far away as France who are thinking about setting up code and theory classes for their deaf and deaf-blind.

One day, Dick Wharton W4LWI dropped in to the Valley Center for the Deaf and told Dottie Brown that he had made a vibrator after the pattern conceived by Jack Lattin and was teaching a deaf person in his home town of Norfolk, Virginia.

For Jack Lattin, the deep meaning of what he is doing comes through the signing fingers of his promising deaf-blind student who tells him simply and with a smile, "Jack Lattin and J.D. Betner."

Jack knows exactly what he means.

Hams on CW are sure to hear the enthusiastic deaf radio operators operating from the Dottie Brown radio shack in the Valley of the Sun. They are working in the Novice frequencies now, and soon they will be working the General and Advanced frequencies. If you are especially lucky, you may soon hear J.C. Betner or one of the other deaf-blind hams calling CQ from his dark and silent world. He'll be sending slowly, and he won't say he's deaf and blind until after you've hooked up with him. But when he does, and you think of how you are communicating with another human mind in a way that recently seemed impossible, you will get a thrill you will never forget.

And if you come to the Valley of the Sun, drop in and visit with the deaf hams in the Dottie Brown radio room of the Valley Center for the Deaf in the Lions' Club Building in Phoenix. They will catch on fast if you can't talk sign language. They will read your lips and write messages to you, and you will have a satisfying eyeball QSO. You might even get to see J.C. Betner or one of the other deaf-blind operators running the rig.

Should chance or intent bring you to Scottsdale from October 9 to 11, catch the Southwest District Convention of the ARRL in the Safari Hotel. The Scottsdale Radio Club will have a booth manned by deaf members demonstrating handicapped ham radio, and they hope to have deaf-blind members there who will communicate briefly with visitors by code. Getting in on that would give you free an experience that would top having any of the souvenirs you could buy on Scottsdale's famous Fifth Avenue.■

A Cost-Effective Approach to OSCAR

—sources and suggestions for getting started

Editor's Note: At press time, the latest word on OSCAR 7 was that it was barely alive! What is apparently a battery short has put this bird on the endangered list. So, don't try to access the satellite—just listen for it and pass your findings on to AMSAT. For the full story, see "Death of a Satellite" on page 97.

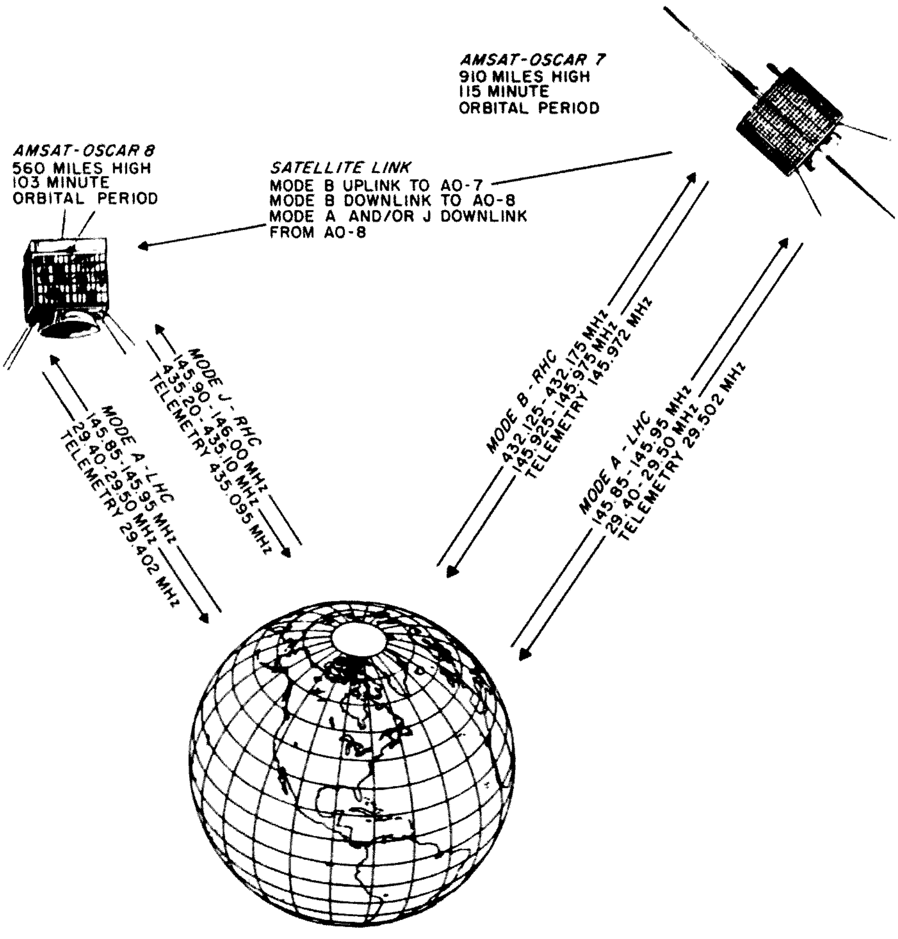


Fig. 1. Frequency and orbital relationships.

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Every time I look at the advertisements in my favorite ham magazines, I envision the ultimate "superstation" ready to zap any unwitting amateur satellite that dares to get within range of my home. But then reality steps into the picture. How dare everyday living expenses take precedence over such a glorious dream?

I feel that many a potential OSCAR enthusiast or old pro has had his enthusiasm dampened when the prices of the various components seemingly needed to accomplish satellite communications came head to head with the family budget. Others read about exotic equipment used by some operators and don't realize that much simpler rigs are all that are really needed to operate effectively.

What I hope to do in this article is to give you some practical and cost-effective ideas and alternatives with the goal of no lost operating efficiency. I do not intend to provide an introduction to OSCAR communications, its history, or its operating procedures. These topics have been covered many times in various articles in the ham magazines. A very good source of this type of information is the "Satellite Communications" package available from the ARRL and at most ham shops. This includes reprints of previously published articles in *QST* and also includes three OSCAR-locators™—a device used to locate the satellites.

I have included a few operating aids that could save you some time and frustration in attempting your first satellite contact. Also included in the article is a list of equipment suppliers that can save you some time-consuming research.

The Bare Requirements for Those Who Have Nothing

Any amateur who has a rig capable of operating in the ten-meter band or has a multi-mode two-meter radio has a tremendous head start. The lucky ham who already has some equipment merely needs to read on, substituting his equipment in the obvious spots.

Let's briefly review just what frequencies we need to operate on both the existing birds and the planned AMSAT-OSCAR Phase IIIB. Mode A's uplink is 145.85-145.95 MHz, with the downlink at 29.4-29.5 MHz; Mode B's uplink is 432.125-432.175 MHz, with the downlink at 145.975-145.925 MHz (inverted); Mode J's uplink is 145.9-146.0 MHz, with the downlink at 435.2-435.1 MHz (inverted); and Phase IIIB's planned Mode B transponder's uplink is 435.3-435.15 MHz, with the downlink at 145.97-145.82 MHz (inverted). The common denominator of all these combinations is the capability to transmit and/or receive on two meters.

The station requirements aren't like those for regular terrestrial transceive operations, due to the very nature of the satellite transponders. As Fig. 1 shows, the satellite accepts one transmitted frequency, amplifies it, and linearly translates the signal into the transmitted downlink frequency. Two rigs (or a separate transmitter and receiver) are required for this duplex operation.

It's not impossible to operate with a single transceiver (with the proper converter) into the spacecraft; several hams have done it. However, the Doppler shifts (frequency changes in received signal due to satellite motion in relation to the ground station) and the inability to hear the strength or quality of one's downlink while transmitting usually cause hopping back and forth in the passband and cause unnecessary QRM. It really is preferable to operate with two independent units, be they two separate transceivers or a separate transmitter and receiver combination.

Let's begin with equipment commercially available and develop alternatives for all three operational modes. Almost any multi-mode two-meter radio on the market today will serve you well and also give you a nice, solid ten-Watt output. Another nice benefit is FM, if you're into that. But those multi-mode units are expensive.

A cheaper alternative is the Icom 202S or 202, which allows SSB and CW two-meter operation within the 200-kHz range of OSCAR operations. It gives you, after the installation of the readily-available crystal, three primary mode capabilities: uplink with a linear amplifier on Mode A and Mode J or barefoot on QRP days (UTC Mondays) and downlink on Mode B. The radio has a very hot receiver—in fact, downlink on Mode B easily can be copied from horizon to horizon with the collapsible antenna provided. (Of course, much better reception results with the use of an external antenna.)

The radio has an output of three Watts PEP and can operate independently with its self-contained battery pack. The Icom 202 can be modified to receive lower sideband (it only transmits and receives upper sideband) and is available used at very reasonable prices. The Icom 202S already has the lower sideband capability. Articles in the September, 1978, and December, 1979, *AMSAT Newsletter* illustrate the conversion, or you can contact Icom directly for conversion information.

The twin to the 202S is the 402, Icom's 432-435-MHz SSB/CW transceiver. This radio also has a hot receiver section, while the transmit section also has an output of three Watts PEP. The 402 retails for approximately $100 more than the 202S. With the appropriate crystals, this radio covers the OSCAR 7 and Phase IIIB Mode B uplink frequencies and the OSCAR 8 Mode J downlink frequency. Icom recently introduced the new IC-451A, a 432-MHz multi-mode radio capable of ten-Watt output, similar to their two-meter multi-mode series. KLM also has available a 432-435-MHz SSB/CW transceiver with a ten-Watt output.

Other commercial radios are available, and while these radios could prove to be the cornerstones of your operations, there are cheaper alternatives. If straight CW is your bag, the Ameco 62 (AM/CW only) provides an excellent two-meter uplink at a good workable power level. The radio can be operated VXO (variable crystal oscillator) with the modifications as described by Raphael Soifer in the March, 1976, *AMSAT Newsletter*. The radio easily can drive a varactor tripler to 432 MHz for a CW signal that won't need an amplifier for OSCAR 7. This is a very popular radio with the CW crowd. The Ameco often can be had for less than $100 through ads, at hamfests, and as used equipment at ham shops.

The local pawn shop, want ads, or flea market may provide one of the cheapest and best additions you can ask for: an SSB/AM CB radio. Most of the phase-locked loop radios are capable of extended-frequency operation and expanded-clarifier (VXO) operation. This inexpensive radio (after conversion) could truly turn out to be the workhorse you have been needing: downlink for Mode A and, with separate downconverters, for Mode B and/or J, and, finally, rf drive for your 145-MHz and/or 432-435-MHz uplink converter.

It should be noted that the new CBs have a much sharper and more sensitive receiver than almost any ham rig capable of operating in the ten-meter range. Obviously, this is a tremendous asset for operating; as we all know, you have to hear 'em before you can work 'em. The cost is nice, too. Two new or recycled CBs, after commercial conversion (if desired), plus the purchase of the required

Uplink Frequency	Mode A Downlink AO-7	Mode A Downlink AO-8	Mode J Downlink AO-8
145.850 MHz	29.400 MHz	-	-
145.851	29.401	-	-
145.852	29.402	-	-
145.853	29.403	-	-
145.854	29.404	-	-
145.855	29.405	-	-
145.856	29.406	-	-
145.857	29.407	-	-
145.858	29.408	29.400 MHz	-
145.859	29.409	29.401	-
145.860	29.410	29.402	-
145.861	29.411	29.403	-
145.862	29.412	29.404	-
145.863	29.413	29.405	-
145.864	29.414	29.406	-
145.865	29.415	29.407	-
145.866	29.416	29.408	-
145.867	29.417	29.409	-
145.868	29.418	29.410	-
145.869	29.419	29.411	-
145.870	29.420	29.412	-
145.871	29.421	29.413	-
145.872	29.422	29.414	-
145.873	29.423	29.415	-
145.874	29.424	29.416	-
145.875	29.425	29.417	-
145.876	29.426	29.418	-
145.877	29.427	29.419	-
145.878	29.428	29.420	-
145.879	29.429	29.421	-
145.880	29.430	29.422	-
145.881	29.431	29.423	-
145.882	29.432	29.424	-
145.883	29.433	29.425	-
145.884	29.434	29.426	-
145.885	29.435	29.427	-
145.886	29.436	29.428	-
145.887	29.437	29.429	-
145.888	29.438	29.430	-
145.889	29.439	29.431	-
145.890	29.440	29.432	-
145.891	29.441	29.433	-
145.892	29.442	29.434	-
145.893	29.443	29.435	-
145.894	29.444	29.436	-
145.895	29.445	29.437	-
145.896	29.446	29.438	-
145.897	29.447	29.439	-
145.898	29.448	29.440	-
145.899	29.449	29.441	-
145.900	29.450	29.442	-
145.901	29.451	29.443	-
145.902	29.452	29.444	-
145.903	29.453	29.445	-
145.904	29.454	29.446	-
145.905	29.455	29.447	-
145.906	29.456	29.448	435.200 MHz
145.907	29.457	29.449	435.199
145.908	29.458	29.450	435.198
145.909	29.459	29.451	435.197
145.910	29.460	29.452	435.196
145.911	29.461	29.453	435.195
145.912	29.462	29.454	435.194
145.913	29.463	29.455	435.193
145.914	29.464	29.456	435.192
145.915	29.465	29.457	435.191
145.916	29.466	29.458	435.190
145.917	29.467	29.459	435.189
145.918	29.468	29.460	435.188
145.919	29.469	29.461	435.187
145.920	29.470	29.462	435.186
145.921	29.471	29.463	435.185
145.922	29.472	29.464	435.184
145.923	29.473	29.465	435.183
145.924	29.474	29.466	435.182
145.925	29.475	29.467	435.181
145.926	29.476	29.468	435.180
145.927	29.477	29.469	435.179
145.928	29.478	29.470	435.178
145.929	29.479	29.471	435.177
145.930	29.480	29.472	435.176
145.931	29.481	29.473	435.175
145.932	29.482	29.474	435.174
145.933	29.483	29.475	435.173
145.934	29.484	29.476	435.172
145.935	29.485	29.477	435.171
145.936	29.486	29.478	435.170
145.937	29.487	29.479	435.169
145.938	29.488	29.480	435.168
145.939	29.489	29.481	435.167
145.940	29.490	29.482	435.166
145.941	29.491	29.483	435.165
145.942	29.492	29.484	435.164
145.943	29.493	29.485	435.163
145.944	29.494	29.486	435.162
145.945	29.495	29.487	435.161
145.946	29.496	29.488	435.160
145.947	29.497	29.489	435.159
145.948	29.498	29.490	435.158
145.949	29.499	29.491	435.157
145.950	29.500	29.492	435.156
145.951	-	29.493	435.155
145.952	-	29.494	435.154
145.953	-	29.495	435.153
145.954	-	29.496	435.152
145.955	-	29.497	435.151
145.956	-	29.498	435.150
145.957	-	29.499	435.149
145.958	-	29.500	435.148
145.959	-	-	435.147
145.960	-	-	435.146
145.961	-	-	435.145
145.962	-	-	435.144
145.963	-	-	435.143
145.964	-	-	435.142
145.965	-	-	435.141
145.966	-	-	435.140
145.967	-	-	435.139
145.968	-	-	435.138
145.969	-	-	435.137
145.970	-	-	435.136
145.971	-	-	435.135
145.972	-	-	435.134
145.973	-	-	435.133
145.974	-	-	435.132
145.975	-	-	435.131
145.976	-	-	435.130
145.977	-	-	435.129
145.978	-	-	435.128
145.979	-	-	435.127
145.980	-	-	435.126
145.981	-	-	435.125
145.982	-	-	435.124
145.983	-	-	435.123
145.984	-	-	435.122
145.985	-	-	435.121
145.986	-	-	435.120
145.987	-	-	435.119
145.988	-	-	435.118
145.989	-	-	435.117
145.990	-	-	435.116
145.991	-	-	435.115
145.992	-	-	435.114
145.993	-	-	435.113
145.994	-	-	435.112
145.995	-	-	435.111
145.996	-	-	435.110
145.997	-	-	435.109
145.998	-	-	435.108
145.999	-	-	435.107
145.600	-	-	435.106
145.601	-	-	435.105
145.602	-	-	435.104
145.603	-	-	435.103
145.604	-	-	435.102
145.605	-	-	435.101
145.606	-	-	435.100
Telemetry	29.502	29.402	435.095

Table 1. Mode A and Mode J frequency relationships (± Doppler).

converters will be cheaper than the purchase of a single new or used multimode rig. With luck, recycled rigs could be cheaper than the cost of the new Icom 202S described earlier. Thus, the recycled CB could prdve to be both highly useful and cost effective.

Even cheaper are the CB boards available from various sources. These boards can be modified to receive SSB/CW signals and can be used to provide rf drive for CW into converters or varactors (as could an AM CB radio). The board(s) also could be dedicated to receive the telemetry channel(s) of both the existing satellites and the upcoming birds. A recent ad offered two of these boards for $25. A note to the wise, though: Be sure to specify the sixteen-pin PLL 02A boards, as the eighteen-pin boards may be next to impossible to convert. Two of the best conversion articles are in the June and September, 1980, issues of *73 Magazine*.

Kits can save many dollars if you have the time and necessary equipment available. Something to remember is that unassembled kits gathering dust do not pay off as do already-assembled operating units. You have to decide how much time you have and just how valuable it is to you, weighing also the educational aspect of the construction project.

For CW-only operation, for both 145 MHz and 432-435 MHz, new FM transmit board kits can be purchased for under $50 to provide drive for a suitable amplifier. The boards usually provide one to two Watts output barefoot. These boards are for crystal-controlled operation, but many on-the-air operators are using them with great success. Someone must have come up with a VXO scheme by now.

Another source of CW

UHF is a varactor tripler which can cheaply convert 144-MHz signals into 432-MHz CW output. Varactor designs can be found in the ARRL *Handbook* and in the September, 1976, *AMSAT Newsletter*. This device can triple your 144-MHz drive to 432 MHz (or 145 MHz to 435 MHz for Phase IIIB). Depending upon signal input into the device, there may be no need for an amplifier. The typical efficiency is around 60%. Remember that the device is useful only for CW operation. It will not linearly translate SSB.

Kits and assembled units are available for linear transverters and converters capable of operation in almost any desired band or frequency. For example, kits or completed units are available for converting received ten-meter signals into two-meter signals for those persons possessing a two-meter radio. Usually these transverters take ten-meter (or two-meter, depending on the unit) rf drive and linearly convert that signal into the desired output frequency. The resulting output varies from a few milliwatts up to two Watts (again depending on the unit), usually just the right amount to drive an amplifier.

The receiving converters operate on the same principle. Naturally, the higher the frequency the higher the cost, and also the more critical the construction techniques required. The beauty of these transverters and converters lies in their ability to be adjusted to various frequency requirements merely by crystal changes. For example, you can permanently convert your SSB CB radio to the 29.4-29.5-MHz Mode A downlink frequency and still use this radio to provide your intermediate frequency (i-f). I-f is the frequency that is mixed with the transverter's or converter's crystal-generated harmonics and results in the final product, either transmitted or received. The "normal" comparison is 28.0 MHz, equaling 432 or 435 MHz (crystal frequencies of 44.888 MHz or 45.222 MHz multiplied by nine and added to 28.0 MHz).

As is obvious, all that really needs conversion—if the 28.0-MHz or 144.0-MHz i-f is not precisely available (but is reasonably nearby)—is the rather cheap converter crystal. In other words, you could use the orginal frequencies the CB radio generated, if you so desired. You probably would want to expand the clarifier adjustment to allow the radio to expand both its transmit and receive variable capability to 10 kHz (the difference between channels). Another advantage is that the converter can be remotely mounted at the antenna or in the attic closer to the antenna, both of which placements reduce line loss.

Antennas: Large Signal from Small Size

Antennas have been and will be exhaustively discussed everywhere. As hams know, there never has been a perfect design for all applications. While many antennas give the overall desired results, the inborn tinkering instincts of most hams dictate modifications and/or designs of their own. Satellite antennas are no exception, especially since signals to and from the satellite experience Faraday rotation. This effect causes fading and loss of signal if the antenna is not circularly polarized. (See the ARRL's *Satellite Communications* for a more technical explanation.) Obviously this effect opens up a fertile area for antenna design and experimentation.

The nice things about VHF/UHF antennas are their relatively low cost and small size. These antennas can fit easily into most zoning laws and regulations of local neighborhoods, especially since the antennas are not 50-150 feet in the air. These antennas can be mounted easily low on the roof, or even at ground level. You can experiment cheaply with various designs and approaches as you dream them up. The connectors may cost as much or more than the other materials in the antenna! Home-built antennas do require accuracy in measurements, especially at UHF, but there is no real problem if you're careful.

For Mode A downlink, an inverted single-loop quad with a preamplifier is a very cheap but effective antenna and is easily placed out of sight in your attic or attached to your ceiling. This antenna is essentially a full-wave loop pointing straight up. Bernie Glassmeyer of ARRL headquarters is the designer of this antenna and will supply you with the design for an SASE. Briefly described, the loop is 34′ 1″ of regular antenna wire, with a 5.5′, 72-Ohm coax cable matching stub into a 52-Ohm coax mate.

Of course, other antennas are useful, such as converted CB antennas, dipoles, and existing ten-meter beams. However, the ten-meter directional antennas are really effective up to 30° above the horizon. Unless you can control or modify your elevation, you really need the inverted-loop quad above this elevation. Some possibilities include permanently tilting your directional antenna 30°+ above the horizon, but you may still get overhead fading and/or nulls. This is due to the beamwidth and orientation of your antenna—the higher the gain, the more compressed is your beamwidth. Your antenna is not circularly polarized, either, which contributes to the fades. These considerations normally are not a concern for non-OSCAR operations, but our little birds up there are consistently changing their positions relative to ourselves at 15,000 mph!

Uplink Frequency	Mode B Downlink
432.125 MHZ	145.975 MHz
432.126	145.974
432.127	145.973
432.128	145.972
432.129	145.971
432.130	145.970
432.131	145.969
432.132	145.968
432.133	145.967
432.134	145.966
432.135	145.965
432.136	145.964
432.137	145.963
432.138	145.962
432.139	145.961
432.140	145.960
432.141	145.959
432.142	145.958
432.143	145.957
432.144	145.956
432.145	145.955
432.146	145.954
432.147	145.953
432.148	145.952
432.149	145.951
432.150	145.950
432.151	145.949
432.152	145.948
432.153	145.947
432.154	145.946
432.155	145.945
432.156	145.944
432.157	145.943
432.158	145.942
432.159	145.941
432.160	145.940
432.161	145.939
432.162	145.938
432.163	145.937
432.164	145.936
432.165	145.935
432.166	145.934
432.167	145.933
432.168	145.932
432.169	145.931
432.170	145.930
432.171	145.929
432.172	145.928
432.173	145.927
432.174	145.926
432.175	145.925

Telemetry: 145.972 MHz

Table 2. Mode B frequency relationships (± Doppler).

The turnstile antenna also is a cheap and effective antenna that can be built easily for 145-MHz and 432-MHz transmitting without worrying about tracking the satellite. This antenna is especially recommended for the novice at satellite operation. The prime advantage is the reasonable gain achieved without the need to track the satellite's motion. Of course, signal levels may not be the highest S-9s, but the idea is to gain the needed experience with the

least possible amount of frustration. You will have plenty of time to get into more directive antennas and az-el (azimuth/elevation) later. This antenna can be built cheaply from almost any material available. A good article on this antenna's construction is in *Satellite Communications*.

Various VHF/UHF antenna designs have been offered by various authors, including quads, quagis, helicals, and crossed yagis. Excellent construction articles are referenced at the end of this article.

Quality commercial antennas are available from several reputable manufacturers (see Table 3). Cushcraft also offers an az-el mounting boom perfect for use with the Alliance U-100 rotor I will mention later. These antennas commercially available are crossed yagis with matching harnesses to provide an adjustable (i.e., left- or right-hand) circular polarization. These antennas usually have ten elements plus and provide 13 dB gain or more.

Something to remember, with whatever type of UHF antenna you do use, is that you should try to keep the line of sight clear to the satellite if at all possible. Unlike HF, signals on these frequencies are absorbed by trees and the like.

Preamplifiers, or How to Copy the Weak Ones

It is remarkable that we amateurs can hear and communicate through our OSCAR satellites when you consider the many factors against it, such as: the up-/downlink attenuations of the atmosphere, the relatively low power output from the satellite (100-milliwatt output on telemetry to a peak of two to ten PEP on the transponders), and so on.

But we can. And most of us are not merely satisfied to hear a weak signal when, with a little extra effort and expense, we can copy strong signals without an increase in transmitted power. The best selling point about preamplifiers is the increase in sensitivity and selectivity to the receiving system for a relatively low cost. Preamps are commercially available for all the downlink frequencies (see Table 3).

Preamps normally are located at the antenna or in the attic as close to the antenna as possible, to allow peak efficiency. If the downconverter (especially for Mode J) is located at the antenna just following the preamp, maximum signal strength is achieved due to the UHF signal not being absorbed by the coax. Ten-meter signals are not attenuated nearly as much as those higher VHF/UHF frequencies. Power to the preamp located at the antenna can be duplexed up the coax to the antenna mounting to reduce additional wiring, if desired. The power requirement for these devices is quite low, and, in a pinch, a nine-volt transistor battery will suffice nicely.

Most enthusiasts use the preamps on Modes A and J. Mode B users, with adequate gain on their two-meter antennas, usually do not need a preamp. Signal levels for OSCAR 7 usually are more than sufficient for adequate reception, but it all depends on the station's receiver sensitivity, antenna, and length and type of coax used. It should be noted that most authorities are recommending the use of a preamp for the downlink from the Phase III satellites. One thing not usually mentioned is the possibility of achieving too *much* gain, thereby overloading the receiver and effectively reducing the quality of the signal. If overloading does occur, it usually occurs on direct overhead passes.

The purist on Mode J may want to resort to a more expensive low-noise preamp, but to get started, good results are achieved daily with the less-expensive but higher noise figure preamps. Another benefit of the less-expensive preamp for Mode J is its resistance to overloading and the resulting need for cavity filters (such as the 4×3×5 filter in *Satellite Communications*). The overloading, if it occurs, is a direct result of the 435 downlink being the third harmonic of the 145-MHz uplink. Usually the overload/crosstalk desense occurs in the more sensitive UHF preamplifiers.

These preamplifiers are readily available from commercial sources. They may be purchased anywhere for $12.00 for a kit on up to an average ready-built price of $25.00.

Another nice thing about preamps is the many good home-brew designs that are available using inexpensive parts. The *AMSAT Newsletter*, *73*, and the ARRL *Handbook* all have carried several designs for the various frequencies and additional references are at the end of this article.

All in all, you can expect 12-20 dB of amplification of the received signals by use of the preamplifiers. If the noise figure of the preamplifier is below 2 or 3 dB, this amplification is generally enough to ensure that no deep fades are constantly encountered, assuming the use of a circularly-polarized antenna.

Az-El, or To Point or Not To Point?

Many methods are employed by OSCAR users to point antennas at orbiting birds. As with most things, results depend on what the individual wants to spend.

One of the easiest methods is to use simple omnidirectional antennas, preferably with preamps for receiving and a slightly higher output power into an omnidirectional antenna for transmitting. Unfortunately, omni antennas do not furnish an abundance of gain; thus the need for higher power. This is not always needed, however, during periods of low load such as on weekday mornings and on QRP days.

Another easy method is the tilting of the directional antennas at the mast 30°+ above the horizon and using a regular rotor (if you have one) as the azimuth movement. The primary problem with this approach is on overhead passes, where the station could then experience a null. The null lasts only two minutes or so, however, and the vast majority of the time the satellite doesn't pass directly overhead. This is probably the cheapest of all the alternatives involving a directional antenna, other than pointing antennas by handpower.

The drawback with using higher power into omnidirectional antennas for constant use after you've gained your initial experience on the satellite is that the cost of the amplifier usually required to get the signal *consistently* into the bird exceeds the cost of two Alliance U-100 rotors and two directional VHF/UHF antennas. Two U-100 rotors and the commercially available mounting boom mentioned above (or a homemade mount) can easily furnish you both azimuth and elevation control.

Many hams use a heavier rotor for the azimuth rotor, but the U-100 is capable of handling the small antennas *and* a sister U-100 for this function. It does have the tendency to lose orientation in high winds, but several articles by Jim Bartlett in June and Sep-

tember, 1979, *QST* give some excellent methods of superior az-el control at a very reasonable cost. Nonconversion is quite acceptable, as well, however, as the rotors track in 10° progressions. The advantage of the Bartlett system is its precise tracking (within two or three degrees) of the birds. This is exceedingly useful for high-gain, narrow-beamwidth antennas such as those for use with Phase IIIB, and another benefit is that no recalibration is necessary after windstorms.

More expensive elevation and azimuth rotors are available but really aren't needed unless you want to get into EME or computer control. An excellent article on computer control was in the November/December, 1980, issue of *Orbit*, the AMSAT magazine. In that article, the author describes the computer program, the interface needed, and conversion mechanical aspects.

Essentially, az-el takes the place of more expensive linear amplifiers at a less expensive price, but it also takes its toll in necessary attention during flyby operation. You have to orient two rotors, adjust for Doppler, etc., and operate. (But that's part of the fun! If nothing else, imagine your neighbor catching glimpses of your antenna moving in some rather peculiar fashions, wondering if he is going crazy.) You also need to know where the satellite will be at three-minute intervals. Many calculator programs and computer programs have been written to solve this problem for you or you can "eyeball" it by using your OSCARlocator™ or Satellabe™. If your antenna does not have too narrow a beamwidth, this method, in conjunction with listening to your downlink, can usually suffice.

Source	Amplifier (Linear)	Antennas	CB Board	CB Conversions	435 Cavity Filter	Crystals	Converters or Transverters Rcvr	Converters or Transverters Xmit	Coax Phasing Harness	Exciter Boards	Mounting Boom	Parts	Preamp	Rotor	Transceiver
Alliance Manufacturing Co. Alliance OH 44601														M	
American Crystal Supply Co. PO Box 638 W. Yarmouth MA 02673				KC		Yes									
ARCOS PO Box 548 East Greenbush NY 12061	KC	M					KC	KC	M			Yes			
Advanced Receiver Research PO Box 1242 Burlington CT 06013					M		M						M		
Certified Communications 4138 S. Ferris Fremont MI 49412		M		M		Yes						Yes			
Cushcraft Corporation PO Box 4680 Manchester NH 03108		M							M		M				
Hamtronics, Inc. 65 Moul Rd. Hilton NY 14468	KC						KC	KC		KC		Yes	KC		
Janel Laboratories 33890 Eastgate Circle Corvallis OR 97330					M		M		M				M		
KLM Electronics, Inc. PO Box 816 Morgan Hill CA 95037	M	M							M				M	M	M
Lunar Electronics 2785 Kurtz St., Suite 10 San Diego CA 92110	M	M					M	M		M			M		
Meshna, Inc. PO Box 62 E. Lynn MA 01904			Yes												
Microwave Modules 4800 W. 34th Street Suite D12A Houston TX 77092		M					M	M					M		
Poly Paks PO Box 942 S. Lynnfield MA 01940			Yes									Yes			
Spectrum International PO Box 1084 Concord MA 01742	M	M			M		M	M	M				M		

Legend: K—Kit only; KC—Kit or completed; M—Manufactured (possible minor assembly needed).

Table 3. OSCAR supplier chart (not all inclusive).

It should be remembered that az-el is *not* needed for beginning OSCAR communications; preferably, it should be graduated into as the operator's experience increases.

Power Supplies, or Cut-Rate Juice

Most of the various components mentioned require 12 volts dc at various amperage ranges. Unfortunately, commercial power supplies for anything over two Amps are rather expensive. Depending on the equipment used, two to ten Amps may be required at a time of peak usage.

Probably the cheapest source of power is an old car or motorcycle 12-volt battery. The battery is recharged during periods of nonuse, such as out-of-range periods and overnight. A very good article for a charging regulator to ensure that the battery is not overcharged was in the September, 1980, *73 Magazine*. Of course, this assumes you own a battery charger.

Batteries can be either new or used, including the kind that won't hold a charge for an extended period. These can be used since demand on their power is usually for less than 25 minutes at a time. As mentioned in the *73* article, be sure to allow for adequate ventilation of the battery during charging.

If you operate in or near your garage, you can always run a power cord to your car's battery. You may want to start up the car after usage to make sure the battery didn't run down too far.

Commercial power supplies sometimes can be found cheaply at ham auctions, close-out sales, or occasionally as a loss leader at a ham store. Home-brew power supplies can be built, also.

Coax and Connectors, or The Forgotten Line

Coax and their connectors can be bothersome for satellite communications or VHF/UHF work if some basic facts are not con-

sidered. Briefly stated, the higher the operating frequency, the higher the transmission line loss. With the already weak signal from the satellite received at the antenna, any long runs of cable and use of connectors not designed for VHF/UHF frequencies will wipe out whatever signal was left.

To combat this loss, you need to do some (or all) of the following: Mount the downconverter/upconverter at the antenna; mount the preamp at the antenna; mount these devices in the attic closer to the antenna; don't use a coax grade below RG-8/U; or use hardline if you can't remotely mount the converters at the antenna. Try to use at least BNC or, preferably, N-type connectors if you can afford them. These connectors do not introduce as significant an impedance "bump" (or reduced signal) as do the more conventional PL-259s.

Some potential sources for the more expensive hardline include cable TV companies. There is a definite upswing in cable TV installations around the country; companies may have some coax they would be willing to sell cheaper than their prime stock.

Simply put, the higher the grade or quality of coax and connectors (and the mounting scheme employed), the higher the quality of your received signal. Ask your dealer to show you the specifications on the coax you are contemplating purchasing for your station; he should have them readily available. Also, when making the connections to the coax, take your time and do a good job. For your outside connections, make sure to have good weatherproof connections. The easiest way to do that is spray them with clear lacquer. It's amazing how easily a little corrosion will degrade your signal.

Additional Reading

General Information

73 Magazine—July, 1975, and November, 1977. *Orbit* (AMSAT's magazine)—all editions. *QST*—December, 1979, April and May, 1980. *The Radio Amateur's Handbook*, 1980 edition—ARRL. *Satellite Communications*—ARRL

Antenna Construction

Helicals
- *AMSAT Newsletter*—March, 1978, p. 8; June, 1979, p. 20.
- *Orbit*—January/February, 1981, p. 8.
- *73 Magazine*—July, August, September, 1975.

Quads
- *AMSAT Newsletter*—September, 1977, p. 26.
- *VHF Antenna Handbook, 73.*
- *The ARRL Antenna Book.*

Quagis
- *The ARRL Antenna Book.*
- *Satellite Communications*—ARRL.

Polarization—Switchable Sense
- *AMSAT Newsletter*—December, 1978, p. 9. (Note: There is an error in the drawing; the text is correct.)

Turnstiles
- *73 Magazine*—November, 1977, p. 24.
- *AMSAT Newsletter*—March, 1977, p. 3.

Yagis
- *AMSAT Newsletter*—March, 1975, p. 4.
- *VHF Antenna Handbook, 73.*
- *The ARRL Antenna Handbook.*

Amplifiers
- *AMSAT Newsletter*—March, 1977, p. 4.
- *The Radio Amateur's Handbook*—ARRL.

Preamplifiers
- *AMSAT Newsletter*—March, 1973, p. 7 (Mode A); June, 1978, p. 10 (Mode J);
- *The Radio Amateur's Handbook*—ARRL.

Mode J Cavity/Transmitter Filter
- Filter: *AMSAT Newsletter*—June, 1978, p. 4.
- Cavity: *Satellite Communications*—ARRL.

Varactors and FM Conversions
- Tripler: *AMSAT Newsletter*—September, 1976, p. 25.
  The Radio Amateur's Handbook—ARRL.
- SSB/FM: *AMSAT Newsletter*—December, 1975, p. 10.

Mode J Operation and Equipment
- *AMSAT Newsletter*—September, 1979, p. 18.
- Mode J Club— 3300 Fernwood, Alton IL 62002.

Amplifiers—Needed? Linear or Class C?

Before you purchase an amplifier, be sure you *really* need it for the Phase II satellites. Remember you need only 100 Watts erp to fully and consistently access the satellite. A 10-dB gain antenna with ten Watts into the antenna should more than adequately serve your purposes.

For Phase III, the requirements do increase to 500-1000 Watts erp. Again, you may be able to use precise az-el and a highly-directive (and cheaper) antenna, with only a small increase in needed rf wattage. Remember, the Phase III satellite will not be changing its position in the sky rapidly.

Whatever you decide, many amplifiers have recently hit the market, some as kits and some fully assembled. (See Table 3.) If you are going to operate SSB, be *sure* the amplifier is linear, or you will be able to operate only CW (Class C) or FM terrestrially through it. Some of the nicer amps include a built-in preamplifier.

Remember that the current requirements directly affect your power supply—the higher the power output, the higher the current requirements and the more potentially expensive the power supplies.

Bells and Whistles, or Neat Things

As everyone knows, there can be additions to any operation that make life much easier and more enjoyable. So it is with satellite operations. Digital or other clocks set at UTC make it easier to be consistent with orbital charts. You will need some method of properly telling the correct time, since Phase II satellite operation really is precise to the second; Phase II birds fly by with windows of a maximum of 22 minutes at a time. Phase III will be much more relaxed operationally, since the bird will be visible usually for ten plus hours at a time.

OSCARlocators and similar devices are exceedingly useful and necessary to exactly visualize and track where the birds are: their approximate elevations and azimuths and the associated windows for the time periods of the pass selected. These devices are easy to use and understand and should be part of your operations unless you are computer-controlled. Even then, you would want one for use in visualizing your coverage and respective communication possibilities. They are useful for planning your DX operations, allowing you to see when your windows open up (i.e., such as for Hawaii).

That's one really neat thing about satellite operation: It's really rather predictable, allowing you to set up schedules well in advance, if so desired. Tables for calibration of these devices are reproduced monthly in *QST, 73,* and other monthly amateur publications, and in *Orbit* semimonthly. They also are available on a quarterly basis from Project OSCAR in a very useful individual

orbit and time format for each day's pass.

A large map of the world is a very useful addition, especially if for Phase II satellites you mark the extreme limits of normal communications from your QTH. This marking is especially useful when you notice unusual propagation.

A tape recorder is a nice addition and can help you relive (and possibly verify) some of your more exciting experiences. Any type of recorder is OK, just as long as you can record continuously for 25-30 minutes. The tape recorder is especially useful if you have a desire to tape telemetry and later decode it, or if you have developed a separate receiver for telemetry. Obviously, you will want a tape recorder if you plan any SSTV operation —transmission or reception. The recorder could also be put into use for taping the upcoming SSTV UOSAT weather picture transmissions and other experimental telemetry, and then taking the tape to a friend who has SSTV capability for viewing. Cheap sources of tape recorders are places like GE Service Centers and discount stores.

Speech compressors have received some attention by some authors for use through the satellites. The problem with using such a device is that it puts an undue extra strain on the satellite system, and AMSAT authorities not only do *not* recommend its use, they discourage it.

Weatherproofing of some components such as preamps and converters can be done in some instances by the manufacturer. Where this feature is not available, other effective alternatives exist. Depending on the component's size, old Tupperware™ containers can be placed into service, sealing the openings after insertion of the component and its wiring. Other possibilities include using the Seal-A-Meal™ plastic bags (double sealed), jars (sealing the lids), or simply placing the component in the attic. You can even cut off tops of smaller containers, such as antifreeze containers, resealing them with Super Glue™. Obviously, other alternatives exist as well.

A computer would be the ultimate addition, since it could track the satellite, control your rotors, decode telemetry, and "talk" through the Phase III computer channel.

Operating Aids, or Easy Help

Probably one of the most confusing aspects of your initial satellite operation is the determination of where your uplink signal will be translated into and received on the downlink. Tables 1 and 2 show you approximately, plus or minus Doppler effect, where the downlink should be heard. Be sure to notice that Mode A downlink is not exactly the same for OSCAR 7 and 8, as there is an offset of eight kHz between the two satellites. This is to allow the user to differentiate between the two satellites, as OSCAR 8 catches up with OSCAR 7 every three days due to its lower orbit. If the satellites are in the proper modes (AO-7 in Mode B and AO-8 in any mode), satellite links are possible.

Summary

The world of OSCAR is there just waiting for you. Nothing is quite as exciting as hearing your first satellite telemetry and your first contacts through the satellite. You will have many a fond memory of those occasions.

The station you assemble can be as expensive or as inexpensive as you desire. There's one advantage of slowly building up a station as I did, and that's having the time to review the many various alternatives, products, and ideas of others before actually operating (other than SWLing the downlink).

I hope you can employ some of the ideas given in this article, but no matter which way you go, there is an exciting QSO awaiting you. I also recommend that you contact AMSAT (PO Box 27, Washington DC 20044) and/or the ARRL for more information.

While you're at it, why not throw in a few bucks toward the satellite matching fund, the dollar-for-dollar tax deductable matching fund set up after the demise of Phase IIIA. (See "Phase III Tragedy," *73*, August, 1980, p. 28.) AMSAT has secured a date with the French project Ariane for an operational (not experimental) launch in the spring of 1982—but be sure to check this date from about March on. The effort being made now is to get the spacecraft ready in time for this near-term launch opportunity. When the Phase III satellites are operational, the benefits will be taken for granted in a short time. Predictable, reliable, and effective worldwide operation, depending on the satellite's orbit, will become a reality. And due to be launched before Phase IIIB on September 15, 1981, is the first scientific amateur satellite (UOSAT). This satellite will carry several scientific experiments, SSTV, and propagation beacons which will open up yet another fascinating aspect of our hobby.

I hope you, too, take up the challenge of satellite operations. The thrill never wears off. I hope I hear from you and talk to you soon! ■

Roger N. Peterson
25 Orchard Lane
New Canaan CT 06840

DX Program Roundup
—for the SWL with DXitis

At last count, there were about 30 DX programs being broadcast in English over the shortwave bands by international broadcasters. Most of these are weekly and some are offered more than once or twice a week. The sheer number of such programs is some indication that station managers either know or believe that shortwave radio listeners like this type of broadcast.

The *World Radio TV Handbook*—the "bible" of the shortwave listening world—defines a DX program as a "broadcast intended for the enthusiasts interested in the various non-programming aspects of radio reception. Covers a wide range of material and can vary from a 3-minute talk on a certain topic to a half-hour magazine program."

This pretty well sums up the content of most of the current DX programs and, by and large, the broadcaster's attempts to produce what the listeners want—up-to-the-minute information on shortwave frequency changes, additions, etc., and any other news that can help or interest the shortwave listener.

Information these programs provide is, of course, only as good as its source. Sources might include the station's own monitoring efforts and those of a commercial monitoring service, such as provided by the British Broadcasting Service. Other important sources are the various DX club bulletins which often are sent to international broadcasters with loggings recorded by their members. And some DX programs receive tips directly from listeners and hasten to put them on the air—with or without confirmation.

Finally, there is, for the less-principled broadcaster, another reliable source of information. This is the material put out on the air by another DX broadcaster. Recently, one of the Iron Curtain DX programs reported the same frequency-change information that had been broadcasted by another European station the week previously!

Just how worthwhile is the information put out by these DX programs? And how many of these broadcasts should the hobbyist who wants to keep abreast of the shortwave radio world listen to each week?

Depending upon an individual's specific interests in shortwave radio listening, I would say that a handful—four or five—of these programs will keep you very well informed. Why just a few?

First of all, if something major in the way of news breaks—such as a big change in broadcast times

Home of the famous DX Juke Box *program.*

or frequencies of the BBC (British Broadcasting Corporation)—just about all of the thirty DX programs on the air will have this news item.

Second, the greater part of the DX program information you will hear each week is really worthless to the average listener. It may be interesting, for example, to hear that a listener in Finland has picked up a station in Siberia on a new frequency, but the chances of the listener in Indiana being able to tune for the same broadcast is very remote.

A third factor is that while all of these DX programs give out information, some of it is rather special in nature and may or may not be of interest.

In rating the DX programs, I would pull some out and say that regardless of your interests, they are so bad that they are not worthwhile tuning for. On the other end of the spectrum are a few programs that are excellent and very worthwhile for every North American listener to tune for each week. Finally, there are the good but primarily special-interest DX programs which some will want very much to hear each week.

I rate five DX programs of the general-interest type as excellent, and I try to monitor at least three of them each week. These are Radio Canada International's *DX Digest*, Radio Netherlands' *DX Juke Box*, Ecuador's HCJB *DX Party Line*, Sweden's *Calling DXers*, and Austria's *Shortwave Panorama*.

Canada's DX Digest

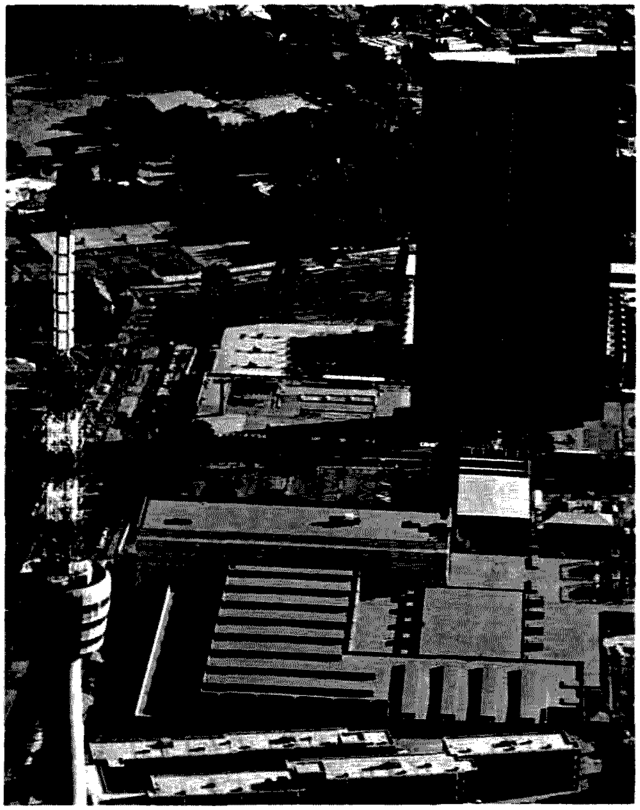
DX Digest is one of the best DX programs on the air. It's on weekly with a half-hour magazine format and has good, solid news and information that you can use. Ian McFarland, the show's host, has been around shortwave radio circles a long time and has put together a program that is made to order for the DXer in North America. First of all, Ian makes sure that his listeners are kept up to date on the latest equipment that hits the market —receivers, antennas, etc. —and has interviews with users or question-and-answer sessions about them. Then, *DX Digest* has Glenn Hauser (a world-known DXer) with the latest in shortwave frequency news. Apart from special interests, you can solve about 90% of your DXing information problems right here on this program.

Listen to it on Saturdays at 2130 GMT on 17.875, 15.325, and 11.945 MHz. On Sundays it is on at 1930 GMT on 11.905 and 15.325 MHz, and on Mondays it is on at 0100 GMT on 11.850 or 5.960 MHz.

Radio Netherlands' DX Juke Box

This old standby of the DX programs has recently undergone a face-lift and the jury is still out as to whether or not they have improved or harmed the show by the changes. The title, *Juke Box,* came from the idea of breaking up the long chain of frequency-change announcements by recorded music—primarily jazz. Before the change in format, they used to devote each weekly program to a particular area of the world. Thus, one week they would have reports from Arthur Cushen in New Zealand, and another week, they'd have reports from the United States by Glenn Hauser, etc. For the listener, it was a very good way to get an idea what was available to pick up from his part of the world.

The new *DX Juke Box* does away with this and has switched to the magazine format with some frequency changes, some questions and answers, and interviews; it has become similar to *DX Digest*. It is still a good program, in my opinion, and worth tuning to each week.



This Johannesburg complex is the home of Radio RSA—the Voice of South Africa. The FM tower is at the left.

Radio Netherlands has a booming signal into the US by virtue of its relay station in Bonaire in the Caribbean. You can hear *DX Juke Box* on Fridays at 0250 GMT on 9.590 and 6.165 MHz. West coast listeners may find it more convenient to tune for it on the same day at 0550 GMT on 6.165 or 9.715 MHz.

Ecuador's HCJB DX Party Line

This religious station is one of the old-time international shortwave broadcasters, and its DX program is also one of the first of its kind. Clayton Howard, the program's host, has been doing this broadcast for many years and has a loyal following. This is principally a "frequency-change" program. The information they give is, however, very accurate and comes from various DX clubs, such as SPEEDX in the US—one of the best of this type of association.

Some listeners complain that the program mixes in too much religion with the DX listings, and if this concerns you, don't listen. For those who don't mind the religious discourses and want up-to-the-minute DX news, you can hear *DX Party Line* easily many times during each week.

On Saturdays, it's on at 0800 GMT on 11.835, 9.760, or 15.235 MHz, and at 2130 GMT on 26.020 or 17.790 MHz. On Sundays, listen at 0230 GMT on 15.155 or 11.915 MHz. Mondays at 0330 GMT it is on 15.155 or 26.020 MHz, at 0800 it's on 11.835 or 9.760 MHz, and at 2130 GMT it's on 21.480 or 17.790 MHz. Tuesdays at 0230 GMT tune in on the

Kol Israel brings you the latest on the Middle East DX scene from Jerusalem.

usual 15.155 or 11.915 MHz. Finally, on Thursdays, at 0230 GMT go to 15.155 or 11.915 MHz, at 0800 GMT to 11.835 or 9.760 MHz, and at 2130 GMT tune in on 21.480 or 17.790 MHz.

Sweden's Calling DXers

This is another old standby and a very solid DX program. The host, George Wood, is an American and knows what we DXers are looking for. George depends a great deal on listeners who send in their rare catches and in return get a weekly summary of the program, which saves tape-recording time and ensures accuracy. You can hear it on Tuesdays at 1415 GMT on 21.615 or 21.700 MHz and at 2315 GMT on 15.380 and 11.705 MHz. On Wednesdays it is at 0245 GMT on 15.315 or 9.695 MHz.

Austria's Shortwave Panorama

This is a relatively new program which has fast become very popular. First of all, it is on the air at a somewhat novel time for DX shows—Sunday mornings. Second, it has recently upgraded itself by signing on Glenn Hauser after he went out of Radio Netherlands when their big changes took place. Listen to this one at 1235 GMT on 21.655 MHz.

More Specialized DXing

So much for the good general-purpose DX shows. I rate the following programs good, too, although they will appeal more to some listeners than others.

South Africa—Radio RSA's *DX Corner*. If you are into DXing the African continent, this is a must program every week. Pieter Martins, the principal engineer of the station, keeps a close watch on broadcasters and their frequencies in all the African countries, including the Third World nations. Last year, I had the privilege of spending a day with Pieter and others of the staff of Radio RSA in Johannesburg, South Africa, and was interviewed for the program during my stay. My impressions of Radio RSA were very good. They have a large staff and the most modern facilities.

You can hear *DX Corner* easily Tuesdays at 1120 GMT on 25.790 MHz, Saturdays at 2140 GMT on 17.795 MHz, and Sundays at 0240 GMT on 9.625, 11.900, or 9.585 MHz.

New Zealand—*NZ Calling*. This is another old favorite, particularly with DXers who are interested in keeping up with broadcasters in the Pacific. Recently, this program has moved up its broadcast time so that it is now on at a decent hour for those of us in the US. Hear it first and third Mondays at 0315 GMT on 17.860 MHz.

Israel—*Calling All Listeners*. This is one for those of you who are interested in keeping up with the Middle East. You can hear it Sundays at 2030 GMT on 15.105, 9.815, or 9.009 MHz and Mondays at 0025 and 0220 GMT on 11.637 or 9.815 MHz.

Switzerland—*Swiss Merry-Go-Round*. Another veteran in DX circles. This one features the "Two Bobs"—Bob Thomann and Bob Zannotti, and its format is the "letter-and-answer" technique. Unlike some DX programs, the questions brought up and answered are not necessarily elementary ones. The two Bobs often wind up in a lively discussion on antennas or some other aspect of the hobby. The program is on only twice a month, on the second and fourth Saturdays at 1320 GMT on 21.570 MHz, at 1535 GMT on 21.570 MHz, and at 2150 GMT on 21.585 or 17.850 MHz. (Later, on Sundays, you can hear it at 0150 GMT on 6.135 and 11.715 MHz.) This is an enjoyable show to hear, and while you won't get many new frequencies to try for from it, you will pick up a good deal of technical knowledge.

Bulgaria—*Radio Sofia*. This is one of the best of the Iron Curtain stations, and its DX program is primarily concerned with information for radio amateurs—news of clubs, some frequency information, etc. Sometimes they hold contests for listeners. Listen to it Fridays at 2135 GMT on 9.665 or 7.115 MHz and Saturdays at 0025 GMT on 15.330 or 9.705 MHz or at 0435 GMT on 7.115 MHz.

The programs reviewed above are the best of the lot—the "Top Ten." There are, of course, others, and while I cannot recommend them, you never can tell when suddenly someone new gets put in charge and you have a winner.

Belgium—*DX Corner*. At present, it is on a kick where it reviews a different international broadcaster, its programs and times of broadcast, etc., each week. Sundays at 1740 GMT on 21.525 or 6.010 MHz; Mondays at 0045 GMT on 11.695 or 15.365 MHz.

Czechoslovakia—*Radio Prague*. While this program

pays particular attention to the radio amateur, the information it gives is very elementary. Recently, they devoted a whole program to telling us what the Morse code requirements were for various Czech licenses. Heard on Fridays at 0135 GMT on 11.990 MHz and at 0335 GMT on 7.345 MHz.

East Germany—*Radio Berlin International*. Not much to offer and not too good a signal at present. Best time seems to be Tuesdays at 0130 GMT on 9.730 MHz.

Hungary—*Radio Budapest*. Tune for this one on 9.835 MHz on Sundays at 0210 and 0310 GMT.

Japan—*Radio Japan*. A brief program of frequency-change announcements; Mondays at 0210 GMT on 21.640 MHz.

Portugal—*Radio Portugal*. Heard at 0310 GMT on 11.925 MHz and at 0510 GMT on 9.575 MHz.

Poland—*Radio Polonia*. Not an easy station to get, but often heard on early Monday mornings—0220 GMT on 15.120 or 7.270 MHz. Not much in the way of DX help, but interesting to hear.

Rumania—*Radio Bucharest*. Listen Saturdays at 0245 GMT on 9.570 MHz.

Spain—*Spanish Foreign Radio*. A few listings. On Mondays at 0050 GMT on 11.880 MHz.

Turkey—*Voice Of Turkey*. What there is pertains to amateurs. Heard on Saturdays at 2100 GMT on 9.725 MHz.

USSR—*Radio Kiev* and *Radio Moscow*. Sometimes the first has interesting material for the radio amateur on Thursdays at 0050 GMT on 15.240, 15.100, and 11.770 MHz. The other, however, is the worst DX program on the air these days. A typical program tells you all about Greenwich Mean Time or the reasons for radio interference. Easily heard on Sundays at 1320 and 1920 GMT on 17.810. Also assorted other frequencies at the same time.

This pretty well sums up the DX programs heard relatively easily in most parts of the U.S. As you know, these programs come and go. New ones crop up all the time as old ones fade from the air. Recently, a couple of the biggest international broadcasters did away with their DX programs. These were Radio Australia and the BBC.

What causes a station to give up a program like this? Both of these broadcasters have plenty of air time—the BBC is on 24 hours every day. It might be because they think the audience is not interested in DXing, yet in both cases, the shortwave radio world was outspoken in its criticism of these deletions from the air.

More likely is the fact that these broadcasters feel that their audience is changing from a few DXers and radio amateurs to a mass group who have recently purchased multiband portables which easily can bring in the powerhouses like the BBC and Radio Australia. Interestingly enough, the BBC replaced their DX program with one called *Waveguide* which tells all about how to tune in their *own* station better—latest BBC times and frequencies. After all, why devote air time to the competition and *their* times and frequencies when you can use it to make sure the listeners keep tuning into your own programs! ■

See List of Advertisers on page 114

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Donald C. Downs NØAGX
1705 S. 5 Street
Marshalltown IA 50158

TRS-80: Your Electronic Brasspounder

—automated CW for Level I owners

Its advertisement boasts that it is able to copy Morse code over the air at the unbelievable rate of 100 words per minute and transmit at the same rate, selecting from ten message buffers. Just think! No more frantic searches for scrap paper to jot down the answer to a misshapen CQ!

The only requirement for owning this fantastic ham aid—a Radio Shack TRS-80, Level II microcomputer and possession of more than a few dollars. But being an owner of a Level I, 4K machine *without* more than a few dollars, I began to wonder just what my computer was good for if I couldn't use it in the ham shack?

The answer was to make the Level I just as powerful as the Level II by breaking the BASIC barrier and going to machine-level language. By using just the T-BUG™ Z-80 Monitor and Debugging Aid available from Radio Shack (catalog number 26-2001), I was able to program my microcomputer to send Morse code at a selectable rate and choose between two message buffers each capable of storing 400 ASCII characters. The addition of a programmable peripheral interface (National Semiconductor's 1NS8255) and a tone decoder (Signetics NE567) allowed me to receive code over the QRM and watch as the computer printed the translation in plain English on the video display.

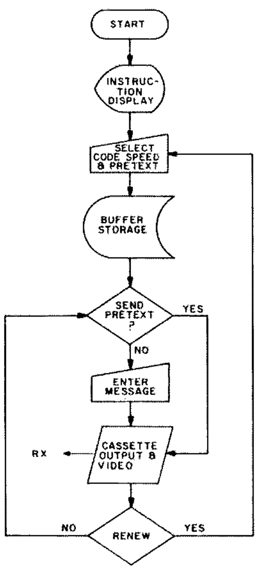

Fig. 1. TX program flowchart.

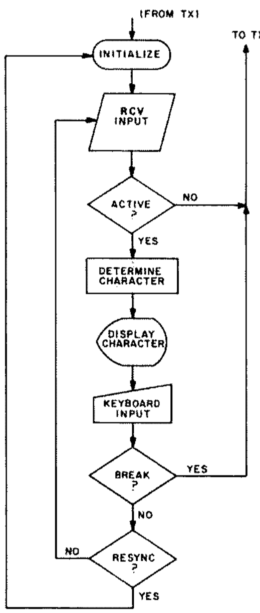

Fig. 2. RX program flowchart.

My system is not as fancy nor as versatile as the commercial product, but it is just as effective and was produced without the expense. (On my budget, $30 qualifies as a few dollars.) This article will show how you, too, may effectively increase the power of your TRS-80 microcomputer and make it talk the international language of Morse code with the bigger machines or with someone with a reasonable fist.

How It Works

The program can be divided into two parts, transmit (TX) and receive (RX). The TX program flowchart, Fig. 1, and RX program flowchart, Fig. 2, outline general operation of the program. TX will output a keyboard-entered message in Morse code through the cassette remote jack of the TRS-80. This portion of the program is detailed in the program listing, Fig. 3. To begin the program, the T-BUG must be loaded and the program tape loaded using the LOAD command and JUMP to 4E01; alternatively, the tape may be loaded using the INITIATE sequence found in the program listing. Initial programming will be done using the T-BUG memory function.

Program execution of START will display the title of the program and instructions as listed in the Instruction Block of Fig. 4. The operator is asked to select the code speed at which he wishes to transmit by entering 1, 2, or 3 from the keyboard, corresponding to 5, 13, or 20 words per minute. (It will be explained later how the program may be changed to adjust the code speed to other than the mentioned speeds.) According to the code speed input,

Fig. 3. Program listing.

```
ADDRESS   CODE      STATEMENT                     REMARK

INITIATE
    4E8Ø   CDF4ØE    CALL LOAD                    ;T-Bug Command
      83   C3Ø14E    JP START
START
    4EØ1   21ØØ4E    LD HL, Instruction Block
      Ø4   7E        LD A (HL)                    ;Loop
      Ø5   D7        RST 1Ø                       ;Print Instruction
      Ø6   2B        DEC HL
      Ø7   FEFF      CMP FF
      Ø9   CAØF4E    JP Z, SELECT SPEED           ;End Instruction
      ØC   C3Ø44E    JP Loop
      ØF   CD4ØØB    CALL CHKIO                   ;SELECT SPEED
      12   28FB      JR Z,-5
      14   57        LD D, A                      ;Store Selection
      15   FE31      CMP 1                        ; 5 WPM?
      17   CA264E    JP Z,  5 WPM
      1A   7A        LD A, D
      1B   FE32      CMP 2                        ;13 WPM?
      1D   CA2E4E    JP Z, 13 WPM
      2Ø   7A        LD A, D
      21   FE33      CMP 3                        ;2Ø WPM?
      23   CA364E    JP Z, 2Ø WPM
5 WPM
    4E26   3E1F      LD A, 5 WPM Factor
      28   326147    LD FACTOR, A
      2B   C33B4E    JP PRETEXT ENTRY INSTRUCTION
13 WPM
    4E2E   3EØ4      LD A, 13 WPM Factor
      3Ø   326147    LD FACTOR, A
      33   C33B4E    JP PRETEXT ENTRY INSTRUCTION
2Ø WPM
    4E36   3EØ2      LD A, 2Ø WPM Factor
      38   326147    LD FACTOR, A
PRETEXT ENTRY INSTRUCTION
    4E3B   7E        LD A (HL)                    ;Instruction Block Loop
      3C   D7        RST 10                       ;Print Instruction
      3D   2B        DEC HL
      3E   FEFF      CMP FF                       ;End Instruction
      4Ø   CA464E    JP Z, PRETEXT LOAD
      43   C33B4E    JP Loop
PRETEXT LOAD
      46   21FD49    LD HL, Pretext Buffer
      49   CD7Ø47    CALL WRITE
      4C   36FF      LD HL, FF                    ;End Of Pretext
      4E   C34444    JP RX                        ;Sample Input And Decode
RX
    4444   3EØØ      LD A, Ø                      ;Initialize Variables
      46   321E44    LD Code Register, A
      49   321544    LD Character Flag, A
      4C   3EØ8      LD A, Ø8                     ;Initialize
      4E   321644    LD Character Register, A
      51   321744    LD Character Register, A
      54   3EØE      LD A, ØE                     ;Initialize
    4456   321A44    LD Dot-time, A
      59   321B44    LD Dot-time, A
      5C   31FD43    LD SP, 43FD
      5F   C38Ø45    JP STATUS
STATUS
    458Ø   CD6Ø46    CALL SCAN                    ;Keyboard Control
      83   CDØØ47    CALL SKEY                    ;Sample Input Status
      86   79        LD A, Status
      87   FE8Ø      CMP 8Ø                       ;Key Down?
      89   CAØØ46    JP Z, DOWN
UP
    45AØ   26ØØ      LD H,ØØ                      ;Reset Uptime Counter
      A2   2EØØ      LD L,ØØ
      A4   221844    LD Uptime, HL                ;Reset Uptime Register
      A7   2A1844    LD HL, Uptime                ;Uptime Loop
      AA   23        INC HL
      AB   221844    LD Uptime, HL                ;Store Uptime
      AE   CDØØ47    CALL SKEY                    ;Look For Status Change
      B1   7C        LD A, H
      B2   FEFF      CMP FF                       ;Key Inactive?
      B4   CA2D47    JP Z, LAST LETTER            ;Print Last Letter
      B7   3EØØ      LD A, ØØ
      B9   B9        CMP C                        ;Key Up?
      BA   CAA745    JP Z, Loop
      BD   2A1644    LD HL, Character Space
      CØ   29        ADD HL, HL
      C1   ED4B1844  LD BC, Uptime
      C5   ED42      SBC HL, BC
      C7   FA9Ø46    JP M, DECODE                 ;Word Formed
   CA-CF   ØØ        NOP
      DØ   ED4B1844  LD BC, Uptime
      D4   ED42      SBC HL, BC
      D6   3EØ1      LD A, Ø1
      D8   321544    LD Character Flag, A
      DB   FA9Ø46    JP M, DECODE                 ;Letter Formed
      DE   3EØØ      LD A, ØØ
      EØ   321544    LD Character Flag, A ;Letter Incomplete
      E3   2A1844    LD HL, Uptime
      E6   29        ADD HL, HL
      E7   221644    LD Character Space, HL;Character Space=Uptime
      EA   C38Ø45    JP STATUS                    ;Complete Letter
DOWN
    46ØØ   26ØØ      LD H, ØØ                     ;Reset Downtime Counter
      Ø2   2EØØ      LD L, ØØ
      Ø4   221C44    LD Downtime, HL              ;Reset Downtime Register
      Ø7   2A1C44    LD HL, Downtime              ;Downtime Loop
      ØA   23        INC HL
      ØB   221C44    LD Downtime, HL              ;Store Downtime
      ØE   CDØØ47    CALL SKEY                    ;Look For Status Change
      11   3E8Ø      LD A, 8Ø
      13   B9        CMP C                        ;Key Down?
      14   CAØ746    JP Z, Loop
      17   2A1A44    LD HL, Dot-time
      1A   CB3E      SRL(HL)
      1C   ED4B1A44  LD BC, Dot-time
      2Ø   Ø9        ADD HL, BC
      21   ED4B1C44  LD BC, Downtime
      25   ED42      SBC HL, BC
    4627   F23Ø46    JP M, DOT                    ;Character Dot
      2A   C35Ø46    JP DASH                      ;Character Dash
DOT
    463Ø   2A1C44    LD HL, Downtime
      33   221A44    LD Dot-time, HL              ;Dot-time=Downtime
      36   3A1E44    LD A, Code Register;Get Code
      39   CB27      SLA A                        ;Shift Code
      3B   C6Ø1      ADD Ø1                       ;Add Dot To Code
      3D   321E44    LD Code Register, A;Store Code
      4Ø   C38Ø45    JP STATUS                    ;Get Rest Of Letter
DASH
    465Ø   3A1E44    LD A, Code Register;Get Code
      53   CB27      SLA A                        ;Shift Code
      55   C6Ø2      ADD Ø2                       ;Add Dash To Code
      57   321E44    LD Code Register, A;Store Code
      5A   C38Ø45    JP STATUS                    ;Get Rest Of Letter
DECODE
    469Ø   215A45    LD HL, RX Character Search Table
      93   3A1E44    LD A, Code Register;Get Code
      96   Ø13BØØ    LD BC, Search #
      99   EDB9      CPDR                         ;Search Table
      9B   7D        LD A, L
      9C   C6Ø1      ADD Ø1                       ;Adjust HL For Match
      9E   D7        RST 1Ø                       ;Print Letter
      9F   3A1544    LD A, Character Flag
      A2   FEØ1      CMP Ø1                       ;Letter?
      A4   3EØØ      LD A, Ø
      A6   321544    LD Character Flag, A;Reset Character Flag
      A9   321E44    LD Code Register, A;Reset Code Register
      AC   3E2Ø      LD A, 2Ø
      AE   D7        RST 1Ø                       ;Space
      AF   CA8Ø45    JP Z, STATUS                 ;Get Next Letter
      B2   D7        RST 1Ø                       ;Space Word
      B3   D7        RST 1Ø
      B4   C38Ø45    JP STATUS                    ;Get Next Letter
LAST LETTER
    472D   215A45    LD HL, RX Character Search Table
      3Ø   3A1E44    LD A, Code Register;Get Code
      33   Ø13BØØ    LD BC, Search #
      36   EDB9      CPDR                         ;Search Table
      38   7D        LD A, L
      39   C6Ø1      ADD A, Ø1                    ;Adjust HL For Match
      3B   D7        RST 1Ø                       ;Print Letter
      3C   3EØD      LD A, ØD
      3E   D7        RST 1Ø                       ;Advance Cursor
TX
    474Ø   3EØØ      LD A, ØØ                     ;Initialize
      42   321C44    LD Delay Base (L), A
   45-49   ØØ        NOP
      4A   321244    LD Dot Flag, A
   4D-4F   ØØ        NOP
      5Ø   321Ø44    LD Buffer Register(L), A
      53   3E4D      LD A, 4D
      55   321144    LD Buffer Register(H), A
    4758   2A1Ø44    LD HL, Buffer Register; Initial Buffer
      5B   3EF9      LD A, F9
      5D   321D44    LD Delay Base(H), A;Initialize Speed Base
      6Ø   3E(Ø2)    LD A, WPM Factor   ;Factor From SELECT
      62   322Ø44    LD Delay(L), A
      65   322144    LD Delay(H), A
      68   CD7Ø47    CALL WRITE                   ;Enter Message
      6B   36FF      LD(HL), FF                   ;Mark End Of Message
      6D   C3AØ47    JP ENCODE
ENCODE
    47AØ   2A1Ø44    LD HL, Buffer
      A3   221344    LD Buffer Location, HL
      A6   11FF49    LD DE, TX Character Search Table;BUFFER SEARCH
      A9   2A1344    LD HL, Buffer Location
      AC   7E        LD A, (HL)                   ;Buffer Letter
      AD   2B        DEC HL                       ;Go To Next Letter
      AE   221344    LD Buffer Location, HL;Store Location
      B1   47        LD B, Letter                 ;Store Letter
      B2   FEFF      CMP FF                       ;End Of Text?
      B4   CA4444    JP Z, RX                     ;Sample Input
      B7   1A        LD A, (DE)                   ;TABLE SEARCH
      B8   B8        CMP B                        ;Table Match Letter?
      B9   CADØ47    JP Z, BIT TEST
      BC   13        INC DE
      BD   13        INC DE                       ;Adjust Table
      BE   C3B747    JP TABLE SEARCH
BIT TEST
    47DØ   13        INC DE                       ;Locate Code
      D1   1A        LD A, Code
      D2   57        LD D, A                      ;Store Code
      D3   FEFE      CMP FE                       ;Space?
      D5   CAØØ4B    JP Z, WORD SPACE
      D8   CB7A      BIT 7, D                     ;First Character
      DA   CD514A    CALL SEND                    ;Morse Code Out
      DD   7B        LD A, E                      ;Get Letter Group
      DE   DEØ3      SUB Ø3                       ;1 Character Group?
      EØ   FA3Ø4B    JP M, LETTER SPACE
      E3   CB72      BIT 6, D                     ;Second Character
      E5   CD514A    CALL SEND                    ;Morse Code Out
      E8   7B        LD A, E                      ;Get Letter Group
      E9   DEØB      SUB ØB                       ;2 Character Group?
      EB   FA3Ø4B    JP M, LETTER SPACE
      EE   CB6A      BIT 5, D                     ;Third Character
      FØ   CD514A    CALL SEND                    ;Morse Code Out
      F3   7B        LD A, E                      ;Get Letter Group
      F4   DE1B      SUB 1B                       ;3 Character Group?
      F6   FA3Ø4B    JP M, LETTER SPACE
      F9   CB62      BIT 4, D                     ;Fourth Character
      FB   CD514A    CALL SEND                    ;Morse Code Out
      FE   7B        LD A, E                      ;Get Character Group
      FF   DE33      SUB 33                       ;4 Character Group?
    48Ø1   FA3Ø4B    JP M, LETTER SPACE
      Ø4   CB5A      BIT 3, D                     ;Fifth Character
      Ø6   CD514A    CALL SEND                    ;Morse Code Out
      Ø9   7B        LD A, E                      ;Get Character Group
      ØA   DE49      SUB 49                       ;5 Character Group?
      ØC   FA3Ø4B    JP M, LETTER SPACE
    48ØF   CB52      BIT 2, D                     ;Sixth Character
      11   CD514A    CALL SEND                    ;Morse Code Out
      14   C33Ø4B    JP LETTER SPACE
WORD SPACE
    4BØØ   CD7Ø4E    CALL DELAY                   ;Word Space Delay
      Ø3   CD7Ø4E    CALL DELAY
      Ø6   CD7Ø4E    CALL DELAY
      Ø9   CD7Ø4E    CALL DELAY
      ØC   3E2Ø      LD A, Space
      ØE   D7        RST 1Ø
```

Continued

Program listing, continued.

```
                                                  ;Print Space
      ØF   D7          RST 1Ø                     ;Print Space
      1Ø   D7          RST 1Ø                     ;Print Space
      11   C3A647      JP BUFFER SEARCH           ;Complete Text
LETTER SPACE
    4B3Ø   CD7Ø4E      CALL DELAY                 ;Letter Space Delay
      33   CD7Ø4E      CALL DELAY
      36   3E2Ø        LD A, Space
      38   D7          RST 1Ø                     ;Print Space
      39   C3A647      JP BUFFER SEARCH           ;Complete Text

                       SUBPROGRAM LISTING

SCAN
    466Ø   CD4ØØB      CALL CHKIO                 ;Sample Keyboard
      63   47          LD B, Letter               ;Store Letter
      64   FBØ3        CMP BREAK                  ;BREAK Key?
      66   CAØ14E      JP Z, TX
      69   78          LD A, Letter
      6A   FE1E        CMP Resync                 ; —► Key?
      6C   CØ          RET NZ
      6D   C34444      JP RX                      ;Resync Counters
SKEY
    47ØØ   DBØØ        IN A, Key                  ;Sample Input
      Ø2   CB47        BIT Ø, A                   ;Test Bit Ø of Input
      Ø4   C2ØA47      JP NZ, Key Down            ;Key Down?
      Ø7   ØEØØ        LD C, ØØ                   ;Key Up
      Ø9   C9          RET
      ØA   ØE8Ø        LD C, 8Ø                   ;Key Down
      ØC   C9          RET
WRITE
    477Ø   CD4ØØB      CALL CHKIO                 ;Sample Keyboard Loop
      73   28FB        JR Z, Loop
      75   57          LD D, Letter
      76   FEØD        CMP ENTER                  ;Text Complete?
      78   C8          RET Z                      ;Text Ready
      79   7A          LD A, Letter               ;Recall Letter
      7A   FE1D        CMP Backspace              ; ◄— Key?
      7C   CA8E47      JP Z, ERROR
      7F   7A          LD A, Letter               ;Recall Letter
      8Ø   FE1B        CMP Scroll                 ;Video Line Full?
      82   CA8E47      JP Z, ERROR
      85   7A          LD A, Letter               ;Recall Letter
      86   FE23        CMP #                      ;Send Pretext?
    4788   CA9247      JP Z, PRETEXT
      8B   C3ØA4D      JP BUFFER FULL
      8E   23          INC HL                     ;ERROR, Adjust
      8F   C37Ø47      JP Loop
      92   21FD49      LD HL, Pretext             ;PRETEXT
      95   221Ø44      LD Buffer, Pretext         Buffer
      98   23          INC HL                     ;Reset Buffer
```

```
      99   C9          RET
BUFFER FULL
    4DØA   7E          LD A, Buffer Content
      ØB   FEFE        CMP FE                     ;End Of Buffer?
      ØD   CA164D      JP Z, ADJUST
      1Ø   7A          LD A, Letter               ;Recall Letter
      11   72          LD (HL), Letter            ;Write Letter
      12   2B          DEC Buffer
      13   C37Ø47      JP Loop
      16   23          INC Buffer                 ;ADJUST
      17   C9          RET
SEND
    4A51   CD644A      CALL CASSETTE ON
      54   28Ø3        JR Z, +5                   ;Bit Dot?
      56   CD7Ø4A      CALL DASH DELAY
      59   CD824A      CALL DOT DELAY
      5C   3EØØ        LD A, ØØ                   ;CASSETTE OFF
      5E   D3FF        OUT Cassette               ;Turn Cassette Off
      6Ø   C9          RET
CASSETTE ON
    4A64   3EØ4        LD A, Ø4
      66   D3FF        OUT Cassette               ;Turn Cassette On
DASH DELAY
    4A7Ø   CD7Ø4E      CALL DELAY
      73   CD7Ø4E      CALL DELAY                 ;Leave Cassette On For Dash
      76   3EØ1        LD A, Ø1
      78   321244      LD Dot Flag, A             ;Store Character Type
      7B   C9          RET
DOT DELAY
    4A82   CD7Ø4E      CALL DELAY                 ;Leave Cassette On For Dot
      85   3A1244      LD A, Dot Flag
      88   FEØ1        CMP Ø1                     ;Character Dash?
      8A   2ØØ5        JR NZ, +7
      8C   3E2D        LD A, Dash Graphic
      8E   D7          RST 1Ø                     ;Print  Dash
      8F   18Ø3        JR +5                      ;Jump
      91   3E2E        LD A, Dot Graphic
      93   D7          RST 1Ø                     ;Print Dot
      94   CD5C4A      CALL CASSETTE OFF
      97   CD7Ø4E      CALL DELAY                 ;Wait For Next Character
      9A   3E2Ø        LD A, Space
      9C   D7          RST 1Ø                     ;Space Video Characters
      9D   3EØØ        LD A, Ø
      9F   321244      LD Dot Flag, A             ;Reset Dot Flag
      A2   C9          RET
DELAY
    4E7Ø   ED4B1C44    LD BC, Delay Base
    4E74   2A2Ø44      LD HL, Delay               ;Loop
      77   ED42        SBC HL, BC
      79   Ø3          INC BC
      7A   2ØF8        JR Z, Loop
      7C   C9          RET
```

the wpm factor is established. The function of this and other variables subsequently used is described in Fig. 5.

Immediately upon making the selection of code speed, program execution is passed to PRETEXT ENTRY INSTRUCTION which prints "PRETEXT:" from data located in the Instruction Block. Up to 488 characters or seven video lines may then be entered from the keyboard under control of PRETEXT LOAD and stored in the Pretext Buffer occupying memory locations specified in the Memory Map of Fig. 6. Text stored in the Pretext Buffer is protected for repeated use and requires a restart of the TX program to change, but may be called for at any time.

PRETEXT LOAD writes text into the Pretext Buffer by the WRITE subroutine. All alphanumeric characters plus punctuation (, . ? / and space) are supported. Corrections to the text as it is being written may be made by using the backspace key on the keyboard. The backspace key also permits retention of the previously entered pretext if the backspace key is depressed when "PRETEXT:" appears and the ENTER key is then depressed. A summary of the keyboard control key functions is listed in Fig. 7.

When the text is complete, the ENTER key is depressed, setting a flag (FF) to mark the end of the text in the buffer, and the program jumps to RX. RX will decode a Morse code signal present at port A as outlined in Fig. 2. (A more detailed description of this portion of the program will follow.) If the input from RX is inactive for six seconds, the program returns to TX, where initialization occurs. The WRITE subroutine permits the setting of the Buffer Register to the Pretext Buffer if the # key is pressed, at which point the program goes to ENCODE; otherwise, it enters the text into the Message Buffer (see Fig. 6) similar to that described for the Pretext Buffer above. Previously entered text in the Message Buffer may be saved using the same procedure outlined above by using the backspace key and ENTER. A total of 397 characters or 6¾ video lines are permitted in the Message Buffer before becoming full and passing to ENCODE.

Upon completing the text, depressing ENTER marks the end of text and the program goes to ENCODE. ENCODE reads the Buffer Register which has been established as the Message or Pretext Buffer by WRITE. Each character of the buffer is read by BUFFER SEARCH. The letter in the buffer is matched with the code found in the TX Character Search Table (see Fig. 8) by BANK SEARCH. If the letter is the end of the text (FF) the program goes to RX. (This can be used to enter RX directly with no message by depressing ENTER. The Message Buffer text will be lost by using this method of reentering the RX program). If the letter is other than FF, BIT TEST determines how many characters are in the letter by testing the letter's position in the table. Each sequential character is determined to be a dot or dash from the code. This character information is processed by SEND, which turns the cassette remote jack on by CASSETTE ON. The program then branches to the appropriate DOT DELAY or DASH DELAY.

In the two subroutines, the cassette jack is left on for the wpm factor selected earlier. This factor is used in determining the minimum cassette-on time in the subroutine DELAY, based upon the Delay Base and Delay Register as described in Fig. 5. The dash is three times as long as the dot. The character type sent is stored in the Dot Flag (see Fig. 5) to determine the Morse code graphic character to be printed in DOT DELAY. DOT DELAY turns the cassette remote jack off by CASSETTE OFF and delays the program the length of a dot before getting the next character of the letter, or

going to LETTER SPACE if the letter has been completed as determined by BIT TEST. LETTER SPACE delays the program for the length of one dash before proceeding to BUFFER SEARCH to get the next letter. If the letter is a space (FE), the program executes WORD SPACE and is delayed the length of seven dots before getting the next letter from BUFFER SEARCH.

Code speeds other than those provided for in the program can be obtained by changing the Delay Base Register. By changing the contents of 475C to any value between F5 and FE, a wide range of speeds can be obtained. Let trial and error be the guide. The relative code speed selection (5, 13, and 20 wpm) is determined by the wpm factor. This can be adjusted by changing the value of addresses 4E27, 4E2F, and 4E37. After determining the newly adjusted wpm value, changing the values of addresses 4DAE, 4DA4 and 4DA3, and 4D99 and 4D98 to correspond to the ASCII code of the new first, second, and third selections will print the new selections from the Instruction Block.

The receive portion of the program (RX) depends solely on the interpretation and timing of ON and OFF inputs representing Morse code characters. The initialization of RX provides for rapid synchronization of the variables to the ON-OFF input states. If timing is awry, resynchronization must be accomplished by reinitializing.

After initializing, the program proceeds to STATUS where the operator may, through the SCAN subroutine, command a jump back to START and TX by depressing the BREAK key, or resynchronization may be accomplished using the → key (see Fig. 7). With no keyboard entry, the program goes to the SKEY subroutine. The SKEY tests the input and determines whether it is ON (key down) or OFF (key up), returning the status as 80 or 00, respectively. Based on the status, the program jumps to DOWN or UP.

In the UP routine, the time the key is up is established and stored in the Uptime Register (see Fig. 5). If it is up for more than six seconds, the input is considered inactive and the program prints the last letter received in LAST LETTER and then proceeds to TX. If the status changes to key down within six seconds, the Uptime is compared to twice that of the Character Space. If Uptime is greater than twice the Character Space, a word has been received and the program goes to DECODE. If Uptime is less than twice the Character Space, it is compared to the Character Space. If Uptime is greater than Character Space, a letter has been received which sets the Character Flag and the program jumps to DECODE. If the Uptime is less than Character Space, it is doubled and becomes the new Character Space. The program then branches back to STATUS to verify that a key-down status exists.

The Downtime is compared to 1½ times the Dot-time (see Fig. 5). If Downtime is less than 1½ times Dot-time, a dot has been received; otherwise, it is a dash. If the character is a dot, DOT sets the Downtime equal to the Dot-time and the Code Register is shifted to add 01. The program then jumps back to STATUS to get the next character. If the character was a dash, the Code Register is shifted and 02 added. The program then jumps to STATUS.

DECODE is entered only when it is determined that a letter or word has been

ADDRESS	DATA	ADDRESS	DATA
4D7F	FF	4DB3	3A
8Ø	2Ø	B4	4E
81	3A	B5	4F
82	54	B6	49
83	58	B7	54
84	45	B8	43
85	54	B9	45
86	45	BA	4C
87	52	BB	45
88	5Ø	BC	53
89	2Ø	BD	2Ø
8A	52	BE	44
8B	45	BF	45
8C	54	CØ	45
8D	4E	C1	5Ø
8E	45	C2	53
8F	ØC	C3	2Ø
9Ø	FF	C4	45
91	2Ø	C5	44
92	3F	C6	4F
93	2Ø	C7	43
94	4D	C8	2Ø
95	5Ø	C9	52
96	57	CA	45
97	2Ø	CB	54
98	3Ø	CC	4E
99	32	CD	45
9A	2Ø	CE	ØD
9B	29	CF	53
9C	33	DØ	4E
9D	2Ø	D1	57
9E	2Ø	D2	4F
9F	4D	D3	44
AØ	5Ø	D4	2Ø
A1	57	D5	2E
A2	2Ø	D6	44
A3	33	D7	2Ø
A4	31	D8	59
A5	2Ø	D9	42
A6	29	DA	2Ø
A7	32	DB	4B
A8	2Ø	DC	34
A9	2Ø	DD	2Ø
AA	4D	DE	49
AB	5Ø	DF	2Ø
AC	57	EØ	4C
AD	2Ø	E1	45
AE	35	E2	56
AF	2Ø	E3	45
BØ	29	E4	4C
B1	31	E5	2Ø
B2	2Ø	E6	3Ø
E7	38	F4	53
E8	2E	F5	52
E9	53	F6	4F
EA	52	F7	4D
EB	54	F8	2Ø
EC	2Ø	F9	58
ED	2C	FA	52
EE	45	FB	2Ø
EF	44	FC	26
FØ	4F	FD	2Ø
F1	43	FE	58
F2	2Ø	FF	54
F3	45	4EØØ	ØC
4817	FE	4B4E	FE

Fig. 4. Instruction block.

REGISTER	TITLE	FUNCTION
441Ø 11	Buffer Register	Contains address of currently used message or pretext storage buffer.
4412	Dot Flag	Set if character sent is dash to determine graphic character.
4413 14	Buffer Location Register	Contains current buffer address during TX table search.
4415	Character Flag	Identifies received character as an incomplete letter if reset.
4416 17	Character Space Register	Determines minimum time between received characters.
4418 19	Uptime Counter	Contains count between received characters.
441A 1B	Dot-time Register	Determines duration of shortest received character.
441C 1D	Downtime Counter/ Delay Base	Contains duration of current received character/Establishes code speed for transmitted character.
441E	Code Register	Contains received characters making up letter.
442Ø 21	Delay Register	Determines transmitted character duration.
4761	WPM Factor	Internally adjusts Delay Base.

Fig. 5. Program variables.

ADDRESS	CONTENTS
ØØØØ - 39FF	Level I ROM
4ØØØ - 43FF	T-Bug
452Ø - 455A	RX Character Search Table
4818 - 49FD	Pretext Buffer
49FF - 4A5Ø	TX Character Search Table
4B4F - 4DØØ	Message Buffer
4DFF - 4EØØ	Instruction Block

Fig. 6. Program memory map.

KEY	DESCRIPTION
BREAK	Program restarted to allow reselection of code speed and pretext entry.
←	Backspace will protect previously entered text in Buffer if depressed initially and ENTER. Also allows correction of text by erasing incorrectly entered text.
→	RX program reinitiated to allow proper timing.
#	Transmits message in pretext.
ENTER	Indicates end of text and allows transmission of text in message buffer.
SPACEBAR	Enters blank space in text.

Fig. 7. Keyboard functions.

ADDRESS	DATA	ASCII
49FF	45	E
4AØØ	ØØ	
Ø1	54	T
Ø2	8Ø	
Ø3	41	A
Ø4	4Ø	
Ø5	49	I
Ø6	ØØ	
Ø7	4D	M
Ø8	CØ	
Ø9	4E	N
ØA	8Ø	
ØB	44	D
ØC	8Ø	
ØD	47	G
ØE	CØ	
ØF	4B	K
1Ø	AØ	
11	4F	O
12	EØ	
13	52	R
14	4Ø	
15	53	S
16	ØØ	
17	55	U
18	2Ø	
19	57	W
1A	6Ø	
1B	42	B
1C	8Ø	
1D	43	C
1E	AØ	
1F	46	F
2Ø	2Ø	
21	48	H
22	ØØ	
23	4A	J
24	7Ø	
25	4C	L
26	4Ø	
27	5Ø	P
28	6Ø	
29	51	Q
2A	DØ	
2B	56	V
2C	1Ø	
2D	58	X
2E	9Ø	
2F	59	Y
3Ø	BØ	
31	5A	Z
32	CØ	
33	31	1
34	78	
35	32	2
36	38	
37	33	3
38	18	
39	34	4
3A	ØB	
3B	35	5
3C	ØØ	
3D	36	6
3E	8Ø	
3F	37	7
4Ø	CØ	
41	38	8
42	EØ	
43	39	9
44	FØ	
45	3Ø	Ø
46	F8	
47	2F	/
48	9Ø	
49	2C	,
4A	CC	
4B	3F	?
4C	3Ø	
4D	20	SPACE
4E	FE	
4F	2E	.
5Ø	54	

Fig. 8. TX character search table.

ADDRESS	DATA	ASCII
452Ø	ØØ	SPACE
21	Ø1	
↓	↓	
29	Ø1	
2A	FF	*(ERROR)
2B	Ø1	
2C	72	,
2D	Ø1	
2E	54	.
2F	31	/
3Ø	3E	Ø
31	2E	1
32	26	2
33	12	3
34	2Ø	4
35	1F	5
36	2F	6
37	37	7
38	3B	8
39	3D	9
3A	Ø1	
↓	↓	
3E	Ø1	
3F	4B	?
4Ø	Ø1	
41	Ø4	A
42	17	B
43	19	C
44	ØB	D
45	Ø1	E
46	11	F
47	ØD	G
48	ØF	H
49	Ø3	I
4A	16	J
4B	ØC	K
4C	13	L
4D	Ø6	M
4E	Ø5	N
4F	ØE	O
5Ø	15	P
51	1C	Q
52	Ø9	R
53	Ø7	S
54	Ø2	T
55	Ø8	U
56	1Ø	V
57	ØA	W
58	18	X
59	1A	Y
5A	1B	Z

Fig. 9. RX character search table.

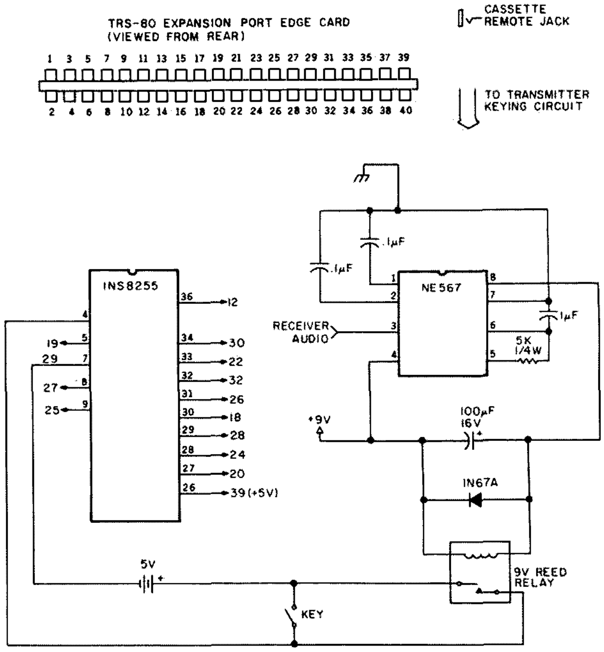

Fig. 10. Hardware schematic.

formed. DECODE takes the letter formed in the Code Register and matches it with the code contained in the RX Character Search Table of Fig. 9. The corresponding ASCII code (* for error) then is printed on the video display after the appropriate letter or word space has been printed from a test of the Character Flag. The program then jumps back to STATUS to get the next character.

Interfacing and Operating

The RX portion of this program requires the addition of an interface and tone decoder or key as shown in Fig. 10. Construction of these circuits is not critical. Breadboarding is acceptable; masking of the input is required to prevent false states, however. The 1NS8255 is a little more than needed but permits adding additional ports to three eight-bit ports. Only the 0-bit A port is used in this program. The nice thing about this chip is the pin-for-pin compatibility with the TRS-80 expansion port. The +5-V power supply of the chip (pin 26) can be connected to the microcomputer's +5-V output on pin 39 of the expansion port edge card. Level II does not have +5 V on this pin; a separate power supply will therefore be necessary. Three 16-pin DIP shunt jumpers were used with the expansion port card edge connector (AMP P/N 88103-1) to tie into the interface. The interface was mounted on a PC board and housed neatly in a Kitchen Maid plastic utility tray that fits nicely beneath the keyboard. The tone decoder cannot be placed near the computer because of logic switching noise getting into the detection circuit.

This system has performed without difficulty for over six months. I have used it to generate code tapes used in teaching Morse code to Novices and have had excellent comments from the students. Over the air, I have never sounded so good. My usual, sloppy fist is now letter perfect. Morse code has been received with perfect copy at 35 wpm from W1AW. A few operating hints follow to permit the user a full appreciation of the system's capabilities.

Transmitter keying is not done directly with the cassette remote jack but through a keyer. This is done to protect the cassette relay's contacts. Weak or fading signals do cause timing problems as the signal is lost; resynchronization will correct the improper timing, however, once the signal is regained. Erratic code speed will likewise cause improper timing requiring resynchronization. The need to resynchronize is seen by the improper generation of letters or no generation on the video display.

Attempts to overcome signal loss by increasing the audio level causes overloading of the NE567, resulting in lockup. Noise or QRM can be filtered out quite effectively through use of the receiver's clarifier which also adjusts the signal's audio tone to put the tone into the detection band of the NE567. Difficulty has been experienced when noise from the high speed logic circuits of the computer are picked up by the receiver resulting in rampant generation of characters across the screen as the computer listens to itself. This is prevented by operating elsewhere on the band where the computer is not as noisy. Excessive RFI from the transmitter does affect the video display but does not interfere with the completion of the TX program.

Level II users may have noticed that their keyboard input and memory map are not compatible with the program. By calling their own keyboard subroutine and reassigning memory, Level II users may adapt the program.

If you are as lazy as I am, I am sure you will find the use of the TRS-80 a great way to just sit back and let the machine do the work. With the addition of the interface, the capabilities of your machine will be improved greatly. The whole outside world awaits—I may even figure out how to turn my coffee pot on.

I wish to thank Laris Pickett WB0QNT for his technical advice on the use of the cassette remote jack and John Engel WA0LPV for his support and suggestions in developing this program. ■

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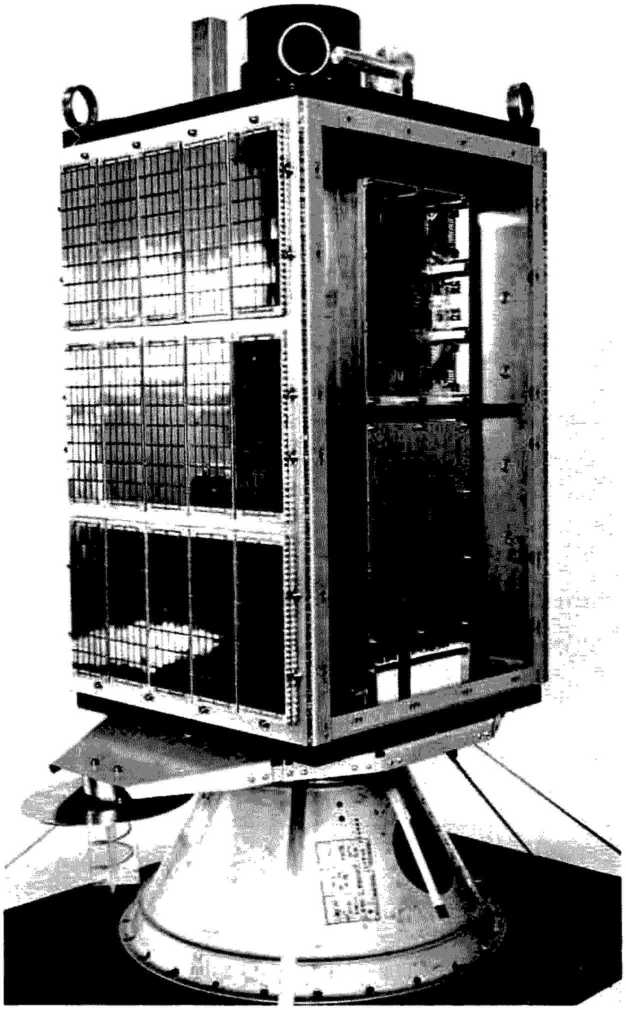
Tim Daniel N8RK
73 Magazine Staff

Phase III and Beyond

—the down-to-Earth satellite service



UoSAT, an amateur satellite built in the United Kingdom, will give experimenters a chance to receive pictures from a slow-scan TV camera pointed towards the Earth. The spacecraft also features beacons on two meters and 70 cm, as well as provisions for HF and microwave propagation experiments.

May 23, 1980, is known as Black Friday among amateur radio satellite enthusiasts. At 1430 GMT on that fateful day, the rocket carrying amateur radio's most ambitious spacecraft yet failed shortly after launch, sending Phase IIIA to a watery grave. One year later, hams still remember the tragedy, but they are not defeated by it. Building from the ruin and despair that accompanied the loss of Phase IIIA, the amateur satellite community has even more ambitious plans for the future. Through persistence and loyalty, these hams have organized the construction and launch of two satellites in the next year.

UoSAT

An early September, 1981, launch is scheduled for UoSAT, an amateur scientific and educational spacecraft conceived and constructed by radio enthusiasts from the United Kingdom. UoSAT is sponsored by the University of Surrey, AMSAT, the Radio Society of Great Britain, and the British Industry and Research Organization. The mission objectives for UoSAT represent an attempt to provide a means for analyzing radio propagation and satellite teleme-

BIRTH OF A SATELLITE SYSTEM

December 12, 1981, will mark the 20th anniversary of amateur radio's first satellite. The Orbiting Satellite Carrying Amateur Radio, OSCAR 1, circled the Earth transmitting the greeting "HI" in Morse code. This battery-powered spacecraft weighed a mere 10 pounds and cost about $65.00 to build.

We have come a long way since the days of OSCAR 1. In 1969, the Radio Amateur Satellite Corporation (AMSAT) was founded. Now in its second decade, AMSAT provides the coordination and support that makes the amateur satellite program possible. Hundreds of hams have committed their energy and resources towards the world's only "amateur" satellites. They have built, launched, and controlled eight satellites for a fraction of the commercial cost.

The success of amateur radio's satellites is directly linked to the support individual hams provide. *73 Magazine* urges you to join AMSAT. They offer a bimonthly magazine, *Orbit*, and a biweekly newsletter, *AMSAT Satellite Report*, full of information about the latest satellite developments. Write to AMSAT, PO Box 27, Washington DC 20044, or call (202)-589-6062.

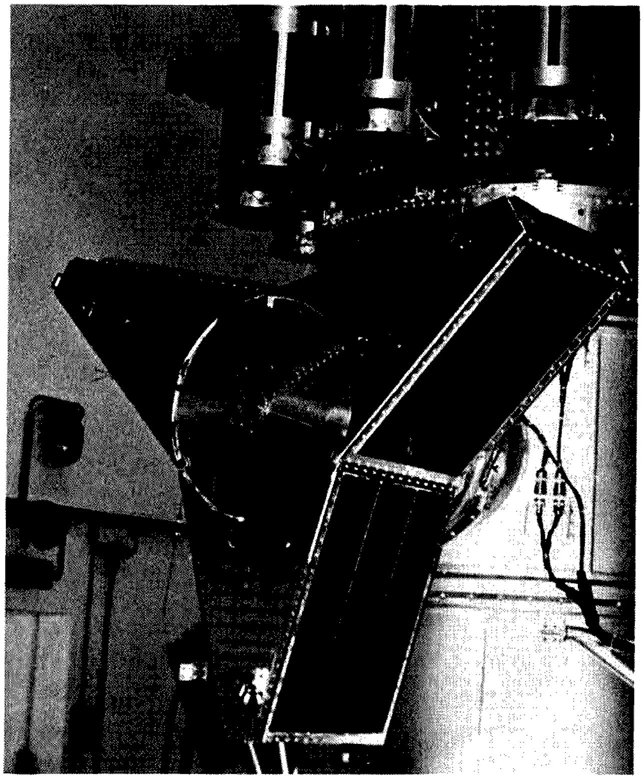
try from HF to microwave frequencies. The thrust of the UoSAT craft will be to develop experimental skills rather than relaying communications, so all of the satellite's functions will be "one way" (i.e., listen-only) for amateurs.*

UoSAT features two "regular" beacons, one on 145.825 MHz transmitting general data, the other relaying engineering and scientific data on 432.05 MHz. Both beacons will have 1200-, 300-, and 110-baud ASCII, and 45.5-baud Baudot capability. The two-meter beacon also can be modulated by a speech synthesizer or asynchronous interface to the spacecraft computer. The 70-cm beacon will provide a high-speed data channel intended for advanced amateur ground stations. In addition to the ASCII data sources, the 70-cm beacon can transmit information from three different computer interfaces, a magnetometer, and two radiation counters.

Receiving the two-meter beacon should be easy with a simple crossed-dipole antenna and an ordinary NBFM receiver. The AFSK signals can be demodulated by a low-cost terminal unit. Reception of the 432-MHz beacon is more involved since the signals will be modulated with bi-phase shift keying. One exciting piece of hardware that will accompany UoSAT is a CCD camera. This device will be pointed at the Earth, transmitting images composed of 256 × 256 pixels, with each image taking about 3½ minutes to transmit. The demodulator, memory, and interface circuitry needed to view these pictures can be built for about $250. The images can be transmitted on either beacon.

Propagation studies for the HF bands will be possible through the use of UoSAT's phase-referenced beacons on 7, 14, 21, and 28 MHz. Information about the Earth's magnetic field will be available from a flux-gate magnetometer. Solar disturbances can be monitored via two particle-flux (radiation) detectors. Another set of experimental beacons will be used to evaluate the use of microwave frequencies for amateur satellites. They will transmit on 2.4 and 10.47 GHz. UoSAT's lack of conventional two-way communications capability is eclipsed by the wide variety of signals that a ground station can receive. There is something here for everyone.

UoSAT is scheduled to ride on a NASA Delta 2310 launch vehicle as a secondary payload accompanying



Close-up of Phase IIIA satellite as it appeared mounted on the application technology capsule below the Firewheel satellite. (AMSAT photo by W4PUJ, taken in May, 1980, at the Kourou ESA facility.)

*Ground-originated telecommands to UoSAT excepted, of course.

DEATH OF A SATELLITE

A worldwide family of amateur satellite users watched anxiously during mid-June as AMSAT engineers, controllers, and managers tried to piece together a picture of AMSAT-OSCAR 7 while the old bird lay perilously close to the end of its productive life. Serious problems began to show up June 11 and 12 when the satellite was not fully responding to commands. The last confirmed QSO took place on orbit 30075 (June 12) with VK3ACR participating.

From that time onward, the transponders and beacons on AO-7 exhibited a worrisome silence and numerous monitoring stations were placed on alert on every possible orbit. This strategem paid off when several stations reported hearing transponder hash and other signs of recovery. The optimism was short-lived—in the days that followed, all transmissions ceased.

While at first it was feared that the malfunctions had been catastrophic and total with no symptoms at all to diagnose, now there are a few pieces of the puzzle to assemble. Jan King W3GEY, AMSAT Vice President for Engineering, stated that he felt a 5- or 10-degree Celsius thermal shock caused by the sudden exposure to deep shadow might have been enough to cause a failure in one of the weakened, aged nicad batteries. Such a failure mechanism might come about through nonuniform heating of a cell, causing, for example, the plate separators to warp and cause a short circuit.

The thermal stress hypothesis is based on the fact that OSCAR 7 experienced a solar eclipse for part of each orbit. The eclipses, which, in theory, started on June 1, were calculated to end on or about July 5. The reports of OSCAR 7's demise are tempered by its exemplary record. The 64-pound bird was launched on November 15, 1974, making it one of the longest-lived satellites in history. Its 6.6 years of service is more than double the three years originally expected. An estimated 10,000 to 15,000 amateurs utilized the satellite, making millions of QSOs.

The construction of the spacecraft was an international effort, with the Mode A transponder built by Americans, the Mode B transponder supplied by German hams, the RTTY encoder coming from Australia, and the 70-cm beacon constructed by Canadians. OSCAR 7 also included a super high frequency (SHF) beacon that was never turned on because the FCC failed to provide authorization.

The failure of AO-7 is like losing a close and valued friend. However, we can look back with pride at OSCAR 7's multitude of accomplishments.

The preceding report is based on material in the June 19 issue of the AMSAT Satellite Report.

the Solar Mesosphere Explorer spacecraft. The satellite's orbit wil resemble the OSCAR 7 and 8 orbits. The 530-km, sun-synchronous, polar, Earth orbit will result in UoSAT circling the Earth every 95 minutes with a latitude increment of approximately 23.75° per orbit. If all goes according to plan, UoSAT will be launched in September, 1981, and, assuming success, become known as OSCAR 9.

Phase IIIB

The OSCAR 9 designator was originally going to belong to the Phase IIIA spacecraft. After its ill-fated launch attempt, the dream that accompanied this ambitious AMSAT program almost came to a halt. Not only did the complex expensive electronic hardware have to be replaced, but a new launch opportunity also was needed. Without a ride, a satellite would be next to useless! In the year that followed Black Friday, the AMSAT crew has overcome these problems. Two new spacecraft are being assembled (Phase IIIB and C) by an international team of amateurs. Phase IIIB is scheduled for a launch during the summer of 1982 aboard an Ariane rocket which will also carry ECS-1 (European Communications Satellite #1). Phase IIIC is being built for a 1983-1984 launch.

The Phase-IIIB bird, with the emphasis on "B", will resemble its predecessor but also will incorporate some significant changes. There will be the mode-B transponder, which has an uplink on 70-cm and a downlink on two meters. In addition to mode B, the new satellite will have an L-band transponder. Users will transmit to the satellite on the new 1269-MHz satellite allocation and receive on a 70-cm downlink. The use of the new 1269-MHz allocation presents some unique challenges to UHF-microwave experimenters since very little commercial equipment is available in the Western Hemisphere. (It proliferates in Europe.)

Several weeks after the spacecraft is launched from the European Space Agency's French Guiana facility, a kick-motor (a small liquid-fuel rocket) will be used to move it into a highly elliptical orbit. This orbit will allow some users to have access to the bird for approximately eight hours at a time. The "slow" apparent movement of the satellite will greatly simplify antenna tracking.

Phase IIIB promises to be the ultimate repeater, where nearly a third of the world will be in range. DXers will have the capability to work stations on four continents without having to worry about propagation. Through its technical challenge and communications capability, Phase IIIB will be a big part of ham radio in the 1980s.

Sky-High Dreams

The future of amateur radio's satellite program does not end with UoSAT and Phase IIIB. Plans are being made for another Phase-III bird. While the Phase-III program promises to give worldwide communications capability, it still does not fulfill the dream of providing global coverage for every ham, 24 hours a day. Enter Phase IV, in which SYNCART satellites are being planned for geosynchronous orbits. If three SYNCART packages were linked, it would be possible to talk to almost any ham on the Earth, 24 hours a day, with 100% reliability. Transforming this dream into reality will require an extraordinary amount of cooperation and innovation. Where does the future of our hobby lie? Perhaps we should look to the sky for an answer. ■

Jeff DeTray WB8BTH
73 Magazine Staff

You Can Scan with the Iscan

—memory scanning for the TR-9000

Kenwood's TR-9000 is a fine radio—no doubt about that. In fact, it has turned out to be exactly what I wanted in an all-mode 2-meter transceiver . . . with one small exception. While the 9000 has the built-in capability to perform scanning of the entire band, no provision is made for scanning the five memories.

The TR-9000's memories are selected by means of a front-panel rotary switch. However, since I like to keep tabs on several repeaters when I'm driving, I discovered that I was forever reaching down to fumble with the switch, much to the detriment of my driving. Sure enough, the minute I selected one frequency, it would go silent, and I'd again be groping for the memory switch. Enter the Iscan I-90, a memory-scan modification for the TR-9000.

Installation

Adding the I-90 to the 9000 is a relatively simple procedure. The I-90 package consists of an assembled 2" × 2" PC board containing four ICs, 12 pieces of very small-gauge insulated wire already cut to the proper lengths, and three pages of instructions, one sheet of which holds several helpful illustrations.

Installation of the I-90 involves attaching the 12 wires to various points inside the TR-9000 and to the I-90 PC board. For the most part, the wires are simply tack soldered to convenient pads inside the 9000, although one existing wire must be rerouted. It is a very clean modification and from start to finish, the whole procedure takes less than an hour. The instructions proved to be complete and understandable. A steady hand and a fine-tip soldering pencil are necessary due to the close quarters inside the 9000. The I-90 fits into the bottom of the TR-9000 cabinet, and absolutely no external modifications to the rig are required.

Operation

Using the I-90 is simple. With the Memory Recall button on the TR-9000 depressed, a touch of the 9000's Scan button sends the rig scanning through the five memorized frequencies. Scanning stops whenever a busy channel is encountered and resumes again when the carrier drops. A quick depression of the microphone's push-to-talk button forces the scan to continue past a busy channel. To return the radio to normal operation, it is necessary only to touch the transceiver's Hold button.

As you can see from the above description, the I-90 is a very clean mod. It makes use of existing controls and does not impair normal operation in any way. The many other scanning features of the TR-9000 are unaffected.

Summary

Although it was a minor annoyance in an otherwise fine rig, I did feel the lack of a memory scan in the stock TR-9000. When the I-90 came along, I was a bit hesitant to grab my soldering pencil and attack a nearly new radio. The results, however, have been well worth the small investment of time and money. In fact, the Iscan I-90 is so simple and does its job so well that one wonders why Kenwood did not include a similar circuit as standard equipment on the TR-9000. At $39.95, it's a bargain. The I-90 is available from *Iscan Engineering, Route 1, Box 90A, Antioch IL 60002.* Reader Service number 478. ■

SOCIAL EVENTS

from page 65

cial building at 9:00 am. Activities include forums, amateur and computer product displays, a flea market, ladies' programs, and children's activities. Full camping facilities are available. Talk-in on 146.16/.76. For more information, contact Charles W. Kuhn WD9EGW, 7005 N. Tobi Lane, Peoria IL 61614.

NEWTOWN CT
SEP 20

The Candlewood Amateur Radio Association's flea market and auction will be held on Sunday, September 20, at the Essex House, Rte. 6 in Newtown CT, Exit 8 off I-84, from 10:00 am to 4:00 pm. Admission is $1.00; tables are $6.00. Activities include door prizes, a raffle, dealers, and a magic show for the kids. Talk-in on 147.72/.12. For more information, contact George WB2THN at (914)-533-2758 or Ken KA1GDS at (203)-744-6953.

ROSS OH
SEP 20

The Greater Cincinnati Amateur Radio Association, Inc., will hold its annual Cincinnati Hamfest on Sunday, September 20, 1981, at Stricker's Grove on Ohio State Rte. 128, one mile west of Ross (Venice) OH. There will be exhibits, 10 major prizes, food, and refreshments available. Activities include a flea market with radio-related products only, a transmitter hunt, entertainment, and an air show. Admission is $4.00. For further information, contact Lillian B. Abbott K8CKI, 1424 Main Street, Cincinnati OH 45210.

MT. CLEMENS MI
SEP 20

The L'Anse Creuse Amateur Radio Club will hold its 9th annual Swap and Shop on Sunday, September 20, 1981, from 9:00 am to 3:00 pm at the L'Anse Creuse High School, Mt. Clemens MI. Take I-94 east-bound to the Metropolitan Parkway exit, then the Metropolitan Parkway to Crocker, go left on Crocker to Reimold and then right on Reimold to the last school, L'Anse Creuse High School. Admission is $2.00 at the door or $1.00 in advance. There will be FCC representatives and a test equipment table. There will be plenty of food and parking, plus hourly prize drawings. Prizes include a first prize of $250, a second prize of $100, and third prize of $50. Talk-in on 147.69/.09 and 146.52. For more information, send an SASE to Mike Corcoran N8CEN, 650 Chippewa, Mt. Clemens MI 48043.

AUGUSTA GA
SEP 20

The Augusta Amateur Radio Club will hold its annual hamfest on Sunday, September 20, at the Julian Smith Casino in Augusta GA. Tickets are $1.00 each; tailgaters, $3.00. Open at 9:00 am, everything is indoors except the flea market. There will be door prizes, a grand prize drawing at 3:00 pm, bingo, and refreshments. Talk-in on 146.34/.94. For more information, contact Diane Miller WB4YHT at (404)-860-3700.

FLINT MI
SEP 20

The Genesee County Radio Club, along with the Bay Area Amateur Radio Club, the Lapeer County Amateur Radio and Repeater Club, the Saginaw Valley Amateur Radio Association, and the Shiawassee Amateur Radio Association, will hold their fifth annual Five-County Swap-N-Shop on Sunday, September 20, 1981, from 7:30 am to 4:00 pm at the Bentley High School, 1150 Belsay Road (just north of I-69), Flint MI. Tickets are $2 per person in advance and $3 at the door. Children under 12 will be admitted free. There will be a food concession, free parking, and prizes (including a main prize of a Bearcat 210XL scanner). Talk-in on 146.52. Rent for an 8-foot table is $8; for reservatons, write Ed King K8OT, 10885 Dehmel, Birch Run MI 48415, or phone (517)-624-9094. For advance tickets, contact Ed King at the above address, or Don Williams KG8X, 5114 Knapp Drive, Flint MI 48506.

ARGOS IN
SEP 20

The Marshall County Amateur Radio Club will hold its 6th annual hamfest and electronics flea market on Sunday, September 20, 1981, at the 4-H Fairgrounds in Argos IN. Activities will include door prizes, refreshments, and a grand prize of $200. For more information, contact Paul R. DeVos WB9VFJ, 109 Maple Avenue, North Liberty IN 46554; (219)-656-4631.

ELMIRA NY
SEP 26

The Elmira Amateur Radio Association will hold the sixth annual Elmira International Hamfest on Saturday, September 26, 1981, at the Chemung County Fairgrounds. Gates will open at 8:00 am. Tickets are $2.00 in advance and $3.00 at the gate. Features will include a free flea market, tech talks, and dealer displays. Food will be available and door prizes will be awarded. The grand prize will be three items: an Icom IC-255A, an Icom IC-2AT, and an Avanti mobile antenna. A shuttle service from the Chemung County Airport will be provided for fly-ins who bring an HT. Talk-in on 147.96/.36, 146.10/.70, and 146.52/.52. For more information and/or tickets, contact John Breese WA2FJM, 340 West Avenue, Horseheads NY 14845.

LOUISVILLE KY
SEP 26-27

The eleventh annual Greater Louisville Hamfest and the 1981 Great Lakes Division Convention will be held on September 26-27, 1981, at the East Hall of the Kentucky Fair and Exposition Center in Louisville KY. There will be a large indoor exhibitors' area and flea market, completely air-conditioned. For more information, write The Greater Louisville Hamfest, PO Box 34444, Louisville KY 40232, or phone (502)-634-0619.

VIRGINIA BEACH VA
SEP 26-27

The 6th annual Tidewater Hamfest-Computer Show and ARRL Roanoke Division Convention will be held in the Virginia Beach Pavilion on September 26-27, 1981. Featured will be ARRL, traffic, and DX forums and XYL free bingo. FCC license exams will be given to those sending a form 610 request in advance. Free transportation to the oceanfront will be provided for the Neptune Festival. Admission is $3.50. There will be an advance ticket drawing for a handheld FM transceiver. Flea market tables are $5.00 for one day or $7.00 for both days. For tickets and information, write TRC, PO Box 7101, Portsmouth VA 23707, or phone (804)-587-1695.

ANNISTON AL
SEP 26-27

The Calhoun County Amateur Radio Association will hold its second annual hamfest on September 26-27, 1981, from 9:00 am to 5:00 pm on Saturday and from 9:00 am to 3:00 pm on Sunday, in the Municipal Auditorium, 1128 Gurnee Avenue, Anniston AL. Admission and parking will be free. Donations are $1.00 for one or $5.00 for 6. Tables are $3.00 for one day or $5.00 for two days. Free overnight parking for self-contained RVs will be available. Features will include a large air-conditioned exhibit area, free bingo on both days, hourly door prizes, MARS and ARRL forums, FCC examinations, and a final drawing on Sunday to award a Ten-Tec Delta Model 580, plus many other prizes. Talk-in on .69/.09; rag chew on .10/.70. Reduced rates will be available at the Anniston Downtowner Motor Inn. There will be a hospitality room at the Downtowner on Saturday evening. Contact Dale Boothe KA4LRL, c/o CCARA, PO Box 1624, Anniston AL 36202 for additional information.

CEDAR RAPIDS OH
SEP 27

The Cedar Valley Amateur Radio Club will hold its 7th annual CVARC Hamfest on Sunday, September 27, 1981, starting at 7:00 am at the Hawkeye Downs exhibition building in Cedar Rapids OH. Included will be an overnight camping area, picnic facilities, food, prizes, ARRL representatives, and movies. Talk-in on 146.16/.76, .52, and 223.34/.94. For advance tickets and reservations, write CVARC Hamfest, PO Box 994, Cedar Rapids IA 52406.

BEREA OH
SEP 27

The Cleveland Hamfest Association will present the 7th annu-

al Cleveland Hamfest on Sunday, September 27th, 1981, from 0800 to 1500 hours, at the Cuyahoga County Fairgrounds in Berea OH. Activities will include indoor exhibits, forums, a ladies' program, and an outdoor flea market with separate parking. Food services will include both breakfast and lunch. There will be three main prizes and a mobile check-in prize. Talk-in on 146.52 (W8QV). Advance tickets are $2.50 prior to August 31; $3.00 at the door. Contact the Cleveland Hamfest Association, PO Box 27211, Cleveland OH 44127.

BOULDER CO
SEP 27

The Boulder Amateur Radio Club will hold Barcfest/81 on Sunday, September 27, 1981, beginning at 9:00 am at the Boulder National Guard Armory, 4750 North Broadway, Boulder CO. An admission donation of $2.00 per family includes swap space and door prize drawing. There will also be a snack bar and an auction. Talk-in on 146.10/.70 and 146.52. For further information, contact Mark Call NØMC, 4297 Redwood Court, Boulder CO 80301, or phone (303)-442-2616.

ISLIP LI NY
SEP 27

The Long Island Mobile Amateur Radio Club (LIMARC) will sponsor the ARRL Hamfair '81, part II, on Sunday, September 27, 1981, at Islip Speedway, Islip NY. Food and refreshments are available at concession stands and many awards will be presented all day. General admission is $2.00; exhibitors' space is $5.00. Ladies and children will be admitted free. For more info, contact Sid Wolin K2LJH at (516)-379-2861 (nights) or Hank Wener WB2ALW at (516)-484-4322.

GAINESVILLE GA
SEP 27

The 8th annual Lanierland ARC Hamfest will be held on September 27, 1981, beginning at 9:00 am in the Holiday Hall at the Holiday Inn, Gainesville GA. Doors will open at 8:00 am for dealer setups, and free tables and an inside display area will be provided. A large parking lot will be available for the flea market, and all activities and facilities will be free to all. A boat anchor auction and prize drawings will be featured. Prize tickets are $1.00 each or 6 for $5.00. Food will be available next door. Talk-in on 146.07/.67. For more information and free dealer space reservations, contact Paul Watkins W4FDK, Rte. 11, Box 536, Gainesville GA 30501, or phone (404)-536-8280.

GRASS VALLEY CA
SEP 27

The Golden Empire Flying Club and Radio Systems Technology are pleased to announce the annual fly-in and avionics swap meet to be held at the Nevada County (CA) Airpark on Sunday, September 27, 1981. The pilot of any antique or home-built aircraft will receive a free "miner's lunch" and a beverage of the pilot's choice. Pastries, bratwurst, and hot dogs will be available also. The swap meet will be free. Table space is limited and it is first-come, first-served. This is the only swap meet in the country to feature the trading of used avionics products. Pilots are reminded that Nevada County Airport is considered a mountain strip, and are advised to check density altitude. For more information, contact Golden Empire Flying Club, PO Box 375, Grass Valley CA 95945.

ADRIAN MI
SEP 27

The Adrian Amateur Radio Club will hold its hamfest on September 27, 1981, at the Lenawee County Fairgrounds, Adrian MI, from 8:00 am to 3:00 pm. There will be prizes, games, and programs. Limited tables available and inside space available for your table. Tickets are $1.50 in advance; $2.00 at the door. Talk-in on 146.31/.91 and .52. For tickets, tables, and information, contact the Adrian Amateur Radio Club, Inc., PO Box 26, Adrian MI 49221. Tables reserved by check no later than September 20.

NEW LONDON NH
SEP 27

The 5th annual Connecticut Valley FM Association hamfest/flea market will be held on Sunday, September 27, 1981, from 9:00 am to 5:00 pm at the King Ridge Ski Area, New London NH. Adult admission will be $1.00 and flea market setup will be $5.00. Children under 16 will be admitted free. The food concession will be by King Ridge.

NEW BERLIN IL
SEP 29

The Sangamon Valley Radio Club of Springfield, IL, will hold its sixth annual hamfest on Sunday, September 29, 1981, at the Sangamon County Fairgrounds, New Berlin, IL twelve miles west of Springfield on Rte. 36. There will be an indoor display and a covered pavilion for the flea market. Exhibits, kids' activities, and food will be available, along with overnight camping. First prize is an Icom synthesized HT. Tickets are $2.00 in advance; $2.50 at the gate. For more information, contact SVRC, c/o Red Cross Building, 1025 S. Sixth St., Springfield IL 62703.

WAUKESHA WI
OCT 11

The KMRA Hamfest '81 will be held on Sunday, October 11, at the Waukesha Exposition Center, Hwy. FT, Waukesha WI. Tickets are $2.00 in advance; $3.00 at the gate. Talk-in on .52. For more info, or advance tickets, write KMRA Hamfest '81, 315 Morey Street, Waukesha WI 53186.

HAM HELP

I'm looking for a Swan 500 transceiver operation manual and schematic diagram. Thank you very much.

Manuel Avendano XE1ABR
Sur 141 #2316
Mexico 8, D.F.

I have been doing some serious listening at low frequencies—50 to 500 kHz—where noise is the problem.

I would like to correspond with anyone who has good technical information and/or experience with shielded antennas, loops or otherwise.

James L. Weiss W9ZMV
Box 840
Hillside IL 60162

I need a schematic for an American Bosch Radio Receiver, model 5A, manufactured by United American Bosch Corporation, Springfield MA. Thanks.

Jeff DeTray WB8BTH
73 Magazine
Peterborough NH 03458

I need some assistance with a problem I've been having. I have been trying to build a large Tesla coil for a while now. The project has been worked on when I have spare time (which is hard to come by these days, as you well know). My problem is that I can't get the thing to work! I'm sure the problem is resonating the coil. I can't seem to come up with the right value capacitor. I have a few books on Tesla, but none of them gives details on figuring out circuit values. Could anyone suggest any books or articles where I might find detailed information on building the coil?

Bob Billson WA2TXY
837 Summit Ave.
Westfield NJ 07090

I need a schematic and/or manual for a Dumont 401B oscilloscope. I will pay for copying or will copy and return, all postage paid.

Arthur Durea N4CJW
102 Indian Lane
Oak Ridge TN 37830
(602)-483-0784

Is anyone using the Heath H-89 on CW? Where can I get CW software?

D. R. Kight WA5RER
PO Box 1651
Abilene TX 79604

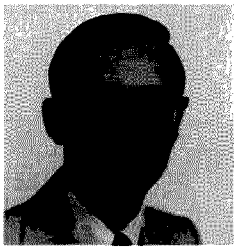
I need a manual and/or schematic diagram for a Globe Electronics Globe Scout Deluxe. I will pay for postage and copying costs.

Brian T. Sullivan
4300 Ivanhoe Place
Alexandria VA 22304

I need a schematic or operating instructions for pre-zip-code Simpson Model 372 ohmmeter. I will reimburse expenses.

Mickey McDaniel W6FGE
940 Temple St.
San Diego CA 92106

CONTESTS



Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

WAS SSTV CONTEST

Starts: 1300 GMT September 5
Ends: 0100 GMT September 8

This is a simple A5 SSTV "Worked All States" contest designed to give the operator a maximum of 60 hours of available time in which the purpose is to work as many of the states as possible via slow-scan television. The time limitations were chosen for operating convenience and propagation fairness. Don't forget Alaska and Hawaii if available.

As in the January contest sponsored by *Amateur Television Magazine*, the contest is designed for quality rather than quantity. The extended operating time period and encouragement of unpopular SSTV band segments ensures minimum QRM between SSTV operators and experimentation in operation on all amateur bands.

All contacts must incorporate the video/signal report in video as well as the call letters of the stations worked. A bonus factor of 10 may be added to those SSTV contacts on non-popular bands as noted with an asterisk in the list of frequencies. Additional contacts within the same state count only as bonus points. Other than suggested frequencies may be used as long as the frequency used is legally authorized for SSTV operation. Log entries (or submitted copies) must include the signature of the operator and be mailed to Mike Stone WB0QCD, *A5 Magazine* Contest Manager, PO Box H, Lowden IA 52255 by midnight, September 10th. Include an SASE for logs that are to be returned. Results will be published in the Nov/Dec issue of *A5 Magazine*.

The winning entry with the most states worked and bonus points will receive a one-year subscription to *A5 Magazine* and a contest certificate. Second and third place winners will receive certificates. Stations completing all 50 states will have their picture published in *A5 Magazine* with a writeup.

FREQUENCIES:

3845-3855*, 7220-7230*, 14230-14240, 21340-21350*, 28680-28690, 50.20-50.21*, 144.23-144.24 (SSB)*, 146.43 (FM)*.

NEW MEXICO QSO PARTY

Starts: 0000 GMT September 12
Ends: 2400 GMT September 13

Sponsored by the Albuquerque DX Association. Crossband and repeater contacts may not be counted for scoring. Each station may be worked once on each band and each mode. NM stations operating mobile may be worked again in each county.

EXCHANGE:

RS(T), QSO number, and state, province, DX country, or NM county.

FREQUENCIES:

CW—63 kHz from the low end of each band; SSB—3900, 7265, 14285, 21365, 28650; Novice—3705, 7105, 21105, 28105. Stations outside NM please refrain from calling CQ NM near these frequencies!

SCORING:

Each QSO counts one point. NM stations multiply total QSO points by the total number of states, provinces, and DX countries worked on each band, each mode. All others, multiply total QSO points by the total number of NM counties worked each band, each mode.

AWARDS:

Plaques will be presented to the top scorers from NM and outside NM. Certificates awarded top scorers from each state, province, and DX country. Special award presented to any station working all 33 NM counties during the QSO party!

ENTRIES:

Stations reporting 100 or more QSOs please include dupe sheets. Entries must be postmarked no later than October 15th and addressed to: Albuquerque DX Association, PO Box 997, Corrales NM 87048. Include an SASE for complete results.

WASHINGTON STATE QSO PARTY

Contest Periods:
0100 GMT to
0700 GMT September 12
1300 GMT September 12 to
0700 GMT September 13
1300 GMT September 13 to
0100 GMT September 14

The sixteenth annual contest sponsored by the Boeing Employee's Amateur Radio Society (BEARS) is divided into three operating periods as shown. All amateurs are invited to participate. Use all bands and modes, but no CW QSOs are allowed in the phone bands. Stations may be worked once on each band and mode for contact points and more than once each band/mode if they are additional multipliers.

EXCHANGE:

QSO number, RS(T), and state, province, country, or Washington county.

FREQUENCIES:

Phone—1815, 3925, 7260, 14280, 21380, 28580; CW—1805, 3560, 7060, 14060, 21060, 28160; Novice—3725, 7125, 21150, 28160.

SCORING:

Washington stations score 2 points for each phone contact and 3 points for each CW contact, including contacts with other Washington stations. Multiply QSO points by the total number of different states, Canadian provinces, and other foreign countries worked. All others score 2 points for each phone contact and 3 points for each CW contact with a Washington station. Multiply QSO points by the total number of different Washington counties worked (39 maximum). There will be an extra multiplier of one for each group of 8 contacts with the same Washington county for all non-Washington stations.

AWARDS:

Certificates will be awarded to the highest-scoring station (both single and multi-operator) in each state, Canadian province, foreign country, and Washington county. Additional

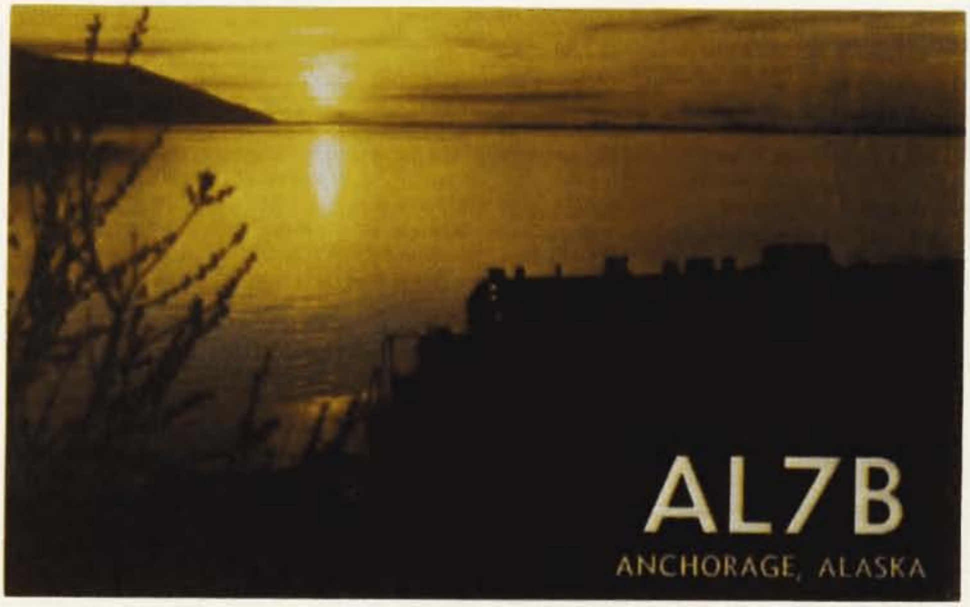
CALENDAR

Sep 5-7	**WAS SSTV Contest**
Sep 12-13	**European DX Contest—Phone**
Sep 12-13	**G-QRP-Club CW Activity Weekend**
Sep 12-13	**New Mexico QSO Party**
Sep 12-14	**Washington State QSO Party**
Sep 19-20	**Maryland-District of Columbia QSO Party**
Sep 19-20	**College Scrimmage**
Sep 19-20	**Can-Am Contest—Phone**
Sep 28	**DARC Corona—10-Meter RTTY**
Sep 26-27	**Maine QSO Party**
Sep 26-27	**Can-Am Contest—CW**
Oct 3-4	**California QSO Party**
Oct 17-18	**Minnesota QSO Party**
Oct 17-18	**Scout Jamboree On The Air**
Oct 17-18	**Pennsylvania QSO Party**
Oct 24-25	**CQ World-Wide DX Contest—Phone**
Nov 7-8	**Antigua & Barbuda Independence QSL Party**
Nov 8	**DARC Corona—10-Meter RTTY**
Nov 8	**OK DX Contest**
Nov 14-15	**European DX Contest—RTTY**
Nov 28-29	**CQ World-Wide DX Contest—CW**
Dec 26-31	**G-QRP-Club Winter Sports**
Jan 16-17	***73*'s International 160-Meter Phone Contest**
Jan 16-17	**International SSTV Contest**

certificates may be issued at the discretion of the Contest Committee. Worked Five BEARS Awards are also available to anyone working 5 club members before, during, or after the QSO party (unless previously issued). All QSO Party entries will be screened by the Contest Committee for possible Worked Five BEARS Awards. Worked Three BEAR Cubs Awards are also available for working 3 Novice members.

ENTRIES:

Logs must show dates/times in GMT, stations worked, exchanges sent and received, bands and modes used, and scores claimed. Include a dupe sheet for entries with more than 100 QSOs. Each entry must include a signed statement that the decision of the Contest Committee will be accepted as final. No logs can be returned. Results of the QSO party will be mailed to all entrants and an SASE is NOT required. Log sheets and summary sheets must be postmarked no later than October 15th and be sent to: Boeing Employees' Amateur Radio Society, c/o Contest Committee, Willis D. Propst K7RS, 18415 38th Avenue South, Seattle WA 98188.



QSL OF THE MONTH

This month's winner was submitted by Dick Mobley AL7B of Anchorage AK.

If you would like to enter the contest, put your QSL *in an envelope* and mail it along with your choice of a book from *73*'s Radio Bookshop to *73 Magazine*, Pine Street, Peterborough NH 03458. Attention: QSL of the Month. Entries which do not use an envelope (the Postal Service does *occasionally* damage cards) and do not specify book choice will not be considered. Sorry.

EUROPEAN DX CONTEST—PHONE

Starts: 0000 GMT September 12
Ends: 2400 GMT September 13

Sponsored by the Deutscher Amateur Radio Club (DARC). Only 36 hours of operations out of the 48-hour period are permitted for single-operator stations. The 12 hours of non-operation may be taken in one period, but not in more than three periods, at any time during the contest. Operating classes include: single-operator allband and multi-operator single transmitter. Multi-operator, single-transmitter stations are allowed to change band only one time within a 15-minute period, except for making a new multiplier. Use all amateur bands from 3.5 through 28 MHz. A contest QSO can be established only between a non-European and a European station. Each station can be worked only once per band.

EXCHANGE:

Exchange the usual five-digit number consisting of RS and progressive QSO numbers starting with 001.

SCORING:

Each QSO counts 1 point. Each QTC (given or received) counts 1 point. The multiplier for non-European stations is determined by the number of European countries worked on each band. Europeans will use the last ARRL countries list. In addition, each call area in the following countries will be considered a multiplier: JA, PY, VE, VO, VK, W/K, ZL, ZS, UA9/UAØ. The multiplier on 3.5 MHz may be multiplied by 4, on 7 MHz by 3, and on 14 through 28 MHz by 2. The final score is the total QSO points plus QTC points multiplied by the sum total multipliers.

QTC TRAFFIC:

Additional point credit can be realized by making use of the QTC traffic feature. A QTC is a report of a confirmed QSO that has taken place earlier in the contest and later sent back to a European station. It can be sent only from a non-European station to a European station. The general idea is that after a number of European stations have been worked, a list of these stations can be reported back during a QSO with another station. An additional 1 point credit can be claimed for each station reported.

A QTC contains the time, call, and QSO number of the station being reported, i.e., 1300/DA1AA/134. This means that at 1300 GMT you worked DA1AA and received number 134. A QSO can be reported only once and not back to the originating station. Only a maximum of 10 QTCs to a station is permitted. You may work the same station several times to complete this quota but only the original contact has QSO point value. Keep a uniform list of QTCs sent. QTC 3/7 indicates that this is the 3rd series of QTCs sent and that 7 QSOs are reported. Europeans may keep the list of the received QTCs on a separate sheet if they clearly indicate the station who sent the QTCs.

AWARDS:

Certificates to the highest scorer in each classification in each country, reasonable score provided. Continental leaders will be honored with plaques. Certificates also will be given stations with at least half the score of the continental leader or with at least 250,000 points. The minimum requirements for a certificate or a trophy are 100 QSOs or 10,000 points.

ENTRIES:

Violation of the rules, unsportsmanlike conduct, or taking credit for excessive duplicate contacts will be deemed sufficient cause for disqualification. The decision of the Contest Committee is final. It is suggested to use the log sheets of the DARC or equivalent. Send a large SASE to get the wanted number of logs and summary sheets (40 QSOs or QTCs per sheet). SWLs apply the rules accordingly. Entries should be sent no later than October 15th, and North American residents may send their applications and logs to: Hartwin E. Weiss W3OG, PO Box 440, Halifax PA 17032 USA.

EUROPEAN COUNTRY LIST:

C31, CT1, CT2, DL, DM, EA, EA6, EI, F, FC, G, GC Guer, GC Jer, GD, GI, GM, GM Shetland, GW, HA, HB9, HBØ, HV, I, IS, IT, JW Bear, JW, JX, LA, LX, LZ, M1, OE, OH, OHØ, OJØ, OK, ON, OY, OZ, PA, SM, S, SV, SV Crete, SV Rhodes, SV Athos, TA1, UA1,3,4, 6, UA2 UB5, UC2, UN1, UO5, UP2, UQ2, UR2, UA Franz Josef Land, YO, YU, ZA, AB2, 3A, 4U1, 9H1.

NEWSLETTER CONTEST WINNER

This month's winner of the *73 Magazine* Club Newsletter Contest is the *Birmingham* (Alabama) *Amateur Radio Club Newsletter.* Not only does this publication have a very attractive layout, complete with photographs, it also offers some darned good technical information.

We found an article describing a simple RTTY demodulator and a "Technical Corner" where real-to-life problems are tackled. Your newsletter does not need to limit itself to ham-radio subjects. The BARC technical data included mention of a troublesome remote controller for a TV. Even if the readers cannot use such information immediately, they'll be able to store it away for future reference. A bit farther afield, *Zero Bias*, the Aroostook (Maine) Amateur Radio Association newsletter, published details on how to grow strawberries in a barrel.

Technical articles don't *need* to be long, involved technical treatises with professional illustrations. A few paragraphs of text accompanied by some simple drawings is all you need for a first attempt. What kinds of things can you write about? We liked the external microphone for the IC-2A described in the *Metropolitan Amateur Radio Club* (Tucson, Arizona) *Bulletin*, and the two-meter pocket antenna featured on the back cover of the *Parking Ticket*, a Plano (Texas) Radio Klub publication.

The pages of a club newsletter are an ideal place to introduce and perfect projects before submitting to magazines such as *73*. Don't let your club's editor send out a newsletter that has too much white space; contribute ideas and projects so that everyone can enjoy them.

Is your club sending its newsletter to *73*? Be a nuisance until they do.

G-QRP-CLUB CW ACTIVITY WEEKEND

Starts: 0900 GMT September 12
Ends: 2300 GMT September 13

All radio amateurs interested in QRP are invited to take part in the club's activity weekend. No special exchange information was mentioned in the information provided by the club. The operating schedule for this weekend is as follows:

3560 kHz = 0900-1000, 1700-1800, and 2200-2300 GMT;
7030 kHz = 1200-1300, 1500-1600, and 1900-2000 GMT;
14060 kHz = 1000-1100, 1400-1500, and 2100-2200 GMT;
21060/28060 = 1100-1200, 1600-1700, and 2000-2100 GMT.

Reports on the Activity Weekend will be welcomed by Christopher J. Page G4BUE.

MARYLAND-DISTRICT OF COLUMBIA QSO PARTY

Starts: 1900 GMT September 19
Ends: 1900 GMT September 20

Sponsored by the Columbia Amateur Radio Association, the contest is open to all single-operator stations.

EXCHANGE:

QSO number, RS(T), and state, province, country, or MD county. Remember that Baltimore and Washington are independent cities!

SCORING:

MDC stations multiply total QSOs by sum of MD counties, states, provinces, and countries. Others multiply MDC QSO total by number of MD counties and independent cities (25 maximum). Also, multiply score by 1.5 if running 200 Watts or less.

FREQUENCIES:

Phone—3950, 7250, 14290, 21390, 28590; CW—60 kHz up from low end; Novice—3720, 7120, 21120, 28120.

AWARDS AND ENTRIES:

Plaques and certificates for top scores in each category. Mail entry by October 20th to CARA, Inc., c/o Robert K. Nauman WA3VUQ, 4017 Font Hill Drive, Ellicott City MD 21043.

COLLEGE SCRIMMAGE

Starts: 0200 GMT September 19
Ends: 0400 GMT September 20

The idea of this contest is to put long-lost alumni in touch with their alma mater. Entry classes include alumni and college stations (one transmitter only). Exchange name of college, Jr. college, or university you last attended, and the last years of the year you graduated or will graduate. Club stations substitute "Amateur Radio Club" for number. Non-collegians, substitute "high school" for college name. Stations may be worked once per band. Multiply total QSOs times number of different colleges, Jr. colleges, and universities worked. Logs must be received by November 1st. Send to Penn State ARC (K3CR), 202 Engineering Unit E, University Park PA 16802. Please include an SASE for results.

FREQUENCIES:

SSB—1815, 3895, 7230, 14280, 21355, 28560; CW—60 kHz from low end; Novice—25 kHz from low end.

CAN-AM CONTEST

Phone
Starts: 1800 GMT September 19
Ends: 1800 GMT September 20
CW
Starts: 1800 GMT September 26
Ends: 1800 GMT September 27

Multi-operator stations can operate the full 24-hour period. Single-operator stations can operate a maximum of 20 hours with a maximum of two rest periods totaling a minimum of 4 hours.

Sponsored by the Ontario Contest Club and Canadian DX Association to increase the friendship among Canadian and American amateurs and to provide a means of measuring the performance of their operating skills and equipment.

Operating categories include: (1) Single operator—all bands with station operated by the station licensee; (2) Multi-operator, single transmitter—stations operated by more than one operator, or single operator other than the licensee, or club station; (3) club competition.

Use all bands, 160 through 10 meters. USA General portion of the bands is recommended. The same station can be contacted once on each band. Stations operating from outside of their own call area must sign slash and the area they are operating from.

EXCHANGE:

RS(T) plus sequential QSO number starting with 001 and multiplier (MX) area abbreviation (in that order). Multiplier-area abbreviation is the usual two-letter postal abbreviation for 50 US states, CN for Caribbean (KC4, KG4, KP1, KS4, KV4), PC for Pacific (rest of US possessions). Canadians will use: NF for VO1 and VO2, NB for VE1 New Brunswick, NS for Nova Scotia, PE for Prince Edward Island, SI for Sable and St. Paul Islands, PQ for VE2, ON for VE3, MB for VE4, SK for VE5, AT for VE6, BC for VE7, NW for VE8 NWT, and YU for VY1 Yukon.

SCORING:

The multipliers are the 50 US states, 2 US possessions (Caribbean & Pacific), 10 Canadian provinces, 2 territories (NWT & YU), 1 island (Sable or St. Paul). Total of 65 multipliers per band, maximum possible on all 6 bands is 390.

QSO points for Americans to Americans or Canadians to Canadians is 2 points per QSO. American to Canadian and vice versa counts 3 points per QSO. The final score is the result of the total QSO points from all bands, multiplied by the sum of the multipliers from all bands. Phone and CW sections of the contest are considered separate contests. However, combined score for phone and CW will be used for overall competition. Combined scores will be calculated by the contest committee as a result of the addition of the phone and CW scores.

AWARDS:

First-place certificates will be awarded in each multiplier area on both modes in single-operator categories. Top five multi-operator stations will receive certificates for high claimed phone and CW scores. All scores will be published in *CQ Magazine*. One year subscriptions to *Long Skip*, the CANADX bulletin, will be awarded to the 5 US stations. Additional trophies and plaques will be awarded the overall winners for the Canadian and American champions on phone, CW, and combined. Also, an award for the club having the highest score as a result of adding the 5 best scores on phone and CW by its members. A club officer must submit the summary showing the callsigns and

scores. Each station is eligible for one trophy only. In cases where one station qualifies for another trophy, the less significant trophy goes to the next eligible station.

ENTRIES:

All times must be kept in GMT. Indicate multipliers the first time only on each band. Log must be checked for duplicate contacts, correct QSO points, and multipliers. Do not use separate logs for each band. Rest periods must be clearly marked in the log. Each entry must consist of: log sheets, summary sheet showing all scoring information, category of competition, operator's name and callsign, address of the station, and signed declaration. Entries with over 200 QSOs must include check sheets for each band. Official logs, check sheets, and summary sheets with multiplier tables are available from the contest chairman; a large SASE with Canadian stamps (for US stamps *not glued to the envelope*) will bring you samples. Usual disqualification rules apply, and the decisions or actions of the Can-Am Contest Committee are official and final. All entries must be postmarked not later than 30 days after the contest and mailed to: VE3BMV, PO Box 292, Don Mills, Ontario, Canada M3C 2S2.

DARC CORONA 10-METER RTTY CONTEST

Contest Period: 1100 to 1700 GMT September 26

This is the third of four tests during the year sponsored by the DARC eV to promote RTTY activity on the 10-meter band. Each of the four tests is scored separately. Use the recommended portions of the 10-meter band.

EXCHANGE:

RST, QSO number, and name.

SCORING:

Each station can be contacted only once. Each completed 2 x RTTY QSO is worth 1 point. Multipliers include the WAE and DXCC lists and each district in W/K, VE/VO, and VK. The final score is the total number of QSOs times the total multiplier.

AWARDS:

Plaques will be awarded to the leading stations in each class with a reasonable score present. Operating classes include: Class A for single- or multi-operator stations and Class B for SWLs.

ENTRIES:

Logs must contain name, call, and full address of participant. Also show class, times in GMT, exchange, and final score. SWLs apply the rules accordingly. Logs must be received within 30 days after each test. Send all entries to: Klaus K. Zielski DF7FB, PO Box 1147, D-6455 Erlensee, West Germany.

The remaining contest period is on November 8th.

MAINE QSO PARTY

Starts: 2300 GMT September 26
Ends: 2359 GMT September 27

Sponsored by the Portland Amateur Wireless Association, the contest is open to all. Stations may be worked once on phone and once on CW, for each band.

EXCHANGE:

RS(T), serial number, and state, province, country, or Maine county.

FREQUENCIES:

SSB—1815, 3930, 7280, 14280, 21380, 28580; CW—1805 and 55 kHz up from low end of band; Novice—3720, 7120, 21120, 28120.

SCORING:

Complete QSOs count 3 points. Out-of-state stations multiply the total number of QSO points by the number of Maine counties contacted (maximum of 16). Maine stations multiply the total number of QSO points by the sum of Maine counties, states, provinces, and countries.

ENTRIES:

Mail entries by December 1st to PAWA, Box 1605, Portland ME 04104. Applications for the Worked All Maine Counties award may go to the same address.

HAM HELP

I need a schematic and service manual for an HF receiver unit of Model RBM-3 radio equipment type CCT-46077. I will pay for schematic/manual (or copy) or I can copy and return original. Thank you.

Larry Steele K0UKO
5060 Chickweed Dr.
Colorado Springs CO 80917

I need instruction manuals for the Realistic DX-160 and the Allied Radio 2589 receiver. I will pay postage for photocopies or originals. I also need a Knight T-60 transmitter unit and schematic.

Kevin Neal
Rte. A, Box 221A
Flippin AR 72634

I need some help in obtaining the following books: *Radiotelegraph Operator's License Q&A Manual* by Milton Kaufman and *Radio Operating Questions & Answers*, 15th Ed, 1977, by Jules L. Hornung and Alexander A. McKenzie. I will gladly pay for these books if someone could provide me with a source for them. Also, if there are any Maritime Radio Officers going to be in port in Athens, Greece, drop me a line. Thanks.

SSG Gary S. O'Neal
HHD, 558th USAAG
APO NY 09253

I desperately need a source of tubes for my linear. It uses surplus-type RK-65s. If anyone can help me I will certainly appreciate it. Thanks.

Larry Ennis K8AXS
394 Leota
Union Lake MI 48085

I would like very much to obtain an instruction, operator's, or service manual for a DSI frequency counter, model no. 3600. This unit was manufactured by Diversified Security Industries, San Diego CA 92111. I think that perhaps the company has gone out of business; my letters have been returned. Can anyone help me out?

Mr. Lawrence Neel, Jr. W8PKV
1236 Bondick Dr.
Cincinnati OH 45230

I need a manual and schematic on an Itron model 680 frequency counter/timer. I will pay for manual or copy or will copy and return. Any help will be appreciated.

J. O. Dickinson W4LLF
1408 Monmouth Court West
Richmond VA 23233

CORRECTIONS

There is an error in my article on the Robot 800H specialty terminal in the August, 1981, issue. On page 92, column 4, the sentence begun in the seventh line from the bottom should read: "Word mode sends each word as it is completed *when* the Model 800 detects a space."

Wayne E. Elseth WB9PKD
Carbondale IL

In my review of *Guide to RTTY Frequencies* in the August, 1981, *73*, my address was incorrect. The street address should be *204* Dellwood Drive.

Dennis G. Brewer K8DIU/4
Greenville NC

NOISE BRIDGE PARTS KIT

A complete kit of parts, including PCB and cabinet, for a noise bridge similar to the one shown in Fig. 2, p. 41, of the August issue, is available for $31.95 plus $2.50 shipping from Radiokit, Box 4115, Greenville NH 03048. The bridge covers 1.5 to 30 MHz with a resistive range of 0 to 250 Ohms and a reactive range of −180 to +180 Ohms.

DS2050 *from page 42*

mind. All functions are keyboard-controlled, involving pressing the control key and one of the keys on the top row of the keyboard. Unshift-on-space can be selected in the Baudot mode and automatically resets the receive circuitry to LTRS (letters) case when a space character is received. Sync idle (often referred to as "diddle") can be switched on or off in all modes, and causes a nonprinting character to be transmitted when your typing rate is slower than the transmit-output rate.

Unlike mechanical RTTY terminals, the DS2050 does a lot of the drone work for you. Start typing, and it keys the transmitter. Stop, and the transmitter shuts off. Word wrap-around is provided in both transmit and receive. In transmit, if you are typing along and come to the end of the line, the computer will bump the word to the next line and insert a carriage return, line feed, and LTRS shift. In addition, when the ENTER key is pressed, a carriage return, line feed, and LTRS shift is generated. In receive, whenever a line feed is received, a carriage return is performed as well. What all this boils down to is that you sit there and type your message and the computer takes care of the rest.

Test messages are generated by pressing CONTROL and one other key. Hit the RY key, and an entire line of RYRY will bless the eyes and ears of others on the same frequency. The same with the traditional Quick-Brown-Fox message. The CQ button generates a bunch of CQs in the blink of an eye. These are augmented by two 32-character ID message buffers which must be loaded each time the system is turned on. The first buffer is used also for the CW ID, so I usually program a short message like DE KA1LR into that. The second buffer is used only for RTTY ID, so I often program something like KA1LR "PAUL" HARRISVILLE NH.

The ability to type a message for transmission while receiving (pretyping) is almost a necessity, and the 2050 can do it, although in a limited fashion. There is a hidden buffer that will hold 255 characters, and it can be typed into at the same time you are receiving a message.

Transmitted text is printed dimmer on the screen than received text, and you can type straight in while receiving, but since it mixes the transmit text in with the receive text, it makes it all a little hard to read. Mind you, it will be sent correctly—it just looks a little strange. In short, the 2050 offers two varieties of pretyping, but neither is quite as convenient as terminals with split-screen operation.

If your typing is as bad as mine, you'll appreciate the DS2050's approach to sending text. It is word-oriented and always stays at least one word behind your typing. As you type a sentence, if you are typing slower than the unit can send, it will stop before the word you are typing and wait until you hit the space bar to send it. This allows you to go back and correct spelling mistakes before the word goes out. A nice touch!

The receive mode works beautifully. The ST5000 demodulator can decode tones I can barely hear and dutifully ignores a fairly high level of QRM. It will tune either 170- or 850-Hz shifts, so you'll be at home both on the HF bands and two meters. Tuning is easily accomplished with the large meter on the top of the unit. Pick up a cheap scope at the next hamfest, and you'll be able to plug it into the 2050 and tune even more accurately.

For those of us who like to leave our equipment on all of the time and tuned to a specific frequency, autostart is included. Both mark and space tones must be present for 3.5 seconds before anything will appear on the screen, effectively preventing garbage from being printed. You'll need a standard teleprinter with loop keying for hard copy if you don't want to miss anything!

Keeping track of the status of all the functions is rather important. The top line of the screen serves as a status indicator, and I find myself looking at it frequently to make sure I'm using the right code, speed, and transmit mode. Unfortunately, one of the two things I don't like about the 2050 involves the status line. It is bumped off when the screen fills with text, and to get it back, you must enter a control code. The status line will disappear again as soon as another line of text is started. No doubt this was done to allow as much text as possible to appear on the screen at one time, but I suspect most of us would gladly sacrifice a line of text to see the status line there all the time.

The other thing I would like to see changed is the number of options we have for keying a transmitter. Currently, you can transmit RTTY anyway you like as long as it is AFSK. Adding TTL- and RS232-level FSK is an easy modification since both are present on the demodulator board. Pick up the signal your rig needs off the board, bring it out to a phono jack on the back panel, and you'll be enjoying the benefits of direct FSK. Considering the large number of transceivers that include an FSK circuit, it would be nice if HAL made FSKing more accessible in future evolutions of the box.

RTTY equipment manuals have generally been better than those supplied with other amateur equipment, and the 57-page tome packed with the DS2050 is no exception. It could easily serve as a textbook for those who know absolutely nothing about RTTY. The instructions for the terminal itself are very complete, but HAL goes on to explain the theory behind RTTY, how to choose a transmitter and receiver for RTTY, how to tune signals, and even how to interface your standard TV set to the terminal.

On The Air

The DS2050 looks pretty good on paper, but it does even better in actual use. It's amazing how annoying even minor glitches can be in a piece of ham gear, but my blood pressure has stayed at normal levels throughout the months I've had the HAL. The keyboard has a satisfying feel and there is absolutely no keybounce. The RFI that has plagued some of the computer/interface combinations I have used is completely absent. If you have never tried sending CW on a keyboard, you owe yourself a session on this machine. You type at any speed you like, and out comes perfectly-spaced CW. Hard to beat! We didn't test the CW-receive option, but for those who are interested, it's available.

Turning to RTTY, the phrase that immediately comes to mind is "rock-solid." The demodulator that HAL included may not be the fanciest board available, but it has never let me down, and the various control functions are so easy to use that you don't even need a cheat sheet to re-

member what does what.

The DS2050 is tailor-made for the ham who wants a high-performance RTTY/CW terminal at a reasonable price. Best of all, the circuitry is straightforward enough to allow us compulsive hardware hackers to enjoy ourselves without getting into too much trouble. If you are looking for SELCAL, message buffers, mailbox operation, or WRU, you'll want to look at one of the more expensive stand-alone units, or a computer/interface combination. For good basic performance that doesn't require a lot of fussing and cussing, you won't find a better deal than the HAL DS2050. For more information, contact *HAL Communications Corp., Box 365, Urbana IL 61801*. Reader Service number 477. ■

FRG-7700 *from page 30*

sufficient to fire the imagination of all but the most jaded ham or SWL. Separate terminals are provided for shortwave and medium-wave antennas, as well an an SO-239 connector for shortwave antennas fed with 50-Ohm coaxial cable. Unfortunately, the shortwave and medium-wave antennas cannot be connected at the same time, so you have to mess around behind the rig every time you want to do a bit of broadcast-band DXing. Not to be neglected is the mute terminal, allowing the rig to be used easily with a transmitter.

Relay outputs from the clock are provided in phono-jack form, one with normally-open contacts, the other with normally-closed. Timer control of a tape recorder is a snap, banishing the usual kludge of control wires and relays forever. A DIN-plug accessory socket allows access to agc voltage, ground, mute output, and 11 V dc. There are no suggestions for the use of this socket in the instruction manual, but you can surmise that it might be used with an accessory preamp or converter. The receiver is equipped with a hefty three-wire line cord, and travelers will appreciate the four-position ac voltage selector. It is with great sadness that I report the lack of a dc power input. A cursory examination of the schematic offers little hope for a simple mod to allow operation from a 12-V dc power source. If, like me, you dream of having a general-coverage receiver bouncing around beneath the dashboard of your automobile, you'll have to look elsewhere. The final two items of interest on the rear panel are the external speaker jack and a switched front-end attenuator.

In Use

The proof of the pudding is, of course, not what goes into the dish, but how well it fares on the table. The Yaesu FRG-7700 does very well, thank you! How such a radio turns out depends to a great extent on the design philosophy of its engineer(s), and whoever is responsible for this receiver generally made all the right decisions. For example, many general-coverage receivers are designed to be used with minimal antennas. When faced with a real antenna, they often manifest an embarrassing array of overload-related problems. Connected to the 30-foot length of wire supplied with the set, the 7700 performed far better than my Sony ICF-5900W, but it really comes into its own with a longwire or dipole attached. Sensitivity in the SSB mode is rated at 0.5 μV between 2 and 30 MHz, and operation gave no reason to question this figure.

The choice of three levels of AM selectivity is extremely helpful. When listening to strong stations like the BBC, the medium level seems just right. The narrow mode removes the various whistles and splatter that threaten to overcome weaker stations like Radio Cairo or Radio Free Grenada, but with a noticeable restriction of audio response. The wide mode was too wide for use in the shortwave spectrum, although domestic broadcast listeners should find it useful. Audio quality in general is good—a reasonable compromise between a desire for high fidelity and the need for intelligibility in a shortwave receiver. The tone control is of the high-cut variety, rolling off treble as it is turned counterclockwise.

For those hams who operate more phone than CW, the 7700 could serve as a very passable backup receiver. As mentioned earlier, a mute terminal is provided, allowing interface with most transmitters and transceivers. Four 1N60 diodes are used as a diode-ring product detector for SSB and CW demodulation. True, its 2.7-kHz selectivity in these modes will keep the 7700 from endangering sales of anyone's ham-bands-only equipment, but it is nice to know that the 7700 can be pressed into service in an emergency. As expected from a synthesized receiver, mechanical and electronic frequency stability was excellent. Minor earthquakes should cause no instability in this radio, and radioteletype aficionados won't be frustrated by tones that mysteriously drift out of the passband of their demodulators.

Certainly the most unusual feature of the FRG-7700 is its memory option. At first, I had some qualms about an accessory that cost more than the entire receiver I used previous to the 7700's arrival, but after using it, the digital memory feature has proved to be extremely useful. I program the first six memories with shortwave broadcast stations that I listen to in the morning, and the other six with stations I like to hear at night. I am a confirmed BBC addict, so four of the 12 memories contain BBC frequencies, which allows me to instantly select the one that suffers the least interference and has the best path to my part of the country at any particular time. Broadcast DXers looking for a rare and hard-to-hear station might program a couple of frequencies where the station should appear, and check back frequently to see if it is readable. Best of all, these memories are retained if you unplug the radio to move it or the power fails, as long as you install three penlight cells in the holder accessed through a port in the bottom of the radio.

While the memory unit is an extremely useful accessory, it could stand some improvement. An annoyingly loud transient occurs whenever the Memory switch is rotated or the MR button is pushed. Moreover, alignment of the circuitry is rather critical—after using the receiver for a while, it no longer memorized the exact frequency I wanted. It would be either 100 Hz high or 100 Hz low. Resolution of the problem involves a simple adjustment inside the rig, but it would be nice if it weren't necessary at all. Even with these shortcomings, the digital memory option is an extremely useful feature, and for many it will

✓See List of Advertisers on page 114

be worth the extra cash demanded for it.

The noise blanker performed as expected, with time constants designed for suppression of ignition noise, rather than the woodpecker. The agc action was just right, without the extremely long hang times found on certain competitive receivers. The attenuator is a variable control with most of its action at the beginning of its travel. The control quickly arrives at an unusably high level of attenuation, and it would be nice to see the range of control expanded a bit, even if it does lessen the ultimate attenuation somewhat.

While it may be a small loss, the function of the analog dial is mostly cosmetic. It is easily knocked out of calibration while tuning and, consequently, is of questionable value. About the only use I could think up for it is keeping rough track of where the main dial is when the digital readout is displaying a memory frequency. Happily, the digital dial works beautifully, and when I use the 7700 as a clock radio, its warm brown glow doesn't keep me awake like some of the blue displays I have seen.

One little-known accessory that I find extremely useful is the FRT-7700 antenna tuner, designed specifically for use with the 7700 receiver. The 7700 is very sensitive to antenna impedance, and the tuner can peak up the signal from a mismatched antenna by several S-units. Unless you have cut a dipole for every band that you listen to, the tuner is good to have in-line. For those of us with overload problems, there is a zero-to-60-dB attenuator, and the separate 150-to-500-kHz antenna input has a two-section low-pass filter to reject shortwave broadcast signals. Beyond such practical considerations, the tuner is a very attractive box of parts, and its price tag is low enough to assuage any guilt over the slight self-indulgence.

If you frequently read the reviews in this magazine, you will know that we complain about the quality of a lot of the manuals that are provided with the ham equipment we see. Yaesu's manuals have been steadily improving and the one packed with the 7700 is excellent. The installation and use section is well written, and the novice ham or beginning shortwave listener will appreciate the section on the basics of radio propagation. Large foldout schematics are printed on heavy paper, and there are circuit descriptions, maintenance and alignment procedures, and a complete parts list.

Conclusion

The FRG-7700 is a receiver that I can easily recommend to anyone who is looking for a competent shortwave receiver for general use. It is as free from quirks and idiosyncrasies as one can hope for, comparing favorably with receivers that cost considerably more. For shortwave listening, broadcast DXing, and back-up use in the ham shack, this receiver is at the top of its class! For further information, contact *Yaesu Electronics Corp., 6851 Walthall Way, Paramount CA 90723.* Reader Service number 476.■

FCC

Reprinted from the Federal Register

Frequency Allocations and Radio Treaty Matters; Amateur Radio Service; Rules To Revise Power Limitations in a Specific Frequency Band

AGENCY: Federal Communications Commission.

ACTION: Final rule.

SUMMARY: This document amends the Commission's rules to revise power and geographic restrictions for amateur radio stations operating in the 1800–2000 kHz band. This action was taken to relieve unnecessary operation restrictions.

EFFECTIVE DATES: June 10, 1981.

ADDRESS: Federal Communications Commission, Washington, D.C. 20554.

FOR FURTHER INFORMATION CONTACT: Nancy A. Krieger, Private Radio Bureau, Washington, D.C. 20554, (202) 632-4964—Room 5202(H).

SUPPLEMENTARY INFORMATION:

Order

Adopted: May 21, 1981.
Released: June 1, 1981.

By the Commission: Chairman Fowler abstaining from voting; Commissioner Jones absent.

In the Matter of Amendment of Rule Sections 97.61(a) and (b)(2) of the amateur radio service rules to revise power limitations in the 1800–2000 kHz band; amendment of § 2.106, table of frequency allocations; FCC 81-251.

1. On July 17, 1980, the Commission received a *Request for Agency Action* from the American Radio Relay League, Inc. (ARRL). The ARRL, in its Request, asked the Commission to delete § 97.61 (b)(1) and (b)(2) of the Amateur Radio Service Rules by Issuance of an Order. The ARRL believes that such an Order would greatly benefit the Amateur Radio Service community by encouraging innovation and experimentation in the 1800–2000 kHz band (also known at the 160 meter band). Also, the ARRL states that these rule sections currently provide protection to long-range aid to radio navigation (LORAN-A) systems from amateur radio interference. Since LORAN-A is being terminated, the League feels there is no longer a need for § 97.61 (b)(1) and (b)(2). The Amateur Radio Service shares the 160 meter band on a secondary basis. § 97.61(b) places transmitter power and geographic restrictions on amateur radio operations in the 160 meter band to prevent interference to LORAN-A. The ARRL states that the Commission can amend its rules by Order because "Footnote NG15(b) . . . empowers the Commission to terminate the restrictions of Section 97.61 (b)(1) and (b)(2) . . . without the necessity of rulemaking or other procedural steps prescribed by the Administrative Procedures Act."

2. On November 26, 1980, the United States Coast Guard sent a Memorandum to the Secretary for the Interdepartment Radio Advisory Committee (IRAC) stating that the Coast Guard planned to cease LORAN-A operations in the United States by the end of 1980.

PART 2—FREQUENCY ALLOCATIONS AND TREATY MATTERS; GENERAL RULES AND REGULATIONS

Appendix

A. Part 2 of Chapter I of Title 47 of the Code of Federal Regulations is amended, as follows:

In Section 2.106, under the heading NG Footnotes, amend Footnote NG 15 subparagraph (a)(4) by the existing Table and adding the following Table:

§ 2.106 Table of frequency allocations.

* * * * *

NG Footnotes

* * * * *

NG 15 (a) * * *
(1) * * *
(2) * * *
(3) * * *
(4) * * *

State(s)	Maximum DC plate input power in watts (kilohertz)			
	1900 to 1925	1925 to 1950	1950 to 1975	1975 to 2000
	Day/night	Day/night	Day/night	Day/night
Maine, Massachusetts, New Hampshire, Rhode Island	100/25	0	0	100/25
Connecticut, Delaware, Maryland, New Jersey, New York, Pennsylvania, Vermont	200/50	0	0	200/50
Kentucky, North Carolina, Ohio, South Carolina, Tennessee, Virginia, West Virginia	500/100	0	0	500/100
Florida, Georgia, Illinois, Indiana, Michigan, Wisconsin	500/100	100/25	100/25	500/100
Alabama, Arkansas, Iowa, Minnesota, Mississippi, Missouri	1000/200	200/50	200/50	1000/200
The remainder of the States and territories	1000/200	1000/200	1000/200	1000/200

* * * * *

PART 97—AMATEUR RADIO SERVICE

B. Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended, as follows:

1. In Section 97.61 paragraph (a) is amended by removing the first line of the Table and replacing it with the following two lines:

§ 97.61 Authorized frequencies and emissions.

(a) * * *

Frequency band	Emissions	Limitations (see paragraph (b))
1800 to 1900	A1, A3	
1900 to 2000	A1, A3	1, 2

2. In Section 97.61 subparagraph (b)(2) is amended by removing the existing Table and replacing it with the following Table:

§ 97.61 Authorized frequencies and emissions.

* * * * *

(b) * * *
(1) * * *
(2) * * *

State(s)	Maximum DC plate input power in watts (kilohertz)			
	1900 to 1925	1925 to 1950	1950 to 1975	1975 to 2000
	Day/night	Day/night	Day/night	Day/night
Maine, Massachusetts, New Hampshire, Rhode Island	100/25	0	0	100/25
Connecticut, Delaware, Maryland, New Jersey, New York, Pennsylvania, Vermont	200/50	0	0	200/50
Kentucky, North Carolina, Ohio, South Carolina, Tennessee, Virginia, West Virginia	500/100	0	0	500/100
Florida, Georgia, Illinois, Indiana, Michigan, Wisconsin	500/100	100/25	100/25	500/100
Alabama, Arkansas, Iowa, Minnesota, Mississippi, Missouri	1000/200	200/50	200/50	1000/200
The remainder of the States and territories	1000/200	1000/200	1000/200	1000/200

However, LORAN-A operations by other countries may continue until December 31, 1982.[1] The Coast Guard recommended changes to Section 97.61 (b)(1) and (b)(2) of the Commission's Rules. The IRAC approved the Coast Guard plan and forwarded it to the Commission in December, 1980. The Commission can incorporate the Coast Guard recommendations for § 97.61(b)(2) into its Rules. However, we must retain Rule Section 97.61(b)(1) since protection should still be provided for LORAN-A stations operated by Canada.

3. Therefore, by this Order, Rule Section 97.61(a) is revised to reflect a reduction in the restrictions on amateur radio operation in the 160 meter band. Rule Section 97.61(b)(1) remains because amateur radio stations should not interfere with the remaining LORAN-A operations. The Table in Rule Section 97.61(b)(2) is revised to reflect the new power limitations for amateur radio operation in the 160 meter band. In addition, we are amending Rule Section 2.106, Table of Frequency Allocations, Footnote NG15(a)(4) to reflect the new power limitations for amateur radio operation in the 160 meter band.

4. The 1979 World Administrative Radio Conference (WARC) in Geneva, decided that Loran-A operations in the 160 meter band in Region 2 (the Americas) would terminate by December 31, 1982. It made an exclusive allocation to the amateur radio service at 1800-1850 kHz and a shared allocation to the service as one of five primary services at 1850-2000 kHz. However, the Final Acts of the Conference are not scheduled to become effective until January, 1982 for those countries who have ratified the treaty. Further, after the United States does ratify the treaty, public consultation may be necessary through the rulemaking process before specific provisions can be incorporated into the domestic Rules. Therefore, the rule amendments adopted in this Order may be effective only for a short interim period.[2] Consequently, Amateur radio operators are cautioned not to invest heavily in equipment which can only be used for this frequency band because there is no guarantee as to the final provisions for the Amateur Radio Service in the 160 meter band.

5. The specific rule amendments that we are adopting are set forth in the Appendix. Authority for the amendments is contained in Sections 4(i) and 303(r) of the Communications Act of 1934, as amended. We are dispensing with the prior notice and public procedures provisions of the Administrative Procedures Act as impracticable (see 5 U.S.C. 553(b)(3)(B) in view of the short period of time that these frequencies are likely to be available.

6. Accordingly, it is ordered effective June 10, 1981 that Parts 2 and 97 of the Commission's Rules are amended as set forth in the attached Appendix.

7. It is *further* ordered that this proceeding is terminated.

8. Information concerning these rule changes may be obtained from John B. Johnston, (202) 632-4964.

(Secs. 4, 303, 307, 48 Stat., as amended, 1066, 1082, 1083; 47 U.S.C. 154, 303, 307)

Federal Communications Commission.
William J. Tricarico,
Secretary.

[1] See discussion of results of 1979 World Administrative Radio Conference in paragraph 4.

[2] The First Notice of Inquiry in Docket No. 80-739, Implementation of the Final Acts of the World Administrative Radio Conference, proposed an exclusive allocation to the amateur service at 1800-1900 kHz and an exclusive allocation to the radiolocation service at 1800-2000 kHz, along with suppression of the footnote NG15.

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

It is hard to believe, but two years have passed since our initial announcement of the famous *73 Magazine* Awards Portfolio. During this period, we've seen the program grow significantly to become one of the most sought-after challenges facing amateurs today.

Consisting of six domestic incentives and five DX achievement programs, the awards portfolio has captured the interest of almost everyone on the bands, whether you are a rag chewer or a big-time contester.

In the paragraphs to follow, I am listing the awards individually. Read through the rules with caution. The requirements are not as easy as one might first imagine. We want our award recipients to realize they had to *earn* their recognition, and therefore have designed each award to be somewhat of a challenge. Here are the five DX awards.

73 DX COUNTRY CLUB AWARD

1. Sponsored by the editors of *73 Magazine*, the 73 DX Country Club Award is available to licensed amateurs throughout the world.

2. To be valid, all contacts claimed must be made in a *single calendar year* (January 1 through December 31), beginning January 1, 1979.

3. This award is issued for All Phone, All CW, and Mixed Modes. Should the applicant wish to recognize a single-band or mixed-band accomplishment, merely state your request when submitting your application.

4. To qualify for any of the 73 DX Country Club Awards, a minimum of 73 DX countries must be worked and confirmed from the *73 Magazine* WTW (Work the World) DX Listing which appears elsewhere in this column. Once again, all contacts must be made in the same calendar year for which application is made.

5. Annual endorsement stickers are available for each succeeding year in which application is made and showing a minimum of 73 countries worked.

6. To apply, prepare a list of claimed contacts in prefix order. Include each station's callsign, date and time in GMT, mode, and band of operation.

7. Do not send QSL cards! Have your list of contacts verified by two amateurs, a local club secretary, or by a notary public.

8. Award fee is $4.00 or 12 IRCs for each award. Endorsements are granted for a fee of $2.00 or 6 IRCs.

9. For All 73 award applications: Enclose your verified list and award fee(s) to: Bill Gosney KE7C, 73 Awards Editor, 2665 North Busby Road, Oak Harbor, Whidbey Island, Washington 98277 USA.

DX CAPITALS OF THE WORLD AWARD

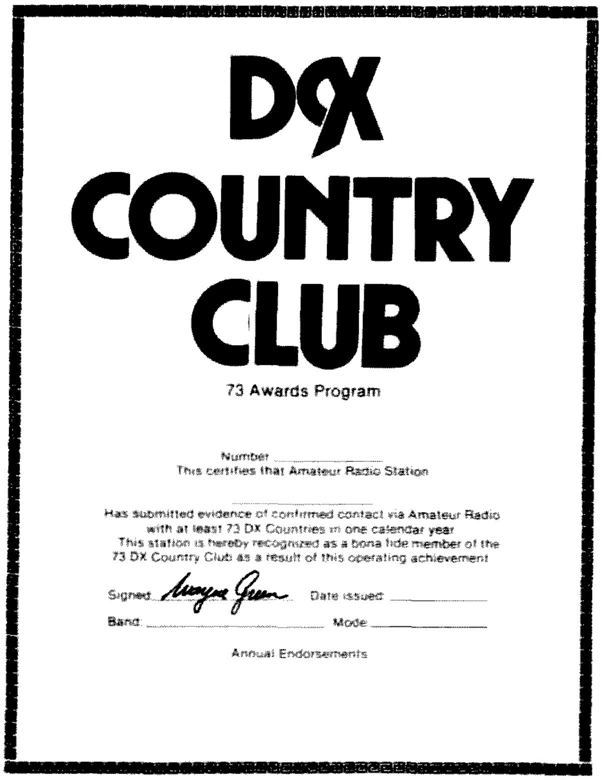
1. Sponsored by the editors of *73 Magazine*, the DX Capitals of the World Award is made available to licensed amateurs the world over.

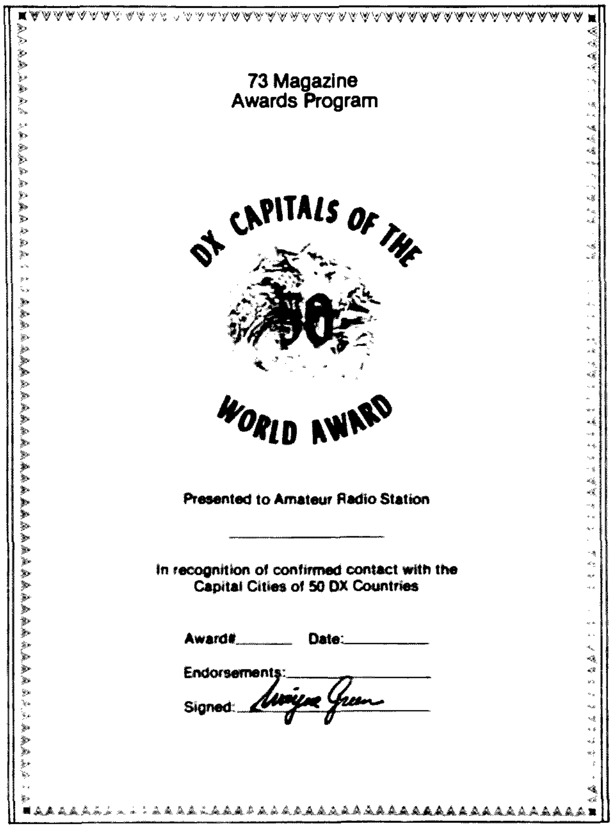
2. To be valid, all claimed contacts must be made on or after January 1, 1979. There are no band or mode restrictions, but special recognition will be given for single band or mode accomplishments if requested in the application.

3. To qualify, applicants must work and confirm fifty (50) different capital cities of the world. Only capitals of those countries which appear on the WTW DX Listing qualify. Should a country be contacted and its capital city is not commonly known, you may list it on your application and the awards editor reserves the right to make a final determination as to its acceptance for award credit.

4. To apply, make a list of contacts made in prefix order. Indicate the station callsign, date and time in GMT, band and mode of operation, the name of the capital city, and the DX country.

5. Do not send QSL cards! Have your list of contacts verified by two amateurs, a radio





club secretary, or a notary public. The award fee is $4.00 or 12 IRCs.

TEN-METER DX DECADE AWARD

1. Sponsored by the editors of *73 Magazine*, the Ten-Meter DX Decade Award is available to licensed amateurs worldwide.

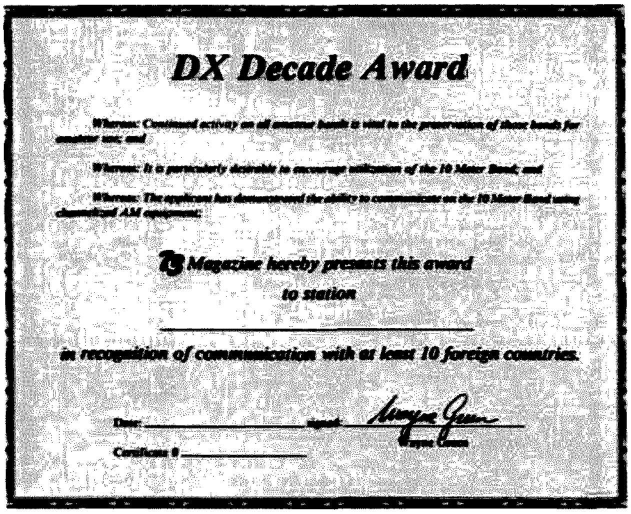
2. All contacts must be made on the 10-meter band using only channelized converted Citizen-Band equipment or similar type commercial units operating a maximum of 15-Watts PEP output. External amplifiers may not be used.

3. To be eligible for this award, all contacts must be made on or after October 1, 1978. Contacts may be claimed for all AM, SSB, CW, or FM. Mixed-mode accomplishments are not valid for this award.

4. To qualify, the applicant must work and confirm at least ten DX countries from the WTW (Work the World) Listing. Endorsements will be given for 25, 50, 75, and 100 countries confirmed.

5. To apply, make a list of contacts claimed, giving the callsign of each station worked in prefix order. Include the date and time in GMT, band, mode, and a brief description of the equipment used in making each contact. Special recognition will be given for QRP mobile achievements.

6. Do not send QSL cards! Have your list of contacts verified by two amateurs, a local radio club secretary, or by a notary public. The award fee is $4.00 or 12 IRCs.



SPECIALTY COMMUNICATIONS ACHIEVEMENT AWARD—CLASS A-1

1. Sponsored by the editors of *73 Magazine*, this award is dedicated to amateurs worldwide who take pride in active participation in the field of specialty communications.

2. To be eligible for this award, some very rigid requirements must be met. All contacts must be made on or after January 1, 1980. Only communications via SSTV, RTTY, EME (Earth-moon-Earth), and/or OSCAR will be recognized for award credit. Contacts between stations on OSCAR and EME may be made using any mode authorized in your country. Applicants must be cautioned, however, that mixed-mode contacts are not valid.

3. To qualify, applicants must work a minimum of 10 DX countries from the WTW DX Listing. Special recognition will be made for those exceeding the 10-country minimum.

4. To apply, the applicant must prepare a list of claimed contacts in callsign prefix order. Include the date and time in GMT, the band and mode of operation, and a signed declaration as to the type and description of equipment and antenna system utilized to make your contacts.

5. Do not send QSL cards! Have your list verified by two amateurs, a local club secretary, or a notary public.

6. The award fee is $4.00 or 12 IRCs.

SPECIALTY COMMUNICATIONS ACHIEVEMENT AWARD—CLASS A

A significant number of amateurs throughout the world find their primary interest in the operation and development of specialty-type communications. It is the efforts of these many pioneers in their respective fields which have created many state-of-the-art improvements in technology today. The editors of *73* wish to recognize those amateurs who make positive steps toward expanding the use of their respective mode or type of amateur operation. As a result, in the paragraphs to follow, learn of our latest communications award, dedicated to "communicator specialists."

To be eligible for the award, all contacts must be made on or after January 1, 1980. In addition, only communications via SSTV, RTTY, EME (Earth-moon-Earth) and/or OSCAR satellite will be recognized for this award. Contacts between stations on OSCAR or EME may be made using any authorized mode allowed in your country. Applicants are cautioned however, that mixed-mode contacts are not valid.

To qualify, applicants must work and confirm contact with each of the 50 US states. There

are no band requirements, but specific band accomplishments will be recognized if requested at the time of application.

To apply, applicant must prepare a list of claimed contacts in alphabetical order by state. Include the date and time in GMT, the band and mode of operation, and a signed declaration of the type and description of equipment and antenna system utilized.

Do not send QSL cards! Have your list verified by two amateurs, a local radio club, or a notary public. Enclose with your application a $4.00 award fee or 12 IRCs.

WORK THE WORLD DX AWARD

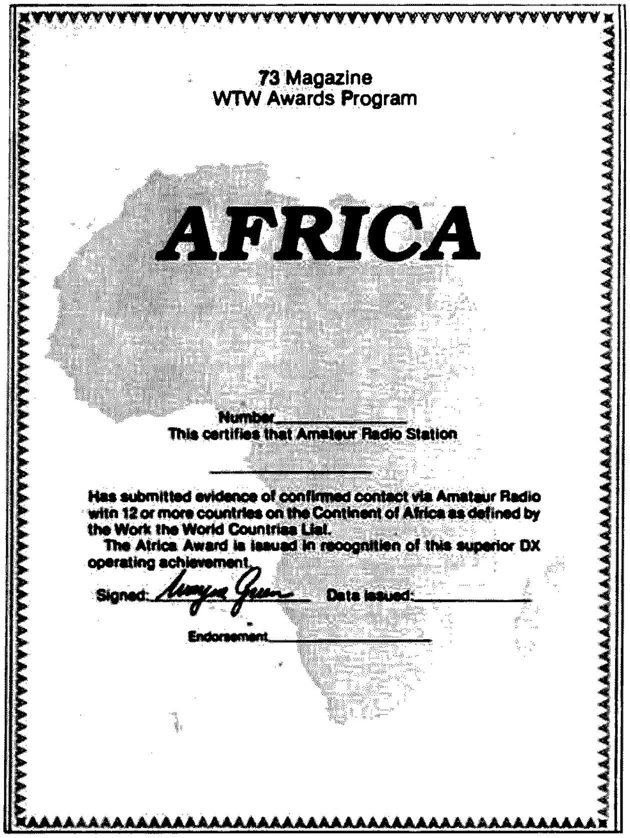
To enhance the enjoyment of working DX, the editors of *73 Magazine* take special pleasure in introducing the most complex and probably the most sought-after award in existence today—the Work the World DX Award.

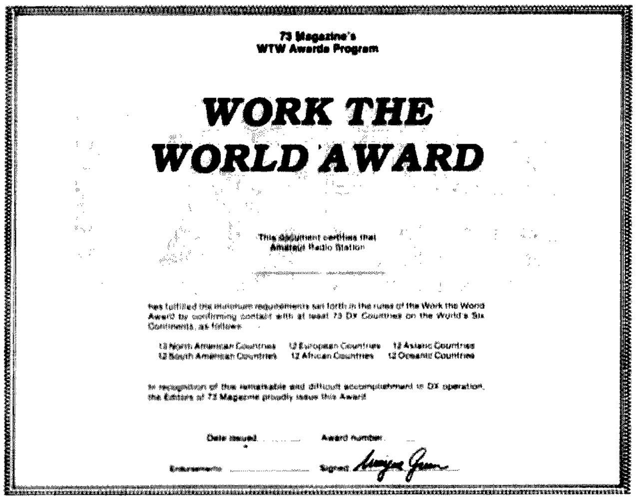
1. The WTW Award is available to licensed amateurs the world over.

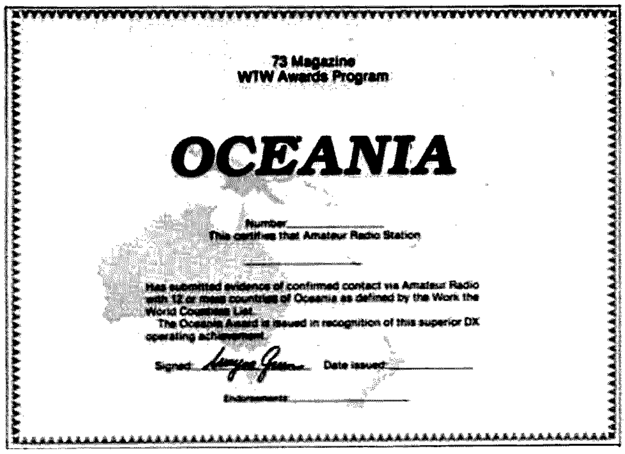
2. To be valid, all contacts must be made on or after January 1, 1979. There are no band or mode restrictions, but applicants will be given recognition for single-band or -mode achievements upon their request. Only DX countries shown on the WTW DX Listing qualify.

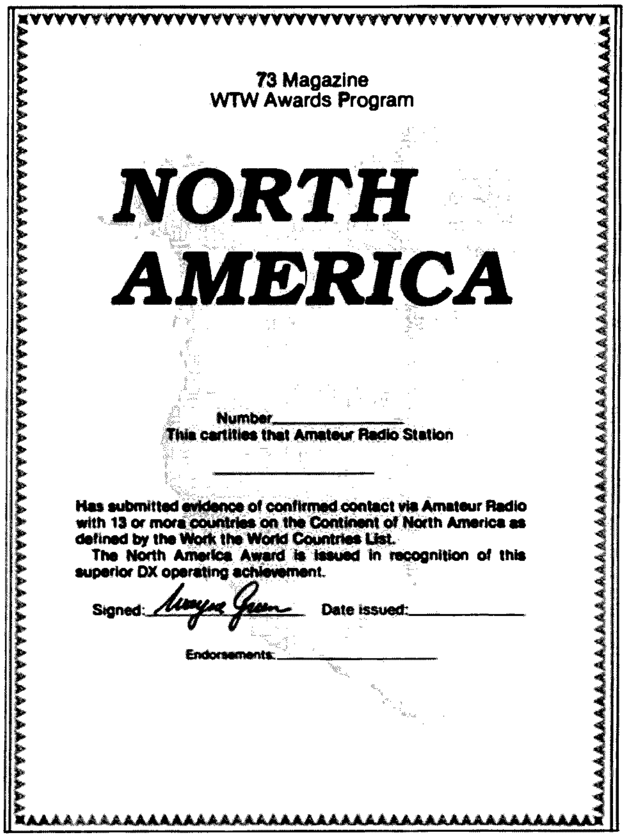
3. The Work the World program consists of six continental awards (North American, South American, European, Oceanic, Asian, and African), each of which is a worthy accomplishment on its own. Once application has been made for all six, the ultimate award, the Work the World DX Award, will be issued automatically without charge. The operator who earns WTW recognition has truly "worked the world."

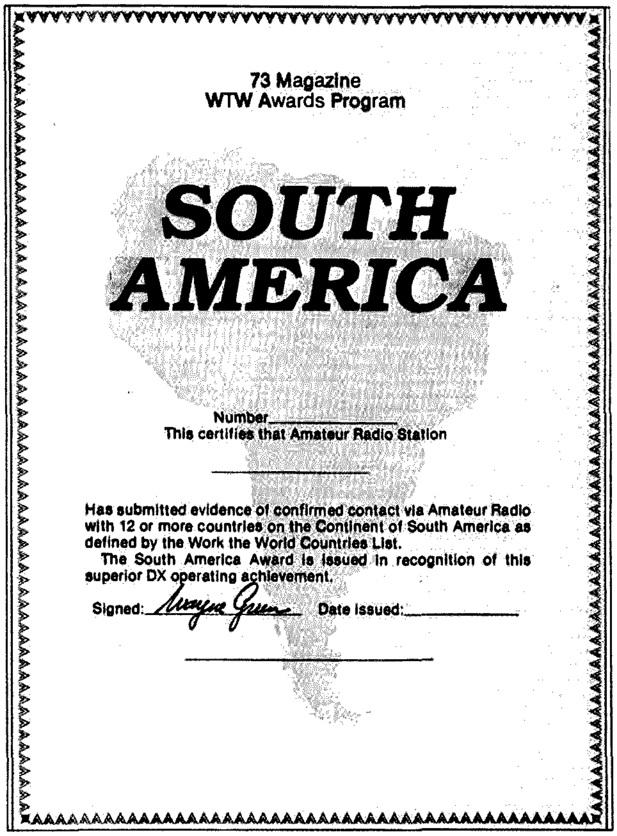
4. Requirements for the individual Continental awards: North American Award—work 13 North American countries; South American Award—work 12 South American countries; European Award—work 12 European countries; Oceanic Award—work 12 Oceanic countries; Asian Award—work 12 Asian countries; African Award—work 12 African countries.










73 Magazine
WTW Awards Program

SOUTH AMERICA

Number____________
This certifies that Amateur Radio Station

____

Has submitted evidence of confirmed contact via Amateur Radio with 12 or more countries on the Continent of South America as defined by the Work the World Countries List.
The South America Award is issued in recognition of this superior DX operating achievement.

Signed:____________ Date Issued:____________

5. To apply for any of these awards, prepare a list of claimed contacts for each continent, listing all callsigns in prefix order. Include date and time in GMT, and the band and mode of operation.

6. If you are submitting the sixth award application, please emphasize this fact to speed processing of your WTW Award.

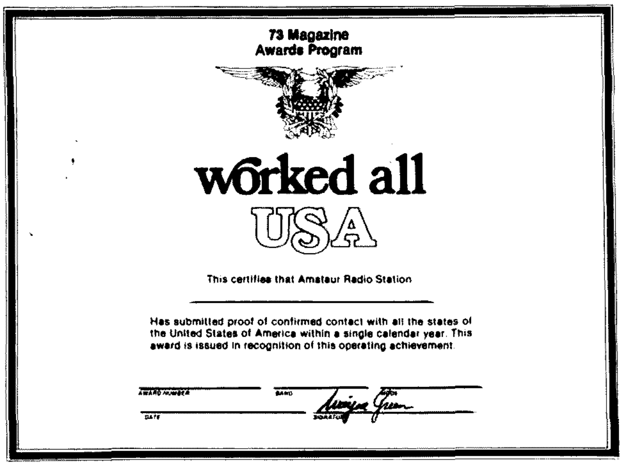
7. Do not send QSL cards! Have your list(s) verified by two amateurs, a radio club secretary, or by a notary public.

8. Each Continental Award has an award fee of $4.00 or 12 IRCs.

Now here are the six domestic awards, also being sought after by award seekers the world over. These awards were not meant to be an overnight venture nor were they designed to duplicate any in existence today. Each offers its own degree of difficulty and creates a sense of accomplishment in those who are happy recipients.

WORKED ALL USA AWARD

Sponsored by the editors of *73 Magazine*, the Worked All USA Award is available to licensed amateurs throughout the world. To be valid, all con-


73 Magazine
Awards Program

worked all USA

This certifies that Amateur Radio Station

Has submitted proof of confirmed contact with all the states of the United States of America within a single calendar year. This award is issued in recognition of this operating achievement.

tacts must be made on or after January 1, 1979. There are no band or mode restrictions, but single-band and single-mode accomplishments will be recognized.

If you're looking for an award with challenge, this definitely is one. To qualify, applicants must work *each of the 50 US states within the same calendar year* (January 1 through December 31). Annual endorsements will be awarded applicants who can verify their claim.

To apply, prepare a list of claimed contacts in alphabetical order by state, beginning with Alabama. List the state, the callsign of the station worked, the date and time in GMT, and the band and mode of operation.

Do not send QSL cards! Have your list of contacts verified by two amateurs, a local radio club secretary, or by a notary public.

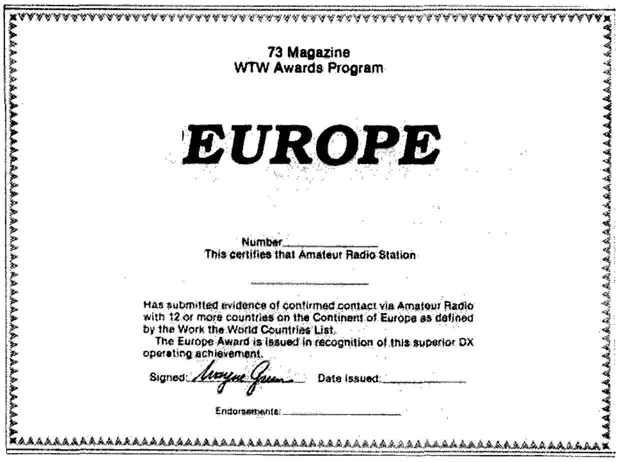
The fee for the basic award is $4.00 or 12 IRCs; endorsements are $2.00 or 6 IRCs.

The Worked All USA Award, with its 12-month limitation, separates the men from the boys! To date, only a few have mastered the 80-meter band, while 10, 15, and 20 have been more popular. Only a few applicants have mastered all states on 6 meters, and 160 meters has been conquered only once. Does your station have what it takes to Work All USA in a calendar year?

THE Q-5 AWARD OF EXCELLENCE

If you frequent the American Novice bands, you will be pleased to hear of an exclusive award for these bands. Sponsored by the editors of *73 Magazine*, the Q-5 Award of Excellence is available to amateurs worldwide who meet the requirements.

To be valid, all contacts must be made on or after January 1, 1979. All contacts must be made operating the CW mode on those frequencies assigned the American Novice. Applicants are cautioned that power limitations are 250 Watts input. There are no band restrictions, but applicants may request special band endorsement on the award


73 Magazine
WTW Awards Program

EUROPE

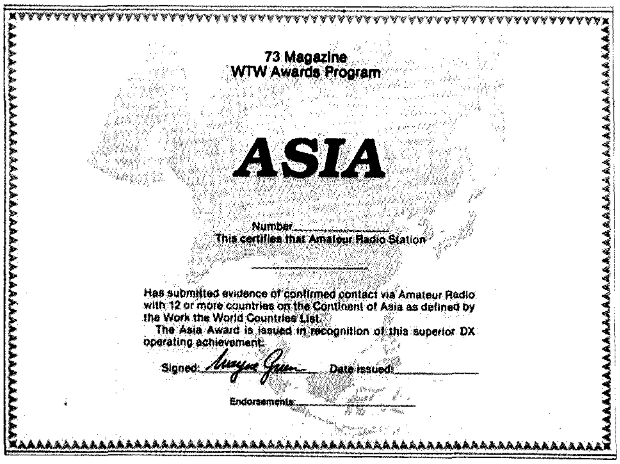
Number____________
This certifies that Amateur Radio Station

____

Has submitted evidence of confirmed contact via Amateur Radio with 12 or more countries on the Continent of Europe as defined by the Work the World Countries List.
The Europe Award is issued in recognition of this superior DX operating achievement.

Signed:____________ Date Issued:____________

Endorsements:____________


73 Magazine
WTW Awards Program

ASIA

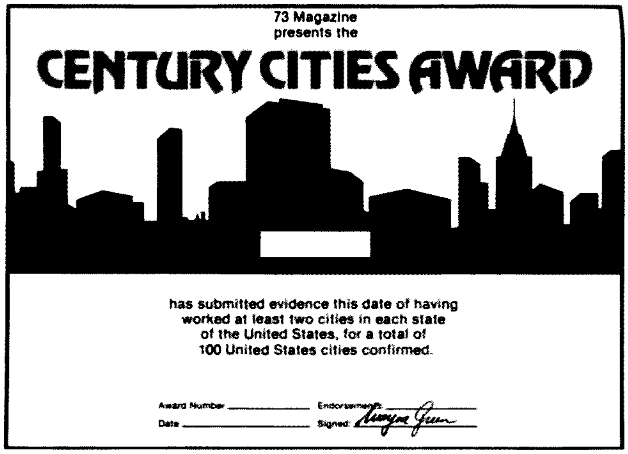
Number____________
This certifies that Amateur Radio Station

____

Has submitted evidence of confirmed contact via Amateur Radio with 12 or more countries on the Continent of Asia as defined by the Work the World Countries List.
The Asia Award is issued in recognition of this superior DX operating achievement.

Signed:____________ Date Issued:____________

Endorsements:____________



if the request is made at the time of application.

To qualify, applicants must work all ten US call districts and receive no less than a Q-5 report. A valid RST might be 559, 539, 579, etc., while an RST of 449, 349, or 479 would not qualify.

This award is not meant to be an overnight accomplishment. Stations meeting the challenge of these requirements will be proud to display this unique award depicting the excellence and superiority of the station's transmitted signal.

To apply, prepare a list of claimed contacts, logging each contact in order of the US call district. Include the station callsign, date and time in GMT, the frequency utilized, and, most important, the RST as noted on your confirmation card. Also required is a brief description of the station equipment and antenna system utilized to complete this award.

Do not send QSL cards! Have your list verified by two amateurs, a local radio club secretary, or a notary public. Enclose with your application the fee of $4.00 or 12 IRCs.

DISTRICT ENDURANCE AWARD

If any of our readers feel our awards are too soft for you, take a hard look at our next award! This one was designed to appear fairly simple at first glance, but it will drive you right up the wall with frustration as it is pursued. Known as the District Endurance Award, you'll need to find yourself an accurate timepiece, as you'll have exactly sixty (60) minutes to work all ten (10) US Call Districts! Simple, huh? Can you beat the best time to date—eight (8) minutes?

Sponsored by the *73 Magazine* editors, the District Endurance Award is offered licensed amateurs throughout the world. To be valid, all contacts must be made on or after January 1, 1979. There will be no band or mode restrictions, but if you are fortunate enough to work these requirements on a single band, we will be happy to recognize this feat when processing your award.

One of the most important rules applicable to this award is that all contacts must be made independent of nets, any net-type operation, or while any contest is underway.

To qualify, applicants must work all ten US call districts in one hour or less. The time will commence the moment the first contact is established and end with the time logged for the last district required.

To apply, applicants must prepare a signed declaration that all contacts were independent of net or contest operation. Applications must include a list of stations worked in callsign order by district, the date and time worked in GMT, the band and mode of operation, and the state.

Do not send QSL cards! Have your list of contacts verified by two amateurs, a local radio club secretary, or by a notary public. Accompanying your application should be a $4.00 award fee or 12 IRCs.

TEN-METER 10-40 AWARD

What would an awards program be like without a QRP incentive? With 10 meters at an all-time high, the editors of *73 Magazine* take pride in announcing the Ten-Meter 10-40 Award. Designed specifically for owners of converted Citizens-Band equipment, the Ten-Forty Award is probably the roughest worked-all-states award program in existence. Ask those who have tried numerous times and failed!

Available to licensed amateurs the world over, the award offers a challenge second to none. To be valid, all contacts must be made on the ten-meter band using only "channelized" Citizens-Band equipment or similar commercial units. Power is limited to 15-Watts PEP output. External amplifiers are prohibited.

To be eligible, all contacts must be made on or after October 1, 1978, on AM, SSB, CW, or FM modes. Mixed-mode contacts are not valid.

To qualify for this award, the applicant must work and confirm at least forty of the 50 US states. (An endorsement will be issued if all 50 states are worked.)

To apply, make a list of contacts in alphabetical order by US state beginning with Alabama. Include the call of the station worked, the date and time in GMT, the band and mode of operation, and a brief description of the equipment and antenna system utilized.

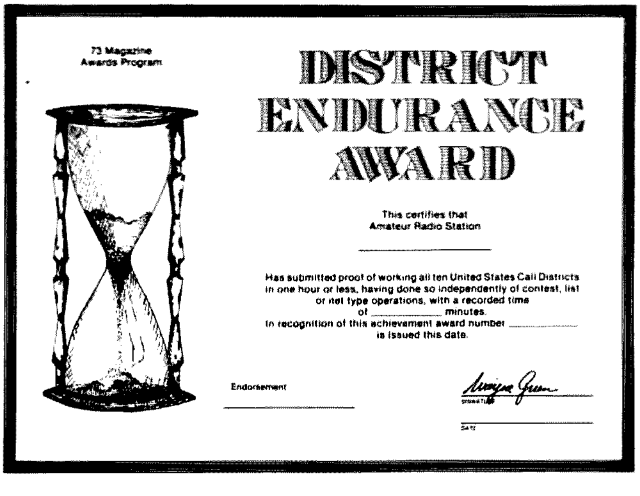
Do not send QSL cards! Have your list verified by two amateurs, a radio club secretary, or by a notary public. The award fee is $4.00 or 12 IRCs.

CENTURY CITIES AWARD

Designed as a Dual-Worked-All-USA effort, the editors present the Century Cities Award to the most demanding of amateur operators. The applicant who applies for this achievement realizes he has accomplished what is probably the greatest feat available in award programs today.

As with all *73*-sponsored awards (with the exception of the ten-meter incentives) all contacts must be made on or after January 1, 1979, to be valid.

To qualify, the applicant must work and confirm a minimum of two cities or towns in each of



the fifty US states, for a total of 100.

To apply, prepare a list of claimed contacts in alphabetical order, by state. As shown below, include the full callsign of the station worked, the date, the band, and the city. Beginning with Alabama, your list will look something like the following: Alabama—W4ZZZ, March 31, 1979, 14 MHz, Decatur; N4XXY, February 1, 1979, 21 MHz, Mobile; Alaska—KL7AB, January 22, 1979, 7 MHz, Anchorage; WL7WW, May 19, 1979, 28 MHz, Fairbanks; and so on.

Do not send QSL cards! Have your list of claimed contacts verified by two amateurs, a radio club secretary, or by a notary public. Enclose this list along with your award fee of $4.00 or 12 IRCs.

For applicants of the awards offered by *73 Magazine*: I would like to give you some insight on how we process the paperwork. Upon receipt of an application, each award requirement is carefully scrutinized to see that the applicant has met each one to the letter. If approved, an award work sheet is prepared. The original copy of this and applicable award fee is mailed to Peterborough NH for the *73* Art Department to process. It is there that your award is given a personal touch and later mailed to your door. A copy of the award work sheet is mailed to the applicant to acknowledge receipt of the application. (Should the applicant feel it necessary to follow up, he or she should write a letter to the Assistant Publisher, *73 Magazine*, Peterborough NH 03458. Writing directly to *73* headquarters will speed things up since the Awards Editor does

WTW DX LISTING

NORTH AMERICA

C6	Bahamas
CO	Cuba
FG	Guadoloupe
FG, FS	Saint Martin
FM	•Martinique
FO	Clipperton Is.
FP	St. Pierre & Miquelon
HH	Haiti
HI	Dominican Republic
J3, VP2G	Granada & Dependencies
KC4, KP1	Navassa Is.
KG4	Guantanamo Bay
KL7	Alaska
KP4	Desechao
KP4	Puerto Rico
KS4, KP3, HK0	Serrana Bank and Roncador Cay
KV, KP2	Virgin Islands
OX, XP	Greenland
PJ5, 6	Saba Is.
VE	Canada
VE1	Sable Is.
VE1	St. Paul Is.
VO	Newfoundland, Labrador
VP2A	Antigua, Barbuda
VP2D	Dominica
VP2E	Anguilla
VP2K	St. Kitts
VP2L	St. Lucia
VP2M	Montserrat
VP2S	St. Vincent & Dependencies
VP2V	British Virgin Islands
VP5	Turks and Caicos Islands
VP9	Bermuda
W, K, N, A	United States of America
XE	Mexico
XF4	Revillagigedo Islands
ZF	Grand Cayman Islands
6Y	Jamaica
4U	HQ, United Nations
8P	Barbados

SOUTH AMERICA

CE	Chile
CE0A	Easter Is.
CE0X	San Felix
CE0Z	Juan Fernandez
CP	Bolivia
CX	Uruguay
FY	French Guiana
HC	Ecuador
HC8	Galapagos Is.
HK	Colombia
HK0	Bajo Nuevo
HK0	Malpelo Is.
HK0	San Andres & Providencia
HP	Panama
HR	Honduras
HR0	Swan Is.
KZ	Canal Zone
LU	Argentina
OA	Peru
PJ	Bonaire
PJ	Netherlands Antilles
PY	Brazil
PY0	Fernando de Noronha
PY0	St. Peter & St. Paul
PY0	Trinidade & Martim Vaz Is.
PZ	Surinam
TG	Guatemala
TI	Costa Rica
TI9	Cocos Is.
VP1	Belize
VP8	Falkland Is.
VP8, LU	South Georgia Is.
VP8, LU	South Orkney Is.
VP8, LU	South Sandwich Is.
VP8, LU	South Shetland Is.
VP8W	South Grahamland
YN	Nicaragua
YS	Salvador
YV	Venezuela
YV0	Aves Is.
ZP	Paraguay
8R	Guyana
9Y	Trinidad and Tobago

EUROPE

C3	Andorra
CT	Portugal
CT2	Azores
DA-DL	Federal Republic of Germany
DM, DT	German Democratic Republic
EA	Spain
EA6	Balearic Islands
EI	Republic of Ireland
EJ0	Aran Is.
F	France
FC	Corsica
G	England
GD	Isle of Man
GI	Northern Ireland
GJ, GC	Jersey
GM	Scotland
GM	Orkney Islands
GM	Shetland Islands
GU, GC	Guernsey
GW	Wales
HA	Hungary
HB	Switzerland
HB0	Liechtenstein
HV	Vatican
I	Italy
IC	Ischia
IA	Tuscan Archipelago
IS	Sardinia
IT	Sicily
JW	Bear Is.
JW	Svalbard Is.
JX	Jan Mayen
LA	Norway
LX	Luxembourg
LZ	Bulgaria
M1	San Marino
OE	Austria
OH	Finland
OH0	Aland Is.
OJ0	Market Reef
OK	Czechoslovakia
ON	Belgium
OY	Faeroe Islands
OZ	Denmark
PA	Netherlands
SM	Sweden
SP	Poland
SV	Greece
SV	Crete
SV	Dodecanese
SV	Mount Athos
TF	Iceland
UA, UK1, 3, 4, 6	European RSFSR
UA1, UK1	Franz Josef Land
UA2, UK2F	Kaliningradsk
UB, UK, UT, UY5	Ukraine
UC2, UK2	White RSFSR
UO5, UK5O	Moldavia
UP2, UK2B, P	Lithuania
UQ2, UK2G, Q	Latvia
UR2, UK2R, T	Estonia
YO	Romania
YU	Yugoslavia
ZA	Albania
ZB	Gibraltar
3A	Monaco
4U	ITU, Geneva
9A	(See M1)

ASIA

A4X	Oman Is.
A5	Bhutan
A6X	United Arab Emirates
A7X	Qatar
A9X	Bahrain
AP	Pakistan
BV	Taiwan
BY	China
CR9	Macao
EP	Iran
HL, HM	North Korea
HL, HM	South Korea
HS	Thailand
HZ, 7Z	Saudi Arabia
JA-JR	Japan
JR6, KA6	Okinawa (Ryukyu Is.)
JD, KA1	Ogasawara
JT	Mongolia
JY	Jordan
KA	US Military in Japan
OD	Lebanon
S2	Bangladesh
TA	Turkey
UA, UK, UV, UW9-0	Asiatic RSFSR
UD6, UK6C, D, K	Azerbaidzhan
UF6, UK6F, Q, O, V	Georgia
UG6, UK6G	Armenia
UH8, UK8H	Turkoman
UI8, UK8I	Uzbek
UJ8, UK8J, R	Tadzhik
UL7, UK7	Kazakh
UM8, UK8M, N	Kirghiz
VS6	Hong Kong
VS9K	Kamaran Is.
VU	India
VU7	Andaman & Nicobar
VU7	Laccadives
XU	Khmer Republic
XV	Vietnam
XW	Laos People's Dem. Rep.
XZ	Burma
YA	Afghanistan
YI	Iraq
YK	Syria
1S	Spratly
4S	Sri Lanka
4W	Yemen
4X, 4Z	Israel
5B4, ZC	Cyprus
7O	People's Dem. Rep. of Yemen
8Z4	Neutral Zone Saudi Arabia/Iraq
9H	Malta
9H4	Gozo & Comino
9K	Kuwait
9M2	West Malaysia
9M6	North Borneo
9M8	Sarawak
9N	Nepal
9V	Singapore
	Abu Ail, Jabal Attair

OCEANIA

A3	Tonga Republic
CR8	Portuguese Timor
C2	Republic of Nauru
DU	Philippines
FK	New Caledonia
FO	French Polynesia
FW	Wallis & Futuna Islands
H4, VR4	Solomon Islands
JD, KA1	Minami Torishima
JD, 7J1	Okino Torishima
KB, KH1	Baker, Howland, American Phoenix
KC6	Eastern Carolines
KC6	Western Carolines
KG6, KH2	Guam Island
KG6R	Rota
KG6S	Saipan
KG6T	Tinian
KH6	Hawaiian Islands
KH7	Kure Island
KJ, KH3	Johnston Island
KM, KH4	Midway Island
KP6, KH5K	Kingman Reef
KP6, KH5	Palmyra
KS6, KH8	American Samoa
KW, KH9	Wake Island
KX	Marshall Islands
P2	Papua, New Guinea
T2, VR9	Tuvalu Island
VK	Australia
VK	Lord Howe Island
VK9	Willis Island
VK9	Christmas Island
VK9	Keeling, Cocos Island
VK9	Mellish Reef
VK9	Norfolk Island
VK0	Macquarie Island
VR1	British Phoenix Islands
VR1	Gilbert Island
VR1	Ocean Island
VR3	Christmas Island
VR6	Pitcairn Island
VR7	Line Island, South and Central
VR8	(See T2)
VS5	Brunei
YB, YC, YD	Borneo
YB, YC, YD	Celebes
YB, YC, YD	Java
YB, YC, YD	Sumatra
YB, YC, YD	West Irian
YJ	New Hebrides
ZK1	North Cook Island
ZK1	South Cook Island
ZK2	Niue Island
ZL	New Zealand
ZL	Auckland & Campbell
ZL	Chatham Island
ZL	Kermadec
ZM7	Tokelaus
3D2	Fiji Islands
5W	Western Samoa

AFRICA

A2	Botswana
C5	Gambia
C9	Mozambique
CN	Morocco
CN2	Tangier
CR3	Guinea Bissau
CT3	Madeira Is.
D2, 3	Angola
D4	Republic of Cape Verde
D6	Comoros
EA8	Canary Islands
EA9	Ceuta and Melilla
EA9	Ifni
EA9	Rio de Oro
EL	Liberia
ET2	Eritrea
ET3	Ethiopia
FB8W	Crozet
FB8X	Kerguelen Is.
FB8Z	Amsterdam & St. Paul
FH	Mayotte
FR	Glorioso Island
FR	Juan de Nova, Europa
FR	Reunion
FR	Tromelin
H5	Bophuthatswana
IG	Lampedusa Island
IH	Pantelleria Island
J2, FL8	Djibouti
S7	Seychelles
S8	Transkai
S9	Sao Tome and Principe
ST	Sudan
ST0	South Sudan
SU	Egypt
TJ	Cameroon
TL	Central African Empire
TN	Congo
TR	Gabon
TT	Chad
TU	Ivory Coast
TY	Benin
TZ	Mali
VK0	Heard Island
VQ9	Aldabra Island
VQ9	Chagos (Diego Garcia)
VQ9	Desroches
VQ9	Farquhar
XT	Upper Volta
ZD7	St. Helena
ZD8	Ascension Island
ZD9	Gough Island and Tristan da Cunha
ZE	Rhodesia
ZS1, 2, 4, 6	South Africa
ZS2	Prince Edward Island
ZS2	Marion Island
ZS3	Southwest Africa (Namibia)
3B6, 7	Agalega & St. Brandon
3B8	Mauritius
3B9	Rodriguez Island
3C	Equatorial Guinea
3D6	Swaziland
3V	Tunisia
3X	Republic of Guinea
3Y	Bouvet Island
5A	Libya
5H	Tanzania
5N	Nigeria
5R	Malagasy Republic
5T	Mauritania
5U	Niger
5V	Togo
5X	Uganda
5Z	Kenya
6O	Somali
6W	Senegal
7P	Lesotho
7Q	Malawi
7X	Algeria
8Q, VS9	Maldive Islands
9G	Ghana
9J	Zambia
9L	Sierra Leone
9Q	Republic of Zaire
9U	Burundi
9X	Rwanda

not retain your paperwork once the request for Issuance is mailed.)

We hope you enjoy the challenges of the *73* Awards Program and will share its rules with your amateur friends. While we hope you all will pursue the objectives these awards have to offer, we also hope you will send any information you might have on other award programs which have never appeared between the covers of this magazine. Looking through my files, I see where we have gone many many months without duplicating information on a single award. Our files are getting bare, however, and it is the input of readers that keeps the image of this column original and creative. If your club has an award it sponsors, why not share it with our thousands of readers?

JERSEY DEVIL STATION W2JUG TO OPERATE HALLOWEEN

The West Jersey Radio Amateurs (WJRA) will man a special operation from the South Jersey Pine Barrens, the haunt of the feared Jersey Devil. Beginning and ending at midnight, the courageous WJRA group will attempt to operate the entire 24 hours of Halloween, October 31st. A certificate engraved with a countenance of the Jersey Devil will be sent to all stations worked who send an SASE to WJRA, PO Box 62, Burlington NJ 08016. Frequencies to be used are 15 kHz from the bottom of each General phone band, 80 through 2 meters. Novice operation also will be 15 kHz up.

The Jersey Devil was born in 1735, a 13th child, in a place called Leeds Point. Not long after its birth, on a foggy and dreary night so usual in the Pine Barrens, the child assumed a serpent-like body, cloven hoofs, the head of a horse, wings of a bat, and the forked tail of a dragon. With loud, raucous cries, it flew up the chimney and into the heart of the Pinelands. Appearances and sightings occur even today. On Halloween, the WJRA will maintain a radio vigil, trying to capture a glimpse of the Devil. Will they see him? Give them a call (W2JUG) and get a first-hand report. (Oh, yes. If the answer is a loud, raucous, cry...) If you have any questions, call (609)-386-5906 or write Frank Huminski K2SQS, 307 Monroe Street, Edgewater Park NJ 08010.

CEDAR ISLAND DXPEDITION

The McHenry County Wireless Association announces a DXpedition to Cedar Island for September 19 and 20, 1981. No ham radio activity has ever taken place from this island in Pistakee Lake, McHenry County, Illinois. The call used will be KB9I, with expected frequencies of 21365 and/or 7265.

WARWICK RI 50th

On September 12th and 13th, the Warwick Amateur Radio operators are sponsoring a special event. The City Of Warwick, Rhode Island, will be celebrating its 50th anniversary. To commemorate this event, any amateur contacting a participating Warwick amateur will be awarded a certificate signed by the mayor of the city. QSL information: mail with three first-class stamps to Pat Mancini K1COI, 11 Amherst Dr., Warwick RI 02889.

GMT times: 1300Z to 2200Z September 12 and 13. Frequencies: Phone—28750, 21380, 14300, 7275,and 3950; Novice—21175, and 7125; CW—28075, 21075, 14075, 7075, and 3575. For further information, contact Robert A. Weigner KB1C, 61 Kirby Ave., Warwick RI 02889, (401)-738-2021.

OMAR BRADLEY

The Tri-County ARC of north-central Missouri is planning a special-events station from Clark, Missouri, birthplace of the late five-star General, Omar N. Bradley, from 10 am to 6 pm on Labor Day, September 7, 1981. Anyone contacting the special-events station will receive a commemorative certificate honoring General Bradley. Operation will be in the general portion of 40, 20, and 15 meters. Send QSL with SASE to Tri-County ARC, 601 McKinley, Moberly MO 65270

RR SESQUICENTENNIAL

The Schenectady Amateur Radio Association will operate a special-event station, K2AE, to commemorate the sesquicentennial (150th) anniversary of the opening of the Mohawk & Hudson Railroad. The railroad was the first to operate in New York State, the first to operate north of the Mason-Dixon line, and the third to run in the United States. Listen for K2AE the weekend of September 26 from 1600Z Saturday to 1700Z Sunday on the following frequencies plus or minus QRM: 7235, 14285, and 21360. Amateurs who work K2AE and desire a QSL card showing a likeness of the historic train should send an SASE to K2AE.

FORD MUSEUM

America's newest Presidential museum, the Gerald R. Ford Museum, will be dedicated this September in Grand Rapids, Michigan, during a week-long celebration that also will call attention to the multimillion dollar revitalization of the city's downtown area.

To commemorate the event, the Woodland Amateur Radio Club is planning to establish a radio station at one of the main locations of the celebration, operating under the callsign of W8FM. Amateur operators who contact W8FM during the celebration will receive a certificate with the official Ford Museum Dedication seal and Gerald R. Ford's signature. Operations will be on September 17 and 18 from 1600 to 0000 UTC. On September 19, the station will operate from 1300 to 0100 UTC. Plans call for operation on frequencies on or near 28.650, 21.410, and 14.310 MHz.

To receive one of these certificates, send a QSL card to W8FM, Post Office Box 6102, Station C, Grand Rapids MI 49506. Do not send IRCs or self-addressed envelopes.

K2BSA

Those who worked K2BSA/4 from the 1981 National Scout Jamboree and wish a special commemorative QSL should QSL with a business-sized SASE to K2BSA/4 Jamboree, c/o ARRL, 225 Main St., Newington, CT 06111.

FUN!

John Edwards KI2U
78-56 86th Street
Glendale NY 11385

CB RADIO

Citizens Band and amateur radio have had a curious relationship over the years. Like two rival siblings, they vie with each other for Daddy FCC's affection.

Amateurs are like the brother who went to college. Hams are worldly, cultivated—with all the latest conveniences at their disposal. CBers, however, have the tough life. They've garnered the reputation of the black-sheep brother who hangs around the local bar, caging drinks from fellow barflies.

A CBer is opinionated and crass—rough on the ears—but never pretending to be something he isn't. There's no mistaking where he's from. He's a dope, and you know it. Hams, on the other hand, put on airs. Many are educated dopes, but they try to cover it.

Actually, it's not a case of who is better. Hams and CBers are dif-

ferent, the use of radios being our only family tie. There's been a long-felt animosity between members of the two camps, but when you consider that many hams are CBers (and in some cases vice versa), it's a peculiar enmity. As we said, it's like a sibling rivalry.

Acknowledging our "brotherly" relationship, this month's FUN! salutes CB.

ELEMENT 1—CROSSWORD PUZZLE
(Illustration 1)

Across

1) CB frequency slots
5) Good CW can be a work of this
8) Never satisfied DXer wants...
11) What the ARRL does to CBers
12) Plenty of this on CB channels
13) Never say this
14) A logic (abbr.)
16) One who spends $5,000 on CB gear
17) CBer's personal "ball"
18) California city (abbr.)
19) Data transmission (abbr.)
20) New GMT (abbr.)
22) Soggy reaction of dealers stuck with 23-channel rigs
23) What we all call the FCC monitor
24) Symbol: aluminum
25) _____ and feather jammers (abbr.)
27) Old amateur Industry group (abbr.)
29) What this is all about (abbr.)
31) Sidewinder's mode (abbr.)
32) FCC never has to say this
33) Atomic (abbr.)
34) Popular rig prefix
35) CBer's signal verification (2 words)

Down

1) CB cretins
2) Old Advanced hams
3) FCC _____ pressure on all
4) Mentioned
6) Original number of CB channels
7) Lids
9) Fellow ham (abbr.)
10) Decay
15) Below MF (abbr.)
19) Affectionate DX ham expression (abbr.)
21) "Regular" CB
22) R/C CB
24) Most popular CB mode (abbr.)
26) Light beam
28) Radio bearing (abbr.)
29) Usual CB mobile
30) Morse double-dash
34) Time-out (abbr.)

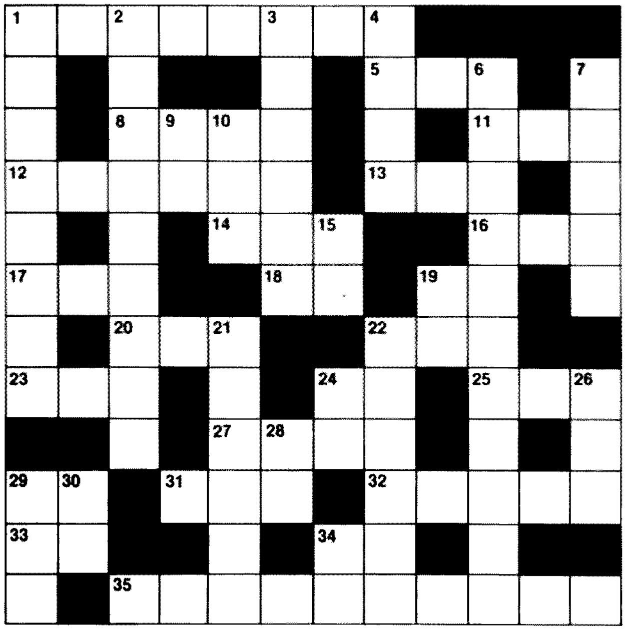


Illustration 1.

ELEMENT 2—MULTIPLE CHOICE

1) How many CBers were active in 1959?
 1) 3,000
 2) 6,000
 3) 50,000
 4) 250,000

2) What famous World War II tank commander used 11 meters to coordinate his maneuvers?
 1) Patton
 2) Rommel
 3) Montgomery
 4) Swirsky

3) What FCC commissioner first proposed the idea of CB radio in a *Saturday Evening Post* article entitled, "Phone Me By the Air"?
 1) Herbert Hoover
 2) Charles Ferris
 3) E. K. Jett
 4) Arnold Jackson

4) In an incredible plan designed to ruin CB, in 1969 the FCC decided to raise CB license fees from $8 to a ridiculously high level. How much did the "new" CB ticket cost?
 1) $10
 2) $15
 3) $20
 4) $50

5) In 1948, the FCC authorized the Firestone Tire and Rubber Company to conduct the first commercial tests using small, three-Watt transceivers on what is now channel 23. What was the first CB callsign issued by the FCC to Firestone?
 1) KBX-8669
 2) KAA-0001
 3) W10XXD
 4) W2XR

ELEMENT 3—MATCHING

Remember CB slang? Sure you do, and if you have an IQ larger than your hat size, you hated it. Nevertheless, the media loved it, and for about 12 minutes this "language" was worked into all types of movies, TV shows, and country music records.

Now, CB slang has been dumped into that great nostalgia warehouse up in the sky, up there with Davy Crockett hats, hula-hoops, and disco leisure suits. But FUN! never forgets. So slip your brain into neutral for a moment and try to match the CB slang listed below with its correct meaning.

Column A	*Column B*
1) Smokey	A) Small car
2) Invitation	B) Slippery road
3) Cotton picker	C) Motel
4) Tijuana taxi	D) Police ticket
5) Bottle popper	E) FCC license
6) Rollerskate	F) Highway cloverleaf
7) Twister	G) Police officer
8) Nap trap	H) Beer truck
9) Skating rink	I) Reckless driver
10) Harvey Wallbanger	J) Police car
	K) An expletive

ELEMENT 4—FILL IN THE BLANK

1) CB rules and regulations are detailed in FCC Part _____.
2) The frequency tolerance for a CB transmitter is _____%.
3) Up until about 10 years ago, units of the same station could use all 23 channels, but station-to-station contacts could only take place on ____ different channels.
4) __________ was the organizer of the "Save 11" campaign.
5) Application for a CB license is made on FCC Form _____.
6) CB beams are ________ polarized.
7) A full-length CB mobile antenna is _______ Inches long.
8) _______ Watts PEP is the maximum SSB CB power.

9) Ham radio _____ still occupy 11 meters In Australia.
10) The Radio Emergency Associated Citizens Team is better known as _________.

ELEMENT 5—HAM ACROSTIC

Guess the words defined and write them over the numbered dashes. Next, place each letter in the correct square in the puzzle. The black squares show word endings. The completed puzzle will form a statement relating to this month's topic.
(illustration 2)

A) CBer's "code"................. ___ ___ ___ (30 52 41)
B) 27.605 MHz..................... ___ ___ ___ ___ (15 8 39 3)
C) Disgust........................ ___ ___ ___ (7 48 18)
D) Class of commercial license needed to repair CBs............ ___ ___ ___ ___ ___ ___ (29 34 5 31 38 17)
E) Present number of channels..... ___ ___ ___ ___ ___ (47 12 28 56 51)
F) Slang for transceiver............ ___ ___ ___ (9 40 54)
G) 10-90............................ ___ ___ ___ (11 21 37)
H) "CBers" above channel 40....... ___ ___ ___ ___ ___ (2 49 27 35 10)
I) "Highway Emergency Locating Plan".......................... ___ ___ ___ ___ (55 44 19 13)
J) Band for converted CBs.......... ___ ___ ___ (1 42 46)
K) Broadcast network............... ___ ___ ___ (32 33 36)
L) Designs rigs..................... ___ ___ (25 45)
M) Tower anchor material........... ___ ___ ___ ___ ___ ___ (6 16 24 14 23 43)
N) Transistor type.................. ___ ___ ___ (4 20 26)
O) Cable bundle joiner.............. ___ ___ ___ (50 53 22)

FUN! MAILBOX

I've been in radio since 1963 using CW, AM, FM, and RTTY—all in the military. I finally came into ham radio as my interests are all leaning that way. I suspect you lean too far towards the Green way of thinking. Why? Employer-employee relationship? Ego? We have too many inflated egos on the air also. The above is my opinion and I also respect yours. Tnx. P.S. How long you been a member of the ARRL? You seem to have lots to say about that, too. I think your April column stank—cheap shot. Why?

Robert E. Cregar WD8NKT
Bay City MI

I've been a League member since the first year I became a ham, and I'm too poor to afford expensive shots.—JE

C	H	A	N	N	E	L	S	■	■	■	■
H	■	A	■	■	X	■	A	R	T	■	L
U	■	M	O	R	E	■	I	■	W	O	O
C	L	A	M	O	R	■	D	I	E	■	U
K	■	T	■	T	T	L	■	■	N	U	T
E	Y	E	■	■	S	F	■	D	T	■	S
R	■	U	T	C	■	■	C	R	Y	■	■
S	I	R	■	L	■	A	L	■	T	A	R
■	■	S	■	A	R	M	A	■	H	■	A
C	B	■	S	S	B	■	S	O	R	R	Y
A	T	■	■	S	■	T	S	■	E	■	■
R	■	R	A	D	I	O	C	H	E	C	K

Illustration 1A.

■	■	1 J	2 H	3 B	■	4 N	5 D	6 M	■	7 C	8 B	9 F	10 H
11 G	■	12 E	13 I	14 M	15 B	16 M	17 D	■	18 C	19 I	20 N	21 G	22 O
23 M	■	24 M	25 L	26 N	27 H	28 E	29 D	■	30 A	31 D	■	32 K	33 K
34 D	35 H	36 K	■	37 G	38 D	■	39 B	40 F	41 A	42 J	43 M	44 I	45 L
46 J	■	47 E	48 C	49 H	50 O	51 E	■	52 A	53 O	54 F	55 I	56 E	■

Illustration 2.

THE ANSWERS

Element 1:
See illustration 1A.

Element 2:
1-2 Vacant territory.
2-2 During World War II, a Rhode Island amateur heard some strange transmissions on what is now channel 14. After contacting the FCC, it was determined that the transmissions were coming from Field Marshal Erwin Rommel commanding his Afrika Korps. The information was passed to British and U.S. forces and later played a significant role in Rommel's defeat. Thus, Rommel may have been the first man snagged by the FCC for working skip.
3-3 It sounded like a great idea in July, 1945. But, then, America had just won a world war; who could have predicted that the FCC wouldn't be able to regulate a bunch of low-powered radios?
4-3 If you make licenses expensive, people won't get them; hence, no CBers. With logic like that...
5-3 The first of many.

Element 3:
1—G, 2—D, 3—K, 4—J, 5—H, 6—A, 7—F, 8—C, 9—B, 10—I.

Element 4:
1—95, 2—.005, 3—7, 4—Wayne Green, 5—505, 6—vertically, 7—108 including spring, 102 without, 8—12, 9—does, 10—REACT.

Element 5:
See illustration 2A.

SCORING

Element 1:
Twenty points for the complete puzzle, or 1/2 point for each question correctly answered.

Element 2:
Four points for each correct answer.

Element 3:
Each slang word correctly matched nets you two points.

Element 4:
Two points for each blank filled.

Element 5:
Two points for each correct answer. Give yourself 20 extra points if you unscrambled the message.

Rate yourself:

1-20 points—No buddy
21-40 points—Poor buddy
41-60 points—Fair buddy
61-80 points—Good buddy
81-100+ points—Great buddy

■	■	T	H	E	■	F	C	C	■	F	I	R	S
T	■	O	P	E	N	E	D	■	E	L	E	V	E
N	■	M	E	T	E	R	S	■	T	O	■	C	B
E	R	S	■	I	N	■	N	I	N	E	T	E	E
N	■	F	I	F	T	Y	■	E	I	G	H	T	■

Illustration 2A.

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 8

they were not speeding, but were victims of interference to the police radar unit.

My first response is to suggest that perhaps it is about time to invest in a radar detector so that in the future they will know when a police radar unit is in the area and stop transmitting until safely out of radar range. The modern superheterodyne models will give you more than adequate warning to get *off the air.* I'm using both the Escort from Cincinnati Microwave and the Whistler Q-1000 with success. I've been promised test models from other firms, so I may be able to add to that list. The $245 for the Escort is cheap enough insurance when you consider the trauma of the ticket and court appearance. Further, beating a ticket is tough, even when you are completely innocent, so you have insurance increases to look forward to as well.

If you are interested in fighting a ticket, you might want to contact Electrolert, the makers of the Fuzzbuster. They sell legal kits which will help both you and your lawyer through the situation. Fuzzbuster, incidentally, at long last has a superhet receiver available...though I have not yet tested it. Electrolert, 4949 South 25A, Troy OH 45373. Phone (513)-667-2461.

A recent release from Electrolert explained about a franchise of legal firms called The Ticket Clinic. This started in Lubbock, Texas, and is spreading around the country. For $45 you can have your ticket defended by experts...with an 80% success rate. This is a great development.

Cincinnati Microwave was started by some hams who had worked at Drake. I like their unit because I've found none that works better...at any price... and it has an S-meter, which tells me just how close the radar really is. This also helps separate the 10-GHz security systems from the police radar units, once you get the hang of it. These can be a nuisance, but they are also comforting in that you get used to their locations and they let you know your detector is working right. Cincinnati can be reached at (513)-772-3700. They sell direct only, not through stores. Tell 'em Wayne sent you. They know me. As a ham and *73* reader, you might just get a receiver which is extra hot.

DXCC PROBLEMS

The massive forging of QSL cards for DXCC, an industry located, naturally, in California (the land of entrepreneurs) gives us a lot of possibilities. My first reaction (knee-jerk) was that a group of amateurs had done a terrible thing. Imagine! Desecrating one of our most treasured idols, the DX Century Club, with a cheap plot to debase its virtue! Tsk.

But then the iconoclast in me began to emerge and I got to thinking about the other side of the coin. DXCC and the accompanying Honor Roll listings have brought about the building of a cult of several hundred hams who have, as a result, devoted their lives to working every country in the world. This, in turn, has made life absolutely miserable for new hams in rare spots, often driving them off the air in hours...permanently.

Though I've never felt the need for public recognition as a super DXer and thus have not ...at least in recent years... messed with the ARRL and their amusing award record-keeping system, I have enjoyed tackling the goal of working a lot of countries. After I moved to New Hampshire and discovered that I would have to start all over again...yoiks, my XU cards were no longer valid!...I went at it with relish. In the first week on the air, I passed the 100-country mark on 20m phone (my favorite). By the end of the first month, I had passed 200 countries, and I arrived at 300 before the end of the year. I stopped counting then.

I remember spending a whole weekend working 100 countries *on 20m*...just to prove that *it* could be done. Now I admit that not all of the contacts were meaningful (it was during a contest) but I managed it...and got the cards to prove it.

A few years ago, fed up with some of the ridiculous rules set up for DXCC credits, I started an award...Worked the World. This one used country lists from national ham organizations instead of from our own internal committee. Thus, if RSGB recognized an island as a country...it *was* a country by us. Ditto the DARC and all other recognized national groups. This went well until we began to notice some strange DX cards appearing in the bundles from a Texas ham. Hmm. Some of the cards were from rare stations I'd worked and they were *not* the regular cards. We looked into it and found that our Texan was working with a printer to make up special cards...all *for our* award. Sigh.

Okay, here's my idea. Since *73* has one of the largest QSL printeries in the country, why not come up with a *series of* special DX cards...one for each country of the world. Then, for a modest price, we could arrange to have these mailed to a DXer from each of those countries, all filled out with his call and a great signal report. We have subscribers in over 200 countries now, so we should be able to make arrangements from most countries. The rare ones would be more expensive because we would have to send someone out a couple times a year to make the mailings. Hey, how about *me for* that job...I love to travel. The cost of the cards would pay for the trip, just as it did for Don Miller. In fact, he bragged to several people that he was clearing over $50,000 a year...and that was back when $50,000 was worth a whole lot more than it is today.

Carpers who beef about the cards not being honest should face some brutal facts. Quite a lot of the cards I have...all acceptable for DXCC...are not honest. We don't really know where Miller was for many of his DXpeditions...we only know he wasn't anywhere near where he said he was. The cards are all okay by the ARRL...even my Spratley and Burma cards. I love it.

We can't seriously come down on Miller in this situation because he was just following in the footsteps of even more famous DXers, all of whom had left a trail of DX operations from places other than they claimed. I personally have had cards from at least 30 countries which are fraudulent, but they are acceptable to the DXCC team. No, I don't put a lot of stock in awards...or cards. As soon as you start an award, people will get right to work to cheat on it...so why not make the cheating part of the business and help people enjoy their cheating? That, obviously, is also a part of amateur radio...just like jamming.

I figure that a 100-country package of cards might go for $250. Cheap enough when you consider the saving in postage stamps, reply coupons, and aggravation. The 300-country package will have to cost a bit more...perhaps $1,000. After all, you don't want to have me stay in a cheap hotel in Rarotonga, do you? The biggo, #1 on the Honor Roll, means getting into places like Iraq to mail cards, so we'll have to research that one more. Would $3,000 be reasonable?

Specialized awards such as all on SSTV or RTTY would only cost a little extra...just enough to keep away the browsers and keep the award clean...just for the more serious hams. We could have a One-Watt Special Award *for 100* countries with only one Watt of power input...or should it be output? Mobile fans could have their own special awards. If you can pay, you can play...and have one of the most impressive ham shacks in town. Remember that the neighbors and family won't know any better...and the ARRL doesn't care. Our cards would all be legitimate, sent direct from the actual country...complete with postage stamp. The only thing lacking would be the contact.

Now of what real importance is a contact? You know as well as I that a DX station anywhere in the world can be worked if you hang in there. It's a matter of spending the time. If you want to be one of the first with the contact...thus giving you time to jam the hell out of the DX station

later to keep others from making the contact...you need high power and a good beam system. No, you can eventually make it even with low power, if the DX station stays on the air long enough. W2QHH proved that years ago with his massive awards collection...all worked with around 100 Watts. Howie is still listed in the *Callbook*, so I assume he is working on certificate number 8,000 by now.

We may just have something here. With this system of getting awards, we might encourage amateurs in rare countries to get on the air and make normal ham contacts instead of contest-type operation every time they appear. Further, we might eventually get rid of pileups. Suppose DX stations stopped QSLing direct, leaving that to us professionals? It would be much more efficient and would save them a fortune. No more "green QSLs" (five dollar bills), no more wasting days filling out cards just because a DX op wanted to get on the air for a few hours of fun. It has benefits for everyone.

There's no reason to just cover DXCC when there are many more awards to be achieved... WAC for $10, right? WAS for $50...an October special. WAE might run $100 since that is harder. WAZ won't be any less, calling for me to get up to Ulan Bator a couple times a year. Maybe $200 would be right for that one.

You all set?

NIAC TESTIMONY

In the July issue, I discussed briefly the National Industry Advisory Committee (NIAC) which has been set up to advise the FCC on amateur matters, with particular emphasis on emergency communications. I think you may be interested in part of my testimony before that committee, so I'll reprint it here verbatim.

With the change in administrations there may be an opportunity for NIAC to provide a valuable service to the amateur radio community, to the FCC, and perhaps in the long run, to our country. We amateurs have arrived at our present situation via a long and complex route, so I can't offer suggestions on ways to bring about what I feel are needed changes without laying the groundwork by tracing some of the events which brought us to where we are.

It does not take any keen perception to see that amateur radio is stagnant. Our growth is minimal. It has been over 10 years since the last major technology change: repeaters, FM. Our clubs are falling apart. Our manufacturers are failing, as are our ham dealers. Virtually all the technological advances in amateur equipment have been coming from Japan, such as synthesized transceivers and synthesized hand transceivers.

Speaking of technology, it is not only amateur equipment in which the Japanese are leading us. If you are familiar with virtually any other branch of electronics, you will find a similar situation. The innovative calculators, which I hear ringing around us, are all coming from Japan. Ditto the cassette and stereo equipment. I am sorry to say, though the U.S. originated the microcomputer industry only five years ago, Japan is already ahead of us in the design of these low-cost computers.

In many electronic fields, as I read the technical journals, I find that the U.S. is now having to import technology from Japan. There have been several articles on this subject, on the loss of our technical eminence, and they all bring up the lack of growth of engineers in our country over the last 20 years. With zero growth in engineers and presumably technicians since they go hand in hand, while there has been a virtual explosion of engineers and technicians in Japan, it is little wonder that there has been a shift in the frontiers of technology in electronics.

If we look back on our own history to see what conditions brought about our present situation, we see one event emerging very clearly.

During the late 1940s, after the war, and through the 1950s, amateur radio was growing at a steady rate of 11 percent a year. This was brought to a sudden halt in 1963 by two events, both of which involved the FCC. One was the four-dollar license fee, which I view primarily as an event which tended to weed out the inactive hams who had been keeping their licenses because they cost nothing. The second and far more catastrophic event was the so-called incentive licensing proposal. If the license fees had been the main culprit, we would have seen a temporary drop in licensees as the inactive hams dropped out. But our input of new hams would have remained constant, and we would soon have been back into a growth mode.

The fact is that it took 11 years before we again saw growth. Having been involved with the licensing proposal, I can testify as to the depths of the emotions it stirred. The prospect of losing virtually all phone privileges dismayed the 90 percent of the hams so threatened. And the prospects of having to go through to an Extra class license before much in the way of DX phone bands would be available turned away hundreds of thousands of prospective hams.

The eventual rules which took away only half of the phone bands instead of all of them did not help matters a lot. This denied the contacting of DX stations to a very high percentage of the hams and denied them experimenting with slow-scan television.

It was this rulemaking situation which I feel was largely responsible for amateur radio stagnating for 11 years. Since that time, we have managed to get back into a growth mode, but only a slow one.

The surveys of amateurs which I have taken via my publication show clearly that the main body of newcomers to amateur radio are teenagers. Indeed, ARRL studies have shown this same fact, with one such survey showing that 50 percent of the newly-licensed amateurs are either 14 or 15 years old. Further surveys show that over 80 percent of these teenagers then go on to develop careers in electronics or communications.

In my talks with R&D firms, there is no question but that the radio amateur who has pursued an electronics career is usually far more valuable when it comes to innovative technology than his non-ham counterpart. The ham is often almost totally immersed in electronics, reading about it at every opportunity and talking about it at work and over the air with friends. He usually has his own lab at home, as well as his ham shack.

If we then project the growth we could have expected from amateur radio, had it not been brought to a halt in 1963, we find that we might have had about one and three-quarter million licensed hams today. That would have resulted in there being at least one million more engineers and technicians than we have today, and that is quite a lot.

Remember, too, that at the same time we were stopping ham growth, the Japanese instituted their no-code license. Further, they actively recruited hams in high schools through clubs. These clubs engage in expeditions, field-day outings, mountaintop VHF trips, hidden transmitter hunts, and so on. Even a casual glance at the Japanese ham magazines will show you that there are hundreds of pictures monthly of these club activities.

The latest issue of *CQ Ham Radio*, the Japanese magazine, had 46 pages of pictures of clubs doing things. So while amateur radio was crumbling in the U.S., the Japanese went from a few thousand hams to over 500,000, with virtually all of them active. Yes, Japan has about half again as many licensed hams as we do, and perhaps three times as many active ones.

I believe that this is where their technological superiority has its foundation. Well, no matter what the case, there is no denying that amateur radio in the U.S. is growing very slowly. I believe that if we could get amateur radio growing again, we might eventually be able to regain the technological superiority we had a few years ago. Most of the loss has occurred in the last five years, as the Japanese caught up and passed us in technical people.

By the way, in case there are any questions about the ability of amateur radio to accommodate two million U.S. hams, I think we could. And it would be a blessing in many ways. There are so many possible ways for us to cope with vastly more active hams, with new technologies, that I wish we had that pressure to get us going with some of them.

Now if we are going to meet the challenge, we need to do every thing we can to get amateur radio into a very strong growth mode. This means we should take a close look at our regulations and see what might be changed with them which might help in our growth. We might look to our clubs as a resource in promoting growth. Perhaps a new technology would help. It would spark interest and growth. The emergence of FM and repeaters ten years ago was the catalyst which got amateur radio moving for a while. The interest of this new mode, together with a supply of pre-interested people from CB, gave us a spurt of growth in the mid-seventies. The FCC's CB 40-channel disaster, which virtually killed Citizens Band, cut off our supply of enthusiasts from that source. It may be time to seriously consider some sort of no-code license.

I have heard every argument pro and con on code. Indeed, it has been perhaps 20 years since I have heard anything new on this. Just the same old arguments. Taking all of this into consideration, we may want to come up with a different approach to licensing, one which will remove the skill aspect of the code test and substitute operating knowledge, as the Japanese have done. There is much that we can learn from the Japanese system, which is working quite well.

And I might just say that any of you who have worked with Japanese amateurs know that you will not find any finer operators in the world.

If we are going to be able to get our older amateurs enthusiastic again, I think we will need some sort of technological development. It is most unfortunate that the FCC for many years made such developments virtually impossible.

As an enthusiast in radioteleype in the late forties, I found it exceedingly difficult to pursue the need for technical developments because the FCC stopped me at every turn. When we wanted to experiment with radioteletype on the low bands, we found that the FCC would not permit it because their monitoring stations were not yet equipped with teletype equipment.

Since it takes years before these monitors finally get new equipment, this approach to our rules meant that amateur experimenting and development would always have to lag commercial developments by 10 to 20 years. And that was the way it was through the fifties and to date. We are still forbidden from unrestricted experimenting because the FCC won't let us use a mode until they can monitor it. One of the first rules that the FCC has on its books for amateur radio, Part 97.1c, is aimed at the Commission, not at amateurs. It is a rule that the Commission must encourage and improve the Amateur Service "through rules which provide for advancing skills in both the communication and technical phases of the art."

The Commission has not been responsive to that, the only amateur regulation guiding them in their job. The FCC rules should be either made or interpreted so that amateurs are not just permitted, but encouraged, to experiment and pioneer new ideas. With the development of large-scale integration and digital electronics, the horizon for the development of new techniques and modes of communication are almost limitless.

We should remember that it was amateurs who historically invented most of the communication modes which are in common use today. It was the development of practical sideband circuits by Don Noregaard in the forties which made sideband possible for military, commercial, and amateur uses. It was the pioneering of amateurs which brought FM mobile uses, and then in 1946 narrowband FM. Slow scan was developed by amateurs, as were parametric amplifiers, helical antennas, and so on. Much of the early television experimentation was done by amateur radio, with the early industry people coming from one particular ham project in Astoria, New York.

Amateurs could, with encouragement from the FCC, be experimenting with many digital techniques. We have plans for setting up dictionaries on IC chips, which would enable us to communicate via ASCII, but at 5,000 words or more a minute with instant translation into any language in the world. Immediately any ham in the world would be able to converse with any other with few translation problems. A two-byte message sent at 1200 baud would give us the possibility of 32,000 words. A one-byte message would give us the use of 256 moat-used words, which represents about 75% of the normal messages. 1200 baud is narrow enough so it is practical over ordinary phone circuits, so it should not be difficult to accommodate on the ham bands.

The words would be typed into a small microcomputer. This would look up each word in the dictionary and store the appropriate byte or two bytes of information for each word. When the message is ready to go, it would be sent in a second or two, thus leaving the radio spectrum available

for hundreds of similar contacts on the same channel without interference.

When received, the bytes would be looked up in the dictionary on the other end, which could be in any language. The resultant message would then be displayed on the microcomputer at that end.

What about voice? As computer circuits and ICs improve, we are getting better and better at translating voice into digital information and then back again. We even have reasonably well-sounding talking clocks which fit into a shirt pocket, with a voice entirely synthesized and digitalized. The work is done by a single silicon chip.

We need rules encouraging experiments with these techniques. We have plenty more in prospect. Spread-spectrum communications have enormous possibilities. Double-sideband stereo transmission should be investigated as a possible method of increasing our density of spectrum use by a factor of 100 or more.

Digital audio without synthesizers may have possibilities for compression and expansion for the time-slicing techniques where we could have half a dozen or more contacts taking place on one channel with no interference between stations. We might even be able to get back to full duplex operation with all on one channel with time-slicing. That could bring about enormous changes in amateur radio communications.

With the space shuttle coming soon, we may be able to put up a great many more amateur satellites or even get spectrum for ham use on some of the commercial satellites.

With this resource, we could set up emergency communications, an emergency communication network, far beyond anything ever imagined before.

With our repeaters able to interconnect via satellite relay, handie-talkie to handie-talkie contact anywhere in the world is a possibility. Indeed, commercial services are going to be working hard on satellite uses, with the possibility of phone and digital communications between cars or even people on foot very likely.

As each of these possibilities is opened up, they in turn bring us new ideas which can be tackled with the use of VLSI circuits. In many ways we are presently just at the beginnings of amateur radio development if the FCC can be persuaded to encourage amateur experimentation. If there is any question about this being a problem, just ask the Commission how many hundreds of applications for Special Temporary Authority for experimenting with ASCII were turned down in the last few years. This was not a small problem. It was one of major proportions. At a time when our technical journals are citing more and more cases where we are importing electronic technology from Japan, it may be time for us to seriously consider tackling the problem in as many ways as we can. There is much that NIAC can do to help spur the growth of amateur radio.

It could be working with the Commission to try to work out approaches to free amateurs for experimentation and study possible changes in the rules which might encourage the substantially greater growth which is needed. Indeed, is there a better group than NIAC for tackling this important problem?

And I might ask that those of you who are going to discuss the new rules notice that one major change has not been made, and that is in the emission mode allocation. They tell you what is permitted, and therefore anything else is not permitted. And it should be the other way around.

The general interpretation of the amateur rule is that if it is not specifically prohibited, it is permitted. And that is the type of freedom that we need. I hope we will remember that when we discuss these rules.

I thank you all very much for your time.

Though the proposed new plain language rules do not include the providing of service in emergencies as a goal of amateur radio, I think we should keep that purpose in mind and always work in the direction of being able to provide emergency help.

In line with this, the better our amateur radio communications systems, the more help we will be able to provide in emergencies. There is nothing so useless as an emergency system which is for use only during emergencies. The equipment won't work...and the operators will be unfamiliar with it and with procedures. If we are going to be able to provide truly valuable emergency communications, we need to have the system up and running on a daily basis. In that way, we encourage the investment in time and equipment which is needed. Who wants to buy a bunch of gear which they can't use until an emergency? Or do we expect the government to buy it for us?

Last year the worst hurricane in over a hundred years hit the tiny island of St. Lucia in the Caribbean. All telephones and commercial communications were demolished. Planes couldn't even land at the airports because they had no radio to talk them down.

I recently visited St. Lucia and talked with the hams there... and with the Prime Minister. From every side I heard nothing but lavish praise for the way the amateurs stepped in and got things running again. *73* sent down Tim Daniel N8RK with four trunks full of ham gear and commercial HTs. The HTs were immediately used to reestablish the airport-to-plane communications. The ham gear, along with that of the local amateurs, provided about the only dependable communications the government had with its people for a week or so. Tim worked hard and did wonders, but the real load was on the locals...and they did a monumental job of getting things going again.

The island was hard hit, with many buildings being demolished and most of the banana plantations destroyed. Now, a year later, most of the serious damage has been repaired and the banana crop is one of the largest in their history. Banana plants grow new with each crop, so knocking them down only put them out of business for one season.

When disasters hit our country, it is amateur radio which takes over. For the first few days after the Alaska earthquake, even the Pentagon had to rely on amateur radio for all of its communications with its SAC base there. Military communications are concentrated and thus vulnerable. Other than that, what have we in long-range *and* short-range coverage? Only amateur radio can provide *all* kinds of communications...and even connect short-range with long-range if the need arises.

Police have short-range capabilities...as do most of the other mobile services. Even these various services have a relatively small contingent for each service and no way to interconnect with other services. When there was a big fire in Boston, the amateurs stepped in and provided the communications between the fire, police, and other agencies. None of them had any way to coordinate except via amateur radio.

Our country has a vested interest, I believe, in amateur radio being strong and developing a really powerful communications network...one where via digital switching any amateur with an HT or mobile unit will be able to talk with any other. I see no serious technical problems holding us back, only the access to a satellite...and I think that can be surmounted.

I've rattled on enough for now.

FOR A BAUDY TIME, CALL...

Now that we are permitted to use ASCII, perhaps it is time that we started taking advantage of it.

Assuming that you may not be exactly sure of what is involved in ASCII or why it presents any advantages for us, let me bring you up to speed. It all started an eon ago (1946) when W2BFD (John Williams) got some Model 12 Teletype™ machines that were being replaced by the then-new Model 15 systems. Rather than junk these noisy, dirty old klunkers, he talked Teletype Corporation into making them available for hams to use and experiment with.

John, being a crotchety genius, made a modest living out of reselling these units and servicing radios out of a tiny storefront in Queens, New York. His main interest was in designing circuits, so many of the hams who sent for equipment found themselves waiting a rather long time for equipment. Some never got their orders.

Oh, well, I'll write more about him one of these months. Getting back to those teletype systems...they used a five-bit code to print all of the letters of the alphabet, plus the numbers and some other special characters. This was in the early days of digital communications. If you figure two to the fifth power, you'll see that this gives you 32 possible combinations. That's enough for the 26 letters and six more characters.

A chap named Murray came up with a scheme to make this work. He set up a five-unit code for each of the letters, plus the space bar, carriage return, line feed, figures (uppercase), letters (back to lowercase)...and a blank. A gent named Baudot invented a somewhat similar, but quite different code, with the result that Murray's code is known as Baudot. It isn't and never has been.

Not only did we get Baudot substituted for Murray, but also we have the *baud* as a result instead of, perhaps, the *murr*. The baud rate of a transmission is the number of bits per second being sent. Thus, at 300 baud, our 11-bit ASCII code would give us a net of about 27 characters per second. With a word being defined as 6.1 characters, this is about 4-1/2 words per second, about reading speed for a slow reader.

With 9600 baud being possible (using some compression and expansion techniques) over ordinary telephone lines, the restriction of amateur radio ASCII to 300 baud seems ridiculous to me. We are still in the need to be deregulated so we can experiment with 1200 baud and higher speeds. There is no question we can go 9600 baud and stay within phone bandwidths, so let's get the FCC off our backs.

At 9600 baud, one character takes about 1.1 milliseconds. This piece of information, coupled with a recent study of amateur operating practices, gave me an idea.

Our ASCII character is made up of eleven bits. This breaks down to seven bits being used to actually indicate the character being sent. If you can whip out seven fingers and multiply by two, you'll find that this results in a possible 128 different characters which can be represented. This allows an ASCII character for each of our letters in both uppercase and lowercase, the numbers, plus a bunch of special characters and punctuation. Even so, there are quite a few unused ASCII characters which can be user defined.

What about the other four bits in our ASCII character? Well, number one is a "start" bit which tells you that hey, a new character is coming, get ready. Then we have the seven bits to indicate the exact character being sent. Bit nine is a parity bit. Thus, if we are using even parity, an extra bit would be used in this slot to even up the number of bits sent in the preceding seven. When you are using even parity, your system will set off an alarm if you get a character with an odd number of bits... telling you that something is wrong somewhere. The last two bits tell the system that it is time to stop.

Now, if we were to define one of these unused characters as an indication that the following characters actually represent a special ham message, we'd be ready for the next thought... which I hope is becoming obvious.

Since over 91% of the average ham contacts consist almost entirely of a recitation of the equipment in use, a request for a QSL card, a signal report, and such, why not encode this important information so each element can be sent as a single ASCII character? All we need is a simple lookup table and we have a way to save enormous amounts of air time. In 1.1 ms we could tell someone that we are using a 520 transceiver. One more 1.1 ms for the three-element beam. Since the request for the QSL is unchanging, we wouldn't even need to send that at all, thus saving 1.1 ms. With your increased ability to make contacts rapidly, every millisecond saved is a millisecond earned. Perhaps we could eliminate that 1.1 ms for the signal report, too, since anything under a 5-9 + + + is a downer and could affect that QSL card. You don't want to take chances unneccessarily... and the assumption of 5-9 + + + in lieu of any other information will take care of that problem, saving you an extra 1.1 ms.

Of course, about now I expect some fruitcake to suggest that when it comes down to it, we don't really give one damn what rig the other chap is using, so we could just as well save that 1.1 ms, too. Thinking like this could lead to further disintegration of amateur radio, with questions being raised about swapping antenna type (who really cares?), the weather (hey, we've got to talk about *something*!), and the name and location (what's the matter, are you too cheap to buy a *Callbook*?).

If you really want to get rid of the chaff, you're down to call letters and one single ASCII character...a 15-ms contact, including both calls and the single friendly all-purpose ham contact ASCII character. At that speed, we might be able to step up our ham contacts, setting new records for WAS, WAC, DXCC, and others of our worshipped awards.

At 15 ms per transmission, two being the minimum for any award-acceptable contact, we would not be able to do much better than 30 contacts per minute...no, I dropped a decimal point, make that 30 contacts per second. Whew! I thought we weren't going to gain much for a moment, since many of us are able to whip off 30 contacts per minute already.

Think of the benefits to contest addictees! We would be able to run contests in perhaps one hour instead of over a whole weekend. Or we might let contest ops operate during the first two minutes of each hour so they would get a lot of different propagation conditions during the contest. In one hour, if they are diligent, they would be able to make at least 108,000 contacts. This would result in a good score. If we extended the contest to four hours, they might be able to WAA...work *all* amateurs.

Actually, I'm sure that with a little thought we will be able to improve our encoding of ham calls and get them down to only three characters total. This could cut our contacts in length enough so we could whip out at least 60 per second, or over 200,000 an hour. DXCC in less than two seconds? Why not? Think of the fun it would be to work one hundred countries while you are sneezing.

Of course, there would be some problems involved with this, but nothing serious. It would take a fast printer to whack out the QSL cards to keep up with your rig. You might want to hook that onto the end of a small printing press so you could print them as you need them, thus saving on QSL storage. Or you might just want the printer to do the whole card and not use printed cards.

You could have your system sort out the contacts and print the cards in zip code order for bundling and shipping to the bureau. The League would have to set up automated systems to sort and forward cards...or possibly just the computer data on the contacts could be forwarded by radio to the QSL centers. In that way, the League would be able to have a computer tell them each day the winners of their awards and perhaps pass along to other organizations the calls of stations winning other awards such as WAE, WAZ, and so on. Then we wouldn't have to clutter our walls with QSL cards. We could stick computer printouts of our DX lists on the wall...all confirmed by the ARRL.

Are you ready?

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
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It's September, and, pause for a drum roll, another RTTY Art Contest is about to begin! Every year, the Southern Counties Amateur Teleprinter Society (SCATS) of southern California sponsors this worldwide contest, and this year is no exception. Last year's winner of first prize was Bill Skipper, whose work is shown in Fig. 1. Other winners included Winky Merk AD4M, Klaus Zielski DF7FB, and John Burnside N3ATH.

Winners receive engraved plaques in recognition of their efforts and the satisfaction of a job well done. Interested in entering the contest yourself? Write to SCATS, in care of Mae Washburn WA6LNH, 5772 Garden Grove Blvd. #415, Westminster CA 92683 for rules. Who knows, maybe next year I'll be running your creation as the winner!

Every once in a while, a reader writes with a question about an old issue of *73*. Such is the case this month. N. L. Ferguson WB5VIY sends in the March, 1979, "RTTY Loop" column, and asks two questions about it. First, with regard to a simple UART-based scheme to send single characters, reproduced here as Fig. 2., N. L. asks how the "Push-to-Send" button on pin 23 works.

Once the Murray (nee Baudot) data is set into the UART, on pins 26 to 30, a pulse is needed to initiate data transmission. In this simple scheme, the "ground-to-send-" input, pin 23, is manually brought to ground by the push-button. This transition, high to low to high again, or press and release, generates the pulse that starts the UART. In a practical circuit, this pulse is normally produced by gating logic since the normal "noise" in a push-button would, in fact, produce many rapid fluctuations as the contacts settled. However, in this demonstration circuit, the function is adequate.

The other question regards several buffers used for isolating and/or inverting the TTL-level signal produced. Originally Fig. 4, this is reproduced here as Fig. 3. The buffer in "A" was originally mislabeled; it is a 7407, as correctly identified in the text. The 7407 is an open collector buffer, useful in isolation. The figure originally branded this as a 7402 which is a NOR gate—quite a different animal.

Along the lines of old publications, Kevin Carey of Rush, New

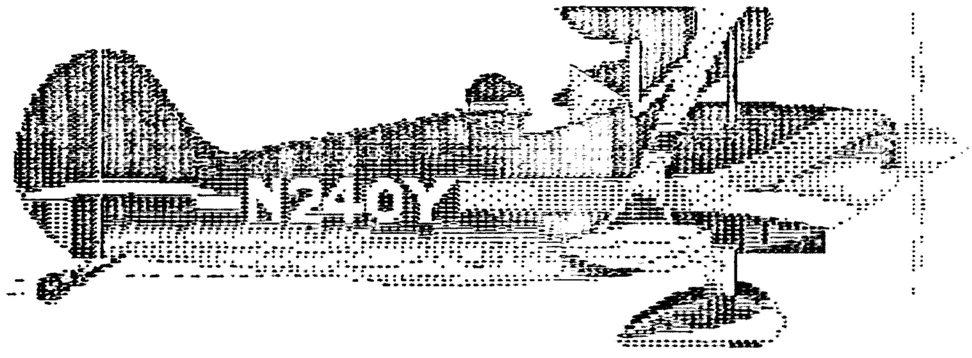

Fig. 1. SCATS 1980 1st-prize winner.

York, is trying to build an old tube-type converter out of the old *RTTY Handbook*, published by *73* in 1972. This circuit used TV sweep coils, about 30 mH, as mark and space filters. Kevin writes that the value of the parallel capacitor for the 2975-Hz filter is given as 0.07 uF, but that the capacitor for the 2125-Hz filter has no value stated.

Kevin, these coils are adjustable, and I used some in a converter I built about fifteen years ago. The value of the capacitors really is not that critical. You might try 0.1 uF for the 2125 Hz and 0.15 uF for the 2975 Hz and trim if you have to, remembering that disk capacitors may be off by 20% or more from what they are marked.

Kevin also wanted a basing diagram for the mixer resistors—these are 100k. As far as where to get these coils, try a local TV service shop, preferably one that has been around a while and might have a stock of "junk" sets to pull from. It never hurts to ask.

Before you hustle along to build this converter, though, let me add a word or two of caution. This is a basic converter of an earlier age. Similar performance may be obtained with simple circuits based on more modern devices such as transistors and phase-locked loops. Although I feel that building a tube-type converter may be a valuable learning experience, it also can be frustrating as the devil. This is more true today with the proliferation of solid-state devices. You may want to wait for a bit for *73's* new *RTTY Handbook*, due out in the near future, and look through that for some other ideas.

This same piece of advice is directed to Bill DeVore WB3DLO, and the many others who have written about their search for RTTY publications. Bill is trying to rewire a Model 19, a subject we talked about in this column several years ago, and needs a diagram to follow. While it is too much to include here in RTTY Loop, that is just the kind of information you will find in the new edition of the *Handbook*. New information on computerized RTTY also will be included, along with modern circuits and ideas. Look for an announcement in the *73* Bookshop section of the magazine, I hope before the end of the year!

I received a letter from a Canadian ham who is a CW and phone operator who greets RTTY signals with less than enthusiasm. He states that "we made great progress in eliminating AM carriers by using SSB and supplying the carrier [in the receiver]. Do you think something similar to SSB could be done for RTTY? A steady tone supplied by the receiver, and the incoming marks alone used to key a Schmitt trigger and shift the receiver's tone oscillator 170 Hz. Many advantages all along the line could come from this system on low bands."

Unfortunately, this question reveals a lack of understanding of how RTTY works. Putting aside for the moment the fact that on-off keying, what the writer is requesting, is illegal, let's examine that mode of transmission. While idling, a steady mark is generated in both FSK and on-off keying. They are, on the air, identical. Transmission of a character pulses the mark carrier, again identically. However, with FSK, an inverse signal (the space) moves a carrier a fixed distance (typically 170 Hz) away from the mark. When the mark is present the space is not, and vice versa. They are never present together, thus presenting the image of a single carrier being moved (shifted) in frequency: frequency-shift keying.

The advantage of this scheme is, among other things, the built-in redundancy of the system. Interfering signals would have to obliterate both the mark and space in order to destroy information. With on-off keying, a single carrier sitting on the mark frequency would render communication impossible. While such a carrier is annoying with SSB, it is devastating with on-off RTTY. Using modern reception techniques, an FSK signal would not even be bothered.

Looking at it from the other side, I cannot see how a good CW signal (RTTY is normally not found in SSB segments) could be copied better through an on-off-keyed RTTY signal than an FSKed one. On-off-keyed RTTY would sound like high speed CW, certainly confusing nearby Morse transmissions. Narrow receiver filters at the CW station should be able to eliminate nearby RTTY signals just as they notch out nearby CW ones.

I'm sorry that I don't agree with you, but I hope you understand why. You may benefit from some reading on RTTY; who knows, you may join us!

Several questions have been received about current VHF RTTY possibilities. Along those lines, allow me to plug the two-meter repeater of AMRAD, located in the Washington, DC, area. Although well known for its work with OSCAR satellites, AMRAD also is on the forefront of digital communications, as typified by its repeater on 147.21/147.81 MHz. I am told that a packet radio beacon is currently on, using Bell 202 standard tones. Also, Sunday night bulletins are transmitted at 6 pm local time. If you're in the area, have a listen.

Some more from these keys next month. Tell me what you'd like to see, then look for it here, in "RTTY Loop"!

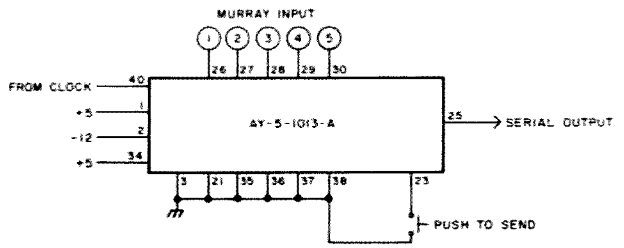

Fig. 2. UART sending scheme.

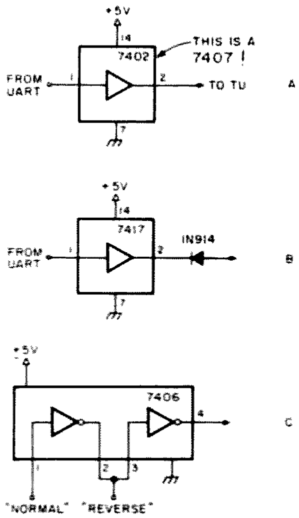

Fig. 3. The buffer goof.

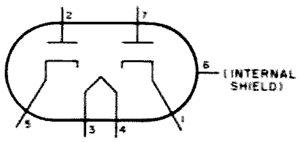

Fig. 4. 6AL5 basing diagram.

LETTERS

WAIN WHEEL?

What year did you invent the wheel?

You're responsible for every new development that has ever taken place in ham radio, if you do say so yourself.

You can be sure that many, many hams are sympathizing with and feeling very sorry for you because of your severe psychotic condition.

Bill Libman KA1JE
West Hartford CT

It's not as bad as you think. Aspirin does the trick... don't worry.—Wayne.

UNTRUSTWORTHY?

Can we be trusted?

Docket HR2203 seeks to reaffirm the FCC's current practice of allowing licensed hams to conduct the tests that lead to the Novice certificate. But clearly, too many of us have shown ourselves to be untrustworthy in this area. As proof, witness the dreadful CW on the Novice band. Some of it drags along at 2 to 3 wpm, with awful format and spacing, long pauses, and repeated errors. These people came nowhere near passing the 5-wpm code test that the FCC entrusted us to conduct.

You can almost see the nodding, grinning, and winking that went on between the hopelessly under-qualified would-be Novice and his licensed buddy who faked the results. This is a serious accusation, but the resulting shameful performance on-the-air proves it. The Novice test is the only area in which we have been allowed to demonstrate our ability to police ourselves. We have betrayed this trust many times. Again I say, listen to the Novice band for proof.

Therefore, I recommend that this self-policing privilege be withdrawn from us. Alternatively, I recommend the following: The section of HR2203 that will allow hams to monitor violations of the Act should be expanded to include monitoring of Novices who violate standards so badly that clearly they could never have passed a legitimate test. If a dishonest licensed ham knows that he could receive a letter from the FCC asking about the incompetence of his Novice friend, he will never be tempted to betray the trust placed by the FCC in him—and therefore in all of us.

Peter Vaughan KC4PX
St. Petersburg FL

Peter, I think you are being very harsh. Perhaps you don't realize just what is involved in being a Novice. This is an introductory license where hams can learn. Yes, some Novices make mistakes (I know I did)—yes, many Novices have abominable fists (so do many Extra class licensees)—but the Novices you hear on the air are communicating, and in the process are learning to be better operators.

The poor fists you hear are largely a result of the FCC's way of handling Novice exams. There is usually a 12-week wait between passing the code test and receiving a license. In the meantime, our new hams are getting rusty if they are not practicing.

We need more seasoned hams to take the time to help Novices get good fists and set up their stations. After all, we aren't born with these skills. Six years of teaching new hams has taught me that Novices are among the most enthusiastic, honest, and friendly hams you will ever meet.—N8RK.

OL' SOGGY

After a hard day at work, I rushed home to my DX300 for the latest news of the Whiskey Jack Rescue Net. I am happy to report that Old Soggybottoms has been found. There came a flash a short while ago that 6605 was in tow by a French naval vessel.

Here comes the fly in the soup. One operator, a sandbagger something or another, was saying that it should have been *our* Navy or Coast Guard to save Soggybottoms, not the French. Gee, I thought the whole purpose to this Mayday Net was to help find Soggy 6605, not to designate who! The way this lid was carrying on, one would think that a French naval vessel was a French ship with a cargo of belly-button lint!

Now, to answer the question of why the French ship was there first, that's because our Navy has landed on Greenland —yes, Greenland. Let me explain. Five kHz up, there were three high-powered WJ stations planning their rescue strategy. The head Jack of this group proposed to wait till 6605 transmits again, then with their beams *"tripodulate"* on him. He suggested that they pool all their readings together and plot his position.

Down 5, commands Capt. Jack, and the three are off to tripodulate. (Makes me think of Tinman, Scarecrow, and the Cowardly Lion, for some reason—oh well.) Out of the QRM comes the long-awaited transmission and the three get cranking. Now, remember that these masterminds are many states apart, so one takes the long path, one takes the short path, and the other takes a standby for Mother Nature. The all-important transmission over, they plot 6605 at 70° north by 45° west.

Where's that, asks the nature boy? I'll be darned if I know, replies Capt. Jack, but let's get it off to the Navy quick! Has it come to light yet? No? Then read on.

The Navy receives this valuable information, and they're on the way to Greenland taking along a few Marines in case Soggybottom is beached. Where's the Coast Guard, you ask? They're busy keeping our shores safe from unfriendly powers while the Navy is on this life-saving mission. While all of this was happening, a French naval vessel (whose captain was oblivious to the past 5 days of radio lunacy) is patrolling the Atlantic shipping lanes. And who do you think he happens to come across? Right. 6605.

I hear Ol' Soggy was going to stay with his boat while being towed, but one fellow WJ suggested that he take the cat and pass it up to the French ship, and *then* his boys, wife, and himself should follow. (Makes you wonder about this guy's priorities, huh?)

For those of you who like a happy ending, 6605 and family are home safe and sound, and the Whiskey Jacks are congratulating each other for doing such a fine job—over and over and over again.

In closing, I ask—How can anybody say the 10½-meter boys don't perform a valuable service? It is said that laughter is a very potent drug, and after 5 days of complete confusion, power battles, and radiomanship that bordered on incompetence, I am well medicated!

The 10½-Meter Reader
New Jersey

BOTSWANA BOOSTER

The March, 1981, edition of *73 Magazine* has just reached the bookshop here in Gaborone, and your editorial has prompted me to write to you about amateur radio in Botswana.

The Government of Botswana has no fear of personal communications. Both ham radio and CB are permitted here. The support for ham radio by Botswana delegates at WARC '79 was welcomed and commented upon by several other countries. The Government is aware of the benefits that can be gained from ham radio in the training of technicians.

However, sympathy on the part of the Government and visits by influential people such as yourself or Bruce Johnson (whose visit here was reported in the September, 1979, *QST*) are not enough. There must be a core of already-licensed hams in the country who are willing to foster interest in the hobby amongst the emerging technicians and engineers and who appreciate that this process may take many years.

What must be overcome is not hostility but indifference. One of the problems we encounter here is that ham radio is regarded as a rich expatriates' hobby. Young Batswana see little point in becoming interested in what appears to them to be an expensive indulgence. Please remember that hobbies are, in any case, a concept foreign to Africa. Also, it must not be forgotten that the majority of

people here do not have electricity in their homes and that components and surplus equipment are virtually unobtainable even in the capital city. In addition to these drawbacks, a large proportion of young people receives no secondary education whatsoever, although that situation is improving. Thus, ham radio can be expected to appeal to only a very small minority of the population at present.

In spite of all these difficulties, the expatriate hams here are doing their best to interest Batswana in the hobby. There are at present three Batswana with ham licenses. A further one has passed the Radio Amateurs' Examination and has only to pass his Morse test to obtain a license; three more retook the RAE on May 11th and await the results. A further three are studying for the examination. It also is hoped that a Novice license will be introduced, as there are about 30 school students who are eagerly awaiting this development. This Novice license would be similar to the American one.

The Botswana Amateur Radio Society was formed in 1976 and has been really active for about two years now. Virtually every ham resident in Botswana is a member of the Society, a total of about 20, and a number of interested Batswana who do not yet hold licenses are associate members. The Society has just managed to buy premises to use as a club room in Gaborone. This will not be of much immediate help to those outside the capital, but it is felt that a club station would do much to encourage interest here and that a really interested and active membership in Gaborone could then encourage activity in the other main centers.

A further point: In our more depressed moments it frequently seems that the main reason for external encouragement of ham radio in Africa is the generation of support at ITU conferences and additional DXCC fodder. It is difficult to demonstrate the ham spirit behind a DX pileup when you are on the receiving end of it.

(Mrs.) Pru Harris A22PH
Gaborone,
Republic of Botswana

The situation you describe is a familiar one... and is repeated in most Third-World countries. It has a solution. Even in Jordan, which is a wealthy country as compared with some of those in Africa, it is beyond most youngsters to aspire to a home station. This is why club stations were put in by King Hussein in every city in Jordan. These were set up in the youth clubs. Although there was some criticism of the CIA for furnishing Hussein with funds, I happen to know that many if not all of these ham club stations came from this fund... well spent, to my way of thinking.

The next stop is an inexpensive one. The government needs to have a person who can get to these club stations about once a week to give classes in amateur radio. Jordan had one chap who did this... and did a fantastic job of it. He taught the fundamentals of theory and code. The students eagerly learned and got familiar with hamming through operation of the club stations.

If any country is interested in this concept, I would like to talk with them about it. I believe that I can get US amateurs to donate the money to set up club stations if the donors are promised a later visit to see their club station and to meet the amateurs who have resulted from their generosity. I think we can put together excellent club stations for about $2,000 each, with rigs, beams, towers, rotors, and so on. I've asked many groups about this and have always had plenty of volunteers to come up with the needed funds.

Thus, there is no problem with a lack of ham gear for personal stations... or power. The youth clubs have power and a person to be in charge of the club station.

The youth quickly are attracted to the wonders of talking all around the world via the club station... and tackle the theory and code programs with enthusiasm. For the long run, they are now on the path toward most rewarding careers as technicians and perhaps even engineers. These Third-World countries need technicians desperately. The main problem facing them is motivation... and amateur radio sure can provide that.

A few days ago I met with the Prime Minister of a small country in the Caribbean and I outlined my plan. He was most enthusiastic. I will be pursuing this, and it if works out I'll be after you, the readers, for some donations to get ham club stations set up. I'd like to see this scheme tried out in a hundred small countries. Amateur radio needs it... and so does the world.

The pileups are another problem.—Wayne.

AFRICAN CLASSES

We noted your comments re license classes with interest (April, 1981). The Johannesburg Branch of the South African Radio League offers every six months three different courses leading to the radio amateur operator certificate examination. All lectures are coordinated, advertised, and run by the SARL-Johannesburg for the benefit of intending amateurs and the club and its members.

There are no "hidden" charges, and the fee of R45 includes the lecture material. All the student has to buy is a pocket calculator at about US$12. No company is involved, and the venues are private colleges with the exception of our special course in Soweto, where courses *are* offered at Molapo Technical Centre to save the students the long travel time. This course is free of charge.

Lectures are selected to bring the students in the shortest possible time up to exam level. The lecturers are selected to have the right psychological profile to enable the students to gain the right attitude to his/her future fellow hams.

The lecturers are paid a fee of US$18 to US$22 per each two-hour lecture, and are expected to check the students' homework.

Our lectures start each year in late January and end in July or early August. The exact date depends on the school holidays. Our club has been offering courses now for over 7 years. The tremendous growth of ham radio, in particular in the greater Johannesburg area, speaks for itself.

Peter Strauss ZR6MI
Johannesburg, South Africa

ARRL OK, BUT...

Attached is a letter which I sent to Robert York Chapman W1QV, President of the ARRL foundation, in response to his appeal for contributions for OSCAR. I think OSCAR is great. I will contribute. Also, I would like to see our house cleaned up. When Dannals and Metzger resign, the fog should abate somewhat. *I urge all ARRL members to write to their directors demanding the resignations of Dannals and Metzger.* The League is a great institution for continuing ham radio as we like it. We don't need "rubber stamp" directors, "closed-door" forced "kick-outs," and uncounted "vote shredding." Let's end dictatorship and return to some kind of decent ethics.

[The letter to Mr. Chapman supported Don Miller and said that the $17 contribution for OSCAR suggested for ARRL Life Members would be exceeded and mailed in as soon as "Mr. Metzger and Mr. Dannals have resigned."]

Ronald C. Williams
W9JVF/ZB2CS
Indianapolis IN

Troublemaker.—Wayne.

JOBS OUT THERE

I hope it's not too late to reply to a letter in your issue of May, 1981. I'm referring to John Townsend's letter (Getting A Job).

I don't know where he is looking, but the man is certainly not including broadcast stations in his definition of "an industrial outfit who needed a competent electronics man." I have had, for almost a month now, an opening for an engineering assistant. The requirements aren't severe: just the knowledge to do the job and an FCC First Class Phone. No experience? Not to worry; I'll train you.

In my search (believe me, there just aren't enough people out there to meet even my minimum requirements), I found many stations which also were looking for engineers... just within a 150-mile radius of Dayton. Part of my search consisted of calling these stations, hoping that maybe they had had a recent applicant that they could point my way.

Our starting salary (typical) for this job is $250 to $300 per week (higher scale for someone who *does* have experience)—somewhere between Townsend's experienced political

technician and the Phi-Beta-Kappa Double E. . . *and* neither applicant need either have minored in politics or worked 15 hours a day in Nome. I make over $400 per week, and I am not related to the boss nor am I one of his buddies. *I* also can move under my own steam and motivation. His secretary and I are not having an affair, and I am not a member of a minority.

Age? No problem. One of my applicants is 63. He is highly qualified. . . but, when I tried to call him back for an interview, he was never in and wouldn't return my calls. I would have hired him in a minute!

There is nothing wrong with feeling sorry for oneself, but, Uncle Wayne, when things have been going wrong for a long, long time, why don't people stop, look at themselves, and think that's perhaps where they should be pointing the finger?

Would I hire John Townsend? With that attitude? Would you?

Patrick J. Shirley
Chief Engineer, WONE/WTUE
Dayton OH

FREE TOROIDS

The public services performed by radio amateurs are recognized by the Chesapeake and Potomac Telephone Company of Maryland, which has donated a large number of 88-mH toroidal inductors for their use.

Superior passive CW filters using these coils have been described by Ed Wetherhold W3NQN in *HR* (April, 1981) and *QST* (December, 1980). He is a filter design and applications engineer with Honeywell, Inc.

Ed is giving generously of his time in packing and handling the eleven toroids per carton. Your only cost is the shipping. Send an SASE for instructions to: Ed Wetherhold, 102 Archwood Avenue, Annapolis MD 21401.

Gene Brizendine W4ATE
Huntsville AL

CABLE QRM

For those of you who thought that your TVI problems would *go* away when your neighbors went on cable TV—'taint necessarily so! I recently ran into an unusual TVI problem here in San Jose that involves a local cable company and its channel assignments. This TVI problem will create a serious situation for amateurs if action is not taken now.

The cable companies have a group of channel frequencies between TV channels 6 (88 MHz) and 7 (174 MHz) which they normally designate as channels A,B,C, etc. These channel frequencies are more or less standardized throughout the cable TV industry. The cable companies use these channel frequencies for their premium offerings such as HBO, Show Time, etc. There seems to be no industry standard as to what offering goes on what channel. The cable companies use downconverters at the subscriber locations to pick off the desired channel and downconvert it to TV channel 3.

My problem is with cable channel E which is used for the "Movie Channel" here in San Jose. (On other cable systems, channel E may be used for any premium offering, as mentioned above.) The problem is—believe it or not—channel E's video is on 145.25 MHz and the audio is on 149.75 MHz! This means that the downconverter's front end is tuned across the entire two-meter band. Tests indicate that 1 Watt will wipe out E to 100 feet, 35 Watts to two blocks, and 130 Watts to five blocks. (This is true with *any* two-meter frequency.) These tests were made with my neighbor after the local cable company had replaced all its coax and checked all its grounds. I wonder how bad the results would have been had we made the tests before the coax and grounds had been restored to like-new conditions. By the way, tests at locations with underground coax systems produced about the same results.

In order to get something done here, I had to set up a conference call between the local cable company and the FCC. The end result was that the FCC told the cable company to correct the problem. I don't know their plans after conducting tests at my QTH other than the fact that they want my neighbor to switch to another offering to get away from the interference.

There is no way that this channel E and two meters can coexist. We don't want another 6-meter and TV-channel 2 situation. So—what I'm asking is that if you have this problem, or know someone who does, please notify the local cable company. If necessary, mention FCC Rule 76.55A1 which pertains to this problem. They need to know just how bad this problem is. Also, please notify the FCC and the ARRL.

We need to face this problem now. Cable is the coming thing, and we need to establish the ground rules now before additional channels are created on the other ham frequencies.

Bill Rinker W6OAV
San Jose CA

Not only are some cable systems very susceptible to interference, but many of them radiate harmonics that interrupt amateur communications. Any suggestions?—N8RK.

BOO TO HOME BREW

I'd like to say a few words in defense of store-bought ham gear.

It seems kind of fashionable these days to heap scorn on so-called "appliance operators," who offend the old guard by not personally building all their transmitters and receivers. At one time, everybody built everything, because that was the only way to get hold of the stuff at a price within the average ham's budget. It was more a necessity than a virtue. The practice had several undesirable side effects.

First, it limited the sophistication of a piece of equipment to the amount of time the owner could spend on designing and building it. The entire cost of development was spent on one single piece of hardware; there was no way to amortize part of the cost over a large run of units, except for the occasional club group project. Guess why things like bandpass i-f filters never caught on until the late 50s?

Second, it limited the amount of testing that could be done to whatever was within the capabilities of the test gear the owner could afford to buy, build, or borrow. Guess what? Spurs all over the place, and mediocre audio.

Third, it slowed the building of equipment enormously, because each assembly job was cut-to-fit using the simplest hand tools. There was no opportunity to tool up for a design and build up some speed. So, a damn sight less equipment got built, and fewer people were willing to bother in the first place.

And where are the virtues of home brewing what can be bought? How does the world benefit from having yet another Novice design and build a CW transmitter whose circuit is essentially the same as the thousands that have been made since 1925? Does anyone seriously think that this kind of project teaches anything applicable to keeping the real workhorse gear—synthesized FM rigs and broadbanded sideband transceivers—working right?

Home brewing was a stage ham radio had to pass through in order to get off the ground, but it never could have grown up to be a serious, reliable, useful form of communication if it hadn't grown out of that stage. Today's gear would be neither adequate nor affordable if there weren't a way of concentrating more effort on its development and construction than a single individual can bring to bear, nor would there be enough hams to supply an adequate response when a disaster strikes.

There's still home brewing, of course, and for good reasons. Ham technology continues to advance, and at the cutting edge the market is small and commercial equipment doesn't exist. When a piece of gear is needed, either for a test or for regular use, and it can't be found, that's the time to get out the reference library, the desktop computer, and the scope. But to build *everything*? We'd never get anything done! Sure, ham technical talent is capable of equaling any professional talent on any task, but let's concentrate that kind of effort where it's needed instead of trying to lay guilt trips on people who are really bringing the strength of diversity to our hobby.

John A. Carroll AB1Z
Bedford MA

Right on, John! Although I truly enjoy home brewing accessories and other small projects, I have no interest whatever in designing and building my next HF rig. I'd rather concentrate on the human side of our hobby, which is every bit as important as the

technical side. Hams are still doing plenty to advance the state of the art. Satellites, microwaves, spread spectrum, moonbounce...there is no shortage of challenging frontiers.—WB8BTH.

SCOUTING HELPS HAMS

Your May editorial calls for clubs to entice young people into the ranks of amateur radio operators. You listed a number of activities for young people which you regard as distractions from ham radio. One of the activities listed was Boy Scouts. Rather than being a distraction from ham radio interest, Scouting can become a tool in developing new hams.

Radio clubs which wish to actively pursue new young operators should encourage their members to become certified with their local Boy Scout Council as Communication Merit Badge counselors, or the club should sponsor an amateur radio special-interest Explorer Post. Boy Scouts are young men from age 11 to 18, and Explorers are young men *and* women from age 14 to 21.

My experience with Scouting as a leader encouraged me to earn my ticket at the age of 33. Please don't put Scouting down; encourage the ham radio community to get involved in Scouting.

John C. Mullan KA2MKU
District Commissioner
Fuertes-Frontenac District
Baden-Powell Council, B.S.A.
Ithaca NY

On my honor, I will do my best...—N8RK.

LOOKING WEST

Bill Pasternak WA6ITF
c/o The Westlink Radio Network
Suite 718
7046 Hollywood Blvd.
Hollywood CA 90028

Dedication: I wish to dedicate this month's column to the memory of my friend and writing colleague, Ray Thill WA9EXP, who died tragically on Sunday, May 31, 1981. Ray was a very special person to many of us. We loved him and we will miss him very much.

In last month's column, I mentioned that I had heard the audiotapes of Dr. Dave Gardner's ill-fated Palmyra DXpedition in 1979. In fact, I spent a little over 50 working hours editing them into a form that Dr. Gardner could use in talks he was planning at that time.

The tapes were recorded by another amateur here in Los Angeles, Bernie Abrahamson W6PJX. Bernie used 2400' mylar™ reel-to-reel tape which ran at a speed of 3-3/4 IPS. He captured much of what transpired during that time including most of the emergency communication between Palmyra and the US mainland.

Editing the tapes into usable form meant first transferring or "dubbing" them from 1/4 track to full track; I upped the speed to something workable for editing purposes, grouping emergency contacts with one another, DXpedition contacts together, etc. This was done by listening to the tape and hand-cutting pertinent sections together on separate reels.

The next step was the most time consuming: removing parts which contained nothing but dead air, totally unintelligible communications, and material not really pertinent to the operation. The equipment used consisted of a Tandberg Model 6 for playback, a Sony TC-250 (full-track converted) for recording, and a modified Sony TC-155A with an Edit-All S-2 block for assembly. (By the way, for those of you outside the broadcast industry, this is called "Assembly Editing," aptly enough.)

The final work was to transfer the many completed open-reel tapes onto standard audiocassettes. For this, the Sony 250 was played through my Vanco Port-A-Board mixer into a Panasonic RS-260-US stereo cassette deck which was parallel-channel connected for monaural recording. As you can tell, this was quite a chore. In fact, over 600 splices were involved in making the raw original into a form usable for discussion and evaluation purposes. Obviously, over this 50-hour period, I became intimately aware of much of the DXpedition's experiences and the problems it faced.

Two things that stand out in my mind were the numerous instances of interference to DXpedition emergency communications—interference that was obviously of the intentional kind—and other instances where amateurs seemed far more concerned about when DXpedition operation would commence than about the welfare of those who were stuck on that isolated rock. The thought of a contact to that rare location seemed to cause many amateurs to lose all common sense. The 5-second contact and hoped-for QSL seemed to replace all sense of reason for many.

I was really appalled by some of what I heard. I find it hard to believe that human beings, hams like myself, would value a lousy piece of paper over the lives of a group of fellow amateurs. Nor were these the only instances of disregard. Some of the disregard was for the amateur rules themselves, such as calling the operation *on frequency* for a contact while operation was below the US phone band. Also, the sometimes downright nasty comments by those who committed the same regulatory violation in order to get the original offender off the frequency.

Since the bogus QSL card story broke, I have spoken with many hams about it. Opinions vary from "How could they possibly have done this to the DXCC program?" to a simple "Right on...it's about time someone cleaned up this ARRL-created mess." Most comments have fallen somewhere in the middle, like, "Now that it's all in the open, maybe we have a chance to revamp things a bit to make it less competitive and more in line with the basis and purpose of amateur radio."

I think these are the people who are on target. I see nothing wrong with having a sport in amateur radio—a sport called DXing. But when this sport becomes an obsession and causes so many to lose all sense of propriety, then the rules by which the game is played must be changed.

Most of those into DXing with whom I have spoken feel that two changes are needed. The DX Advisory Committee rather than the General Manager must be the entity to decide on the validity of a country or place for DXCC credit, and the DXCC Honor Roll must be eliminated. This, they say, would keep the sport, make it even more democratic in the judgment aspect, and take away the razor edge from the competitiveness.

They are the experts in this one, not I. If I ever get back into DXing it won't be from this QTH because of antenna restrictions. It will be on my old friendly 6-meter band only. As I wrote once before, the HF DXer could learn a lot from his VHF/UHF brethren with regard to cooperation. Many VHF/UHF DX records attest to this. Ask people like WB6NMT or N6NB if you don't believe me. Cooperation is how the records are set. That's how everyone gets his slice of the pie.

SECOND-CLASS CITIZENS

Some three years ago, a friend of mine decided to run for the ARRL Vice Directorship in his division. He went through the nominating process only to be declared ineligible because he held a Technician-class, not a General-class, license. He thought he was eligible to run for that office because, according to the ARRL, there are only two classes of membership: full members, who are any licensed amateurs, and associated members, who are unlicensed and therefore cannot vote for either Director or Vice Director.

(By the way, Newington, in case you have never read your own paperwork, nowhere can I find anything regarding SCM elections. Does this mean that an associate member can vote for SCM?)

My buddy was, and still is, very active in local amateur radio affairs. He spent years working in AREC (now ARES), organized communications for walkathons and other civic events, has been active with many radio clubs, and is currently the presi-

dent of one. He is a person who gets things done and he felt he could do even more. So, when he was rebuked by Newington only because he did not hold a General-class license, he was rather upset and planned legal action on what he felt was an obvious contradiction between the League's corporate charter and their operating rules. The cost of such litigation caused him to decide against it, so we will never know if he would have been elected or not. He was popular, but so was the incumbent. Both were good men. But this has caused many amateurs to wonder if the ARRL isn't guilty of something called "License-Class Bigotry," discriminating against an individual because he or she does not meet certain arbitrary criteria set forth by the League hierarchy.

I must ask: How many Novices and Technician-class operators are there who would gladly serve in an elective post if not for this restriction? (A restriction enacted by the Executive Board, and not one that appears in the ARRL's corporate charter!) One of the excuses often uttered in defense of this policy is that Novices and Techs cannot operate on certain bands where League-function networks are held. That may be true today, but we are entering a new era, one of amateur communication by geosynchronous satellite. It won't be too many years before the 80-meter nets are a thing of the past, having been replaced by similar on-the-air conclaves via satellite. The entire future of the Amateur Service really lies in space communications, and these are frequencies that the Tech can and does operate.

Believe it or not, there are people who have no interest whatsoever in operating on any band below 50 MHz. They view HF as a zoo, a place to be avoided at all costs. Hence, they see no need to upgrade. Many never will. Yet these very same people are ready, willing, and able to lead. They want to lead. They have the ability to lead.

I can only wonder what excuse the ARRL will have for keeping these people as second-class citizens some 10 or 20 years down the pike. As I and many others see it, another change needed in the ARRL is for an end to this type of license-class discrimination. People must never be judged on their ability to copy 13 words per minute as is now the case. If you are going to set some criteria, then they must be overall, and the most important point is willingness to serve.

My buddy didn't have the financial wherewithal to make it stick, but one of these days a Novice or Tech will come along who will. It may take such action if HQ doesn't wake up to the realization that we are in a new era. The 1980s. An era of split-second communication. A time in which amateurs are attuned to what's happening around them. Many of today's amateurs, regardless of license class, are politically active. They want and demand to have their voices heard, and if the ARRL doesn't attune itself to this, then one of these days there may be a "court ordered Novice in Newington," with everyone else up there wondering how it happened. The electoral process needs drastic revision. Ending the license class requirement to hold office would be a major step. I can only hope it's a voluntary one initiated in Newington, and not one that is eventually court ordered. There are better ways to see my dues spent than on protracted court battles.

By the way, I have no interest in becoming an ARRL official, nor am I eligible under Rule 11, with which I agree for the most part. Those of us who make a living, even in part, from amateur radio, should not run for such offices.

There are some exceptions I would like to see made even here, however. A few months ago, Wayne alluded to the true story behind the 1980 Southwest Division Vice Director's race which saw Gordon West WB6NOA disqualified from candidacy that time. I don't have the time this month to go into it extensively, but I will in the near future. Suffice it to say that Gordon was disqualified because, as editor of *CB Magazine*, he decided to use that vehicle as a way of helping CBers who wanted to get their amateur tickets. To that end, he began publishing a license-training course using training material from the League itself. It was in part because of this that he was disqualified. There's more, but we'll get into it later on.

I'd like to invite you, the reader, to voice your feelings about the ARRL and what direction you feel it should take in the decades to come. What changes are needed, if any? I have my views. I invite yours and will be happy to print them in this column as space permits. It's your League and mine. Let's tear down the "codfish curtain" together and make the ARRL play.

KAHANER REPORT

Larry Kahaner WB2NEL
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Washington DC 20016

PLAIN LANGUAGE REVISITED

The first time that I read through the plain language rules' comments in February, the red vinyl FCC binder was thin. I checked again in late June, and it took four, fat looseleafs to hold it all. A torrent of letters arrived at the last minute even though hams had since December (theoretically, at least) to comment. That's not unusual, however; most petitioners wait until the cut-off date. But in this case, hams largely ignored the plain language proposal until recently.

Several amateurs asked for a six-month extension for comments, saying that they couldn't get their hands on the *Federal Register* issue in which the rules were published until March. In addition, some said their clubs got bogged down printing and distributing the 50-page document to members because of the rule's bulk.

The FCC denied all extension requests. They said the rules were out for public comment for nine months (again, theoretically), much longer than other proposals and that the amateur community wouldn't be served by further delays.

However, Carlos Roberts, Private Radio Bureau chief, showed compassion. When the ARRL asked him to reconsider their petition for extension—this time they only asked for two extra months—he agreed. By the time you read this, that extension will have expired (August 21), and the "replies to comments" period begun.

With so many comments to wade through, I couldn't get an accurate count on the definite yeas and nays. Most comments seemed somewhere in between, with hams liking some parts, despising others. Some just wanted to trash the whole thing.

One objection stood out, though. Overwhelmingly, hams took exception to the text's beginning in which the commission dropped the traditional principles and reasons for amateur radio spelled out in Part 97: promotion of international goodwill, public service, perfection of communications technology, and so forth. The new rules just leave it this way: for the satisfaction of the operator.

Many commenters deemed that to be too simple a statement for such an important facet of the service. They believed the FCC's new approach too basic, that it lowered the Amateur Service's stature to that of the CB Service, noted several hams. Their pride hurt. Their egos ached.

In a more practical vein, however, other hams pointed out that when the time comes for amateurs to defend their frequencies—as they must often do when another service believes it can make better use of the ham bands—intruders will look at the given official reason for amateur radio, and then use it to show the frivolous and self-serving nature of the service. Also, they added, to those who know absolutely nothing about amateur radio, the statement of purpose doesn't say anything substantial, doesn't teach an outsider anything.

I talked with Roberts about the plain language rules, and he assured me that the commission staff remains open-minded. "That's why we put the rules out

for comment," he said. He emphasized that the proposal isn't etched in stone—not by any means—and that before the rulemaking period ends, he expects changes, both in wording and in substance, based on comments.

What the FCC really looks for in comments is not "I hate any change; I hate the new rules" kind of letters, but the "I hate the new rules because..." types. Or, "I like the new rules except for ..." So, keep those cards and letters coming in. And be specific.

And a word on comments. It's a rich-man's game. The FCC doesn't make it easy for private citizens to read filed comments so interested parties can reply. The only place dockets are kept is in Washington, DC, at Commission headquarters. If you live in Seattle, you're out of luck unless you maintain counsel here. And that's precisely what broadcast stations, common carriers, and others do. It's spawned a whole new industry. Lawyers make their living just following rulemaking for their clients, duplicating letters, and mailing them out. (Actually, lawyers often hire college students at cut-rate prices to do the legwork.)

One trick attorneys use to make life easier is to intervene in a rulemaking—make a comment, any comment. Then, following the rules of professional etiquette among attorneys, you become part of the "service" list and anyone who comments afterwards automatically sends you his filings.

Well, what started this whole plain language thing? Why did the FCC decide to rewrite the amateur radio rules in the first place? The stock answer that Commission staffers give inquirers is that it stemmed from an executive order. That's Washington talk for "the President told us to do it."

In this case, that's quite true, and when I jog your memory you'll recall it. The Carter administration was hot on the idea that legalese was becoming too foreign a language for government documents that affected the public. Carter declared that federal agencies should begin programs to rewrite rules in plain English. The FCC took that edict to heart (other agencies, unfortunately, didn't) and started work on the CB Part 97 rules and those governing maritime radio operation. They did such a good job on the CB rules that the President held it up as a model for other agencies to follow.

So, the commission, reeling from all the executive attention, decided to expand the project to the next logical area: amateur radio. Because of its strong general public interest, it seemed the next likely candidate.

FCC staffers took the President's order seriously and attacked Part 97 like it was part of an etymological holy war. They can't turn back now even if they wanted.

With budget cuts keeping people running scared, afraid to even hint that they were wasting public monies, stopping the plain language rulemaking now would be embarrassing. Too much time, effort, and money have been invested already. Also, a large number of FCC staffers still loyal to the Carter administration intend to carry out his order. In addition, the FCC boasts that they rewrite better than anyone else and vow to keep it that way, pal.

No matter how strongly you ask the FCC to stop the rulemaking, no matter how much you yell and scream, chances are slim on dropping the matter. My guess is that it's going to happen whether you like it or not. So, again, keep those cards and letters coming in. It's your only chance for a fair shake.

NO CODE, NO WAY—ALMOST

It comes in cycles. For some reason, the amateur community is once again talking about a no-code ham license. It could be because of the '79 WARC decision which allows dropping the code requirement for licensees transmitting above 10 meters. That International rule takes effect in 1982, and the FCC can, if it wants, follow it. However, WARC doesn't allow no-code for 10 meters and below. According to the agreement, code below 30-MHz still reigns. As an aside, the US Senate has yet to ratify the WARC treaty.

The no-code proposal has been floating around the commission for about 10 years, but contrary to some reports, the FCC harbors no immediate plans to drop the code requirement.

However, highly-placed FCC sources told us they favor a no-code ticket designed with VHF, UHF, and microwave experimenters in mind. It's not necessary, the thinking goes, for operators to understand International Morse just to tinker with the new technology. In fact, very little if any futuristic radio techniques will employ International Morse, and the FCC knows it. The commission still looks to hams as prime movers for expanding radio technology, and it doesn't want to hinder the state-of-the-art because someone can't master the dit-dahs.

Instead of the code, though, FCC officials say they would substitute a very difficult written test—with emphasis on the word "difficult." Even though commission officials seem to agree with this concept, it's still a long way off. If it were implemented tomorrow, it still couldn't take effect until 1982.

NEW PRODUCTS

MCM's Automatic Antenna Tuner.

AUTOMATIC ANTENNA TUNER

The Daiwa CNA-2002 marks a major advancement in antenna tuner technology with a compact, economical, and automatic 2.5-kW antenna tuner. The relatively small size of the CNA-2002 is made possible by a Daiwa breakthrough in high-voltage variable capacitor design. The large, old-style, variable capacitors have been replaced by small, rugged, encapsulated units. The CNA-2002 makes it possible to achieve an optimum antenna match in a minimum amount of time.

The matching function of the tuner becomes automatic whenever the operate button is pressed (5 to 50 Watts of rf must be applied to the tuner). The internal detection circuitry detects forward and reflected power and the resultant proportional dc voltage is applied to the motor control amplifier, which in turn drives the tuning motor. The tuning motor is connected to two variable tuning capacitors through a gear train using a 30:1 gear ratio. Automatic operation ceases when the swr dips below 1.5:1. Two fine-tuning controls on the right-hand side of the CNA-2002 can be used to quickly lower the swr to 1:1. The CNA-2002 performs its automatic tuning function in less than 45 seconds!

The tuner section of the unit can be switched out to permit the swr metering function to be used independently. The CNA-2002 incorporates the unique Daiwa cross-needle meter. It allows forward power, reflected power, and swr to be read simultaneously without sensitivity adjustments! The CNA-2002 also features a built-in 100-Watt dummy load, two switchable antenna outputs (SO-239 connec-

tors), and a linear amplifier remote-control terminal.

For more information, contact *MCM Communications, 858 E. Congress Park Dr., Centerville OH 45459; (513)-434-0031.* Reader Service number 486.

BEARCAT 100 HAND-HELD SYNTHESIZED SCANNER

Electra Company has announced a breakthrough in scanning radios with their new Bearcat® 100 hand-held portable, which they will manufacture here in the US. Fully synthesized, it requires no crystals. Compressed into a 3" × 7" × 1¼" case is more scanning power than many base or mobile units. The unit has a full 16 channels with extended frequency coverage. Power consumption is kept extremely low by using a liquid-crystal display and several low-power integrated circuits which are new to the industry.

The Bearcat 100 produces an audio power output of 500 milliwatts and a hefty one Watt when used in conjunction with the accessory ac adapter included in the package. The unit has patented Track Tuning, high selectivity, and sensitivity of less than a microvolt on all bands and all channels.

The unit operates on 6 AA batteries and has a battery-low LED indicator to signal when to recharge. A special internal circuit protects against overcharging while also preventing excess drain on the batteries. The unit's wide frequency coverage includes all public service bands (low, high, UHF, and "T" bands), both 2-meter and 70-centimeter amateur bands, plus military and federal land mobile frequencies. The unit has direct channel access and a built in automatic scan delay. The package includes a sturdy carrying case, earphone, and battery charger/ac adapter.

Complete details are available from Bearcat scanner suppliers, or by writing to *Electra Company, 300 East County Line Road, Cumberland IN 46229.* Reader Service number 480.

VOICE CONTROLLER

Remote control by voice via radio or telephone is now possible with the Covox Model I voice controller. Low in cost and fully self-contained, this noise- and click-resistant system extracts the voicing component of speech from low-grade voice communication circuits in the manner of a human listener.

The primary measure of voicing duration is modified and corrected through cross correlation, with vowel sounds characterized by the spoken words "dih" and "dah". Spoken Morse, binary, or RTTY codes are reliably recognized with considerable tolerance of the particular speaker and voice-channel quality.

A 16-word vocabulary controls anything that can be switched: garage doors, wheelchairs, etc. Use the fundamental pitch output for proportional control tasks, such as varying motor speed or dimming lights. Low power requirements make it ideal for portable systems using mobile, marine, aircraft, amateur, or CB radio.

The system is flexible, with applications to such diverse tasks as driving external vibrators for aiding the deaf through the sense of touch, or working in conjunction with a host computer to achieve a high degree of security in telephone or radio identification. The system comes complete with ac adapter, microphone, and user's manual. For more information, contact *Covox Company, PO Box 2342, Santa Maria CA 93455; (805)-937-9545 or 928-4818.* Reader Service number 483.

INSTANT-TUNING WEATHERADIO®

Radio Shack, a division of Tandy Corporation, has announced a new three-channel VHF-FM weather broadcast receiver. This latest addition to the company's line of Weatheradio® receivers features crystal control of tuning for instant station selection with a simple three-position switch, eliminating the problem of off-channel tuning and drift.

The crystal-controlled Weatheradio (12-152) receives NOAA/National Weather Service broadcasts on any of the three channels used: 162.550, 162.475, or 162.400 MHz. Because of the precise frequency selection possible with crystal control, stations can be accurately selected with a three-position switch instead of the usual manual tuning knob.

An rf amp brings in NOAA VHF weather stations at a range of up to 50 miles, making this receiver effective virtually anywhere in the United States.

The crystal-controlled Weatheradio is housed in a low-profile design with a simulated rosewood finish. It measures just 1-1/2" × 5-1/4" × 3-1/4" (H × W × D). The convenient top-mounted play-bar turns the unit on and off; the channel selector and volume control are hidden beneath the unit, since these settings are seldom changed in actual use. A 2-1/4" (diameter) speaker is top-mounted for excellent clarity.

Signals are captured by an attached antenna, which can be telescoped down and folded behind the unit for easy storage, if desired. Power is provided either from a 9-volt battery (not supplied) or an optional ac adapter (not included, available separately).

The Model 12-152 crystal-controlled Weatheradio and ac

Bearcat's hand-held synthesized scanner.

The Realistic crystal-controlled Weatheradio.

adapter are available at Radio Shack stores and participating dealers. Reader Service number 485.

DATAK FLEXY-MARKER

The Datak Corporation has developed a novel wiremarker. Called Flexy-Marker™, it is claimed to be the first major design improvement in 30 years.

The new marker breaks with tradition by using no cloth. It is made instead from a dead-soft vinyl plastisol film that clings and conforms to all wires. The adhesive adheres especially well to vinyl and will not loosen when the marker is flexed or exposed to heat and hydraulic and lubricating oils. The recommended upper temperature limit is 125° C, but when samples of the new marker were exposed continuously to 150° C, they showed no loosening and only a slight cosmetic discoloration.

While ordinary marker legends have a tendency to wear off when roughly handled, Flexy-Marker legends are heat-fused into the plastisol film so that they remain legible under the most severe working conditions. They are unaffected by most solvents and easily withstand the abrasion encountered from fishing wires through conduit and raceways.

If a standard wiremarker is hand-applied, it is difficult, if not impossible, to avoid contaminating the adhesive at the end of the marker. The result, after a few days, can be a loose or dangling marker. Flexy-Markers avoid this problem with a 3/8" tear-off tab that serves to both apply the marker and to seal down the end in one continuous motion. Flexy-Markers are perforated so that they can be used on one large diameter wire (0.35" diameter) or on a terminal strip and two smaller wires.

The new markers are supplied in sets of 24 identical sheets bound into a handy 3-1/4" × 5-1/2" pocket pad. The pads all contain a set of 1056 1- and 2-figure markers. The marker range initially includes identical and sequential numbers to 520 as well as the alphabet, supply-voltage designations, and miscellaneous machine-wiring designations. For more information, contact *The Datak Corporation, 65 71st Street, Guttenberg NJ 07093; (201)-869-2200.* Reader Service number 489.

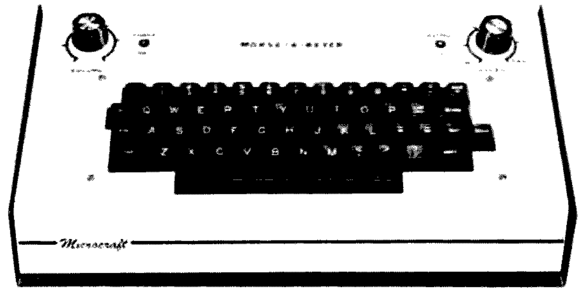
MORSE-A-KEYER CW KEYBOARD

A low-cost, dependable CW keyboard is now available from Microcraft. It features an industrial-quality keyboard, a rugged steel case, and a 16-character first-in, first-out buffer which allows you to type slightly ahead of the text being sent. Also included are an internal speaker, a sidetone monitor, and a "buffer-full" LED warning.

The speed range is 5 to 45 wpm, standard, but can be easily increased by changing one resistor. A reed relay is used to key your transmitter and to provide isolation between the keyboard and associated equipment.

The Morse-A-Keyer is available as a partial kit, complete kit, or factory wired and tested. The partial kit consists of a PC board, construction manual, and board parts. The builder must supply an ASCII-coded keyboard, a 5-V at 120-mA supply, and miscellaneous hardware.

Shipments are made worldwide and requests for quotes are invited. Contact *Microcraft Corporation, PO Box 513, Thiensville WI 53092; (414)-241-8144.* Reader Service number 481.



The Microcraft Corporation Morse-A-Keyer.

TUBULAR PLYWOOD

Molded tubular plywood, a unique product with multiple uses, has recently been developed for industrial applications. Known as Plytube, it is a tough, versatile, and economical tubing, yet retains the warmth and beauty of natural wood. Stronger than steel, weight for weight, it is nonconductive, noncorrosive, waterproof, lightweight, and easy to cut and handle. In large diameters, it can be a low-cost replacement for fiberglass, metal, or plastic tubing.

Plytube is bonded under heat and high pressures with specially developed resins. This chemical impregnation gives the material unusual hardness and impermeability. It resists fungi, flame, and salt air and can be treated for underground installations. For special purposes, one or two of the wood plies can be replaced by metal, wire mesh, or synthetic laminates.

In the electronics field, Plytube offers unlimited uses. It is ideal for low-cost, easy-to-erect antenna masts. It can be used as coil forms for transformers, bobbins for coils, insulators, for lightweight housings, loudspeaker enclosures, and packaging of fragile or valuable instruments.

Plytube is available in any thickness from 3 to 46 plies and up to 84" in diameter. While circular in shape, it also can be formed in square, oval, and rectangular configurations. It can be extended to any length by internal or external sleeves. By using various types of wood and construction techniques, it can be adapted to a wide variety of weight and strength characteristics. For more information, write *Plytube Corporation of America, 39 S. Canal Street, Lawrence MA 01843.* Reader Service number 482.

Molded tubular plywood from Plytube Corporation.

TRAILERED TOWERS

Trailer-mounted antenna towers can be erected by a single person in record time as was

Indiana Quick Charge's QC500 charger.

recently demonstrated at Telex/Hy-Gain. From the time the trailer was parked to the full extension of the tower, only 15 minutes had passed. The company also demonstrated that these self-supporting crank-up steel towers are easily trailered even by passenger cars. According to the manufacturers, the trailer towers are exceptionally well suited to microwave tower surveys, their construction or repair, for site evaluation of repeaters, and for emergency field communications.

Towers are mounted on the trailer by a method which requires only one winch to tilt and erect the tower to its full height. Single-axle trailers, complete with legal running lights, accommodate medium to heavy-duty towers to 52 feet (15.85m). Two-axle, heavy-duty trailers with towers to 70 feet (21.3m) are also available.

For full information, contact Clyde Blyleven, *Hy-Gain, Division of Telex Communications, Inc., 8601 N. E. Highway Six, Lincoln NE 68505; (402)-467-5321.* Reader Service number 487.

INDIANA QUICK CHARGE QC500 CHARGER

Indiana Quick Charge, Inc., has announced the development of their newest product, the QC500 nicad fast charger. The QC500 is a combination home fast charger and mobile battery eliminator for nicad-powered portable hand-held transceivers.

The QC500 offers a quality constructed housing of die-cast metal that measures 2-1/2" × 4-1/4" × 1-1/4" and is covered with a gray baked-enamel finish that resists marring from constant use. Also featured are indicator lights that show input voltage, short-circuit condition, and output voltage, allowing the user to be assured of correct operation at a glance. Enclosed accessories include a UL-approved 1-Amp wall transformer (for home use), a mobile eliminator cord (which plugs into automobile cigarette lighter sockets), two replacement fuses, and a complete instruction manual. A warranty covers parts and service on the unit for a period of one year from date of purchase.

The QC500 is designed with heavy use and durability in mind. The charging unit is virtually indestructible physically and electrically. The unit can survive shorted output conditions and improper polarity connection. Both the input and output are fused to protect the charging unit and the user's equipment.

When used with the supplied wall transformer, the charger typically supplies 300 mA to the battery pack, gradually tapering down to 40 mA in about 4 hours. Extensive filtering of the charging current will allow normal operation with most equipment while the charging unit is in operation. When used with the mobile cigarette-lighter cord, the charging unit will allow operation of the user's radio equipment while in motion. Models are in stock for most popular hand-held units and the QC500 is readily adaptable to virtually any nicad-powered device with a 4- to 9-cell battery pack.

For more information, write *Indiana Quick Charge, Inc., 367 West Main Street, Danville IN 46122.* Reader Service number 488.

NEW HAMTRONICS® CATALOG

Hamtronics, Inc., has announced publication of a new expanded catalog crammed full of goodies for the VHF/UHF/OSCAR enthusiast.

The 40-page two-color catalog features a new 5-channel, 10-Watt VHF FM transceiver, new COR and CW ID modules for repeater builders, and new accessories, such as rf-tight enclosures for repeaters and power supplies. Also featured are the new T51 (VHF) and T451 (UHF) FM exciter modules. Many new ranges of transmitting and receiving converters have been added, as well as a series of receiving converters to extend the frequency coverage of scanners to new military, satellite, and commercial bands. The catalog also includes the full line of Cushcraft and Larsen VHF and UHF antennas.

For your free copy of this new catalog, write to *Hamtronics, Inc., 65F Moul Rd, Hilton NY 14468; (716)-392-9430.* (For overseas mailing, please send $2.00 or 5 IRCs.) Reader Service number 484.

SP-300 *from page 46*

sensors, and everything else are shielded from both each other and the outside world. Swr sensors? Yup. This meter has three, and they are switch-selectable from the front panel. Three different rigs and antennas can be connected to the meter at the same time. Each sensor has its own input and output connectors, and if there is any crosstalk between them, I couldn't detect it.

The first sensor covers 1.8 to 200 MHz, with a maximum power input of 200 Watts. The second covers the same frequency range, at a maximum level of 1 kW. These two sensors are fed with UHF connectors. The third sensor covers 130 to 500 MHz at a maximum of 150 Watts, and wonder of wonders, it's fitted with N-type connectors!

The SP-300 offers both relative and absolute power measurement using the procedures outlined earlier. Accuracy is rated at 10 percent, but should be much better than that under normal circumstances. Recalibration to a laboratory standard is possible, but as the instruction sheet says, "This SP-300 was perfectly tuned and adjusted by us, so don't try to remove the cover of this set and touch the inside." Cute.

I only found one thing on this meter to worry me, much less complain about. There are three LEDs on the front panel to indicate which sensor is in use. Other meters using the same scheme have had some problems with the LEDs rectifying the signal, causing radiation of harmonics. I didn't experience this unwelcome phenomenon, but if you should, or if you want to be careful, it is a simple matter to clip the LEDs out of the circuit.

All things considered, this is a surperb piece of equipment that outclasses most of the competition in looks, features, and performance. It isn't cheap, but what is these days? For further information, contact *NCG Company, 1275 N. Grove Street, Anaheim CA 92806,* and pray he has a few left. Enjoy! Reader Service number 479. ■

OSCAR ORBITS

Courtesy of AMSAT

The OSCAR satellites are subject to atmospheric drag, of course, and the present period of intense solar activity has accentuated the problem. During this period, our sun has been expelling huge numbers of charged particles, some of which find their way into the Earth's upper atmosphere, increasing the density (and thus the drag) there. It is through this region that the OSCARs must pass. OSCAR 8, in a lower orbit than OSCAR 7, is the more seriously affected of the two.

If the drag factor is not considered when OSCAR calculations are performed, long-range orbital projections will be in error. For example, by the end of 1979, OSCAR 8 was more than 20 minutes ahead of some published schedules. The nature of orbital mechanics is such that extra drag on a satellite causes it to move into a lower orbit, resulting in a shorter orbital period. Thus, the satellite arrives above a given Earthbound location earlier than predicted.

Using data supplied to us by Dr. Thomas A. Clark W3IWI of AMSAT, the equatorial crossing tables shown here were generated with the aid of a TRS-80™ microcomputer. The tables take into account the effects of atmospheric drag and should be in error by a few seconds at most.

The listed data tells you the time and place that OSCAR 7 and OSCAR 8 cross the equator in an ascending orbit for the first time each day. To calculate successive OSCAR 7 orbits, make a list of the first orbit number and the next twelve orbits for that day. List the time of the first orbit. Each successive orbit is 115 minutes later (two hours less five minutes). The chart gives the longitude of the day's first ascending (northbound) equatorial crossing. Add 29° for each succeeding orbit. When OSCAR is ascending on the other side of the world from you, it will descend over you. To find the equatorial descending longitude, subtract 166° from the ascending longitude. To find the time OSCAR 7 passes the North Pole, add 29 minutes to the time it passes the equator. You should be able to hear OSCAR 7 when it is within 45 degrees of you. The easiest way to determine if OSCAR is above the horizon (and thus within range) at your location is to take a globe and draw a circle with a radius of 2450 miles (4000 kilometers) from your QTH. If OSCAR passes above that circle, you should be able to hear it. If it passes right overhead, you should hear it for about 24 minutes total. OSCAR 7 will pass an imaginary line drawn from San Francisco to Norfolk about 12 minutes after passing the equator. Add about a minute for each 200 miles that you live north of this line. If OSCAR passes 15° east or west of you, add another minute; at 30°, three minutes; at 45°, ten minutes. Mode A: 145.85-.95 MHz uplink, 29.4-29.5 MHz downlink, beacon at 29.502 MHz. Mode B: 432.125-.175 MHz uplink, 145.975-.925 MHz downlink, beacon at 145.972 MHz.

At press time, OSCAR 7 was scheduled to be in Mode A on odd numbered days of the year and in Mode B on even numbered days. Monday is QRP day on OSCAR 7, while Wednesdays are set aside for experiments and are not available for use.

OSCAR 8 calculations are similar to those for OSCAR 7, with some important exceptions. Instead of making 13 orbits each day, OSCAR 8 makes 14 orbits during each 24-hour period. The orbital period of OSCAR 8 is therefore somewhat shorter: 103 minutes.

To calculate successive OSCAR 8 orbits, make a list of the first orbit number (from the OSCAR 8 chart) and the next thirteen orbits for that day. List the time of the first orbit. Each successive orbit is then 103 minutes later. The chart gives the longitude of the day's first ascending equatorial crossing. Add 26° for each succeeding orbit. To find the time OSCAR 8 passes the North Pole, add 26 minutes to the time it crosses the equator. OSCAR 8 will cross the imaginary San Francisco-to-Norfolk line about 11 minutes after crossing the equator. Mode A: 145.85-.95 MHz uplink, 29.4-29.50 MHz downlink, beacon at 29.40 MHz. Mode J: 145.90-146.00 MHz uplink, 435.20-435.10 MHz downlink, beacon on 435.090 MHz.

OSCAR 8 is in Mode A on Mondays and Thursdays, Mode J on Saturdays and Sundays, and both modes simultaneously on Tuesdays and Fridays. As with OSCAR 7, Wednesdays are reserved for experiments.

● IMPORTANT NOTE: At press time, it appears that OSCAR 7 has finally expired after more than six years of service. We continue to publish the orbital parameters, based on the slim hope that the satellite can be brought back to life. For further details on the demise of OSCAR 7, see "Death of a Satellite" on page 97.

OSCAR 7 ORBITAL INFORMATION FOR SEPTEMBER

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
31086	1	0053:39	94.8
31099	2	0147:53	108.4
31111	3	0047:10	93.3
31124	4	0141:24	106.9
31136	5	0040:41	91.7
31149	6	0134:55	105.3
31161	7	0034:12	90.1
31174	8	0128:26	103.7
31186	9	0027:43	88.6
31199	10	0121:57	102.2
31211	11	0021:14	87.0
31224	12	0115:28	100.6
31236	13	0014:45	85.4
31249	14	0108:59	99.0
31261	15	0008:16	83.9
31274	16	0102:30	97.4
31286	17	0001:47	82.3
31299	18	0056:01	95.9
31312	19	0150:15	109.5
31324	20	0049:32	94.3
31337	21	0143:46	107.9
31349	22	0043:03	92.7
31362	23	0137:16	106.3
31374	24	0036:34	91.2
31387	25	0130:47	104.8
31399	26	0030:05	89.6
31412	27	0124:18	103.2
31424	28	0023:36	88.0
31437	29	0117:49	101.6
31449	30	0017:06	86.5

OSCAR 8 ORBITAL INFORMATION FOR SEPTEMBER

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
17793	1	0103:11	79.4
17807	2	0107:44	80.5
17821	3	0112:17	81.7
17835	4	0116:50	82.9
17849	5	0121:22	84.0
17863	6	0125:55	85.2
17877	7	0130:28	86.4
17891	8	0135:01	87.5
17905	9	0139:33	88.7
17918	10	0000:55	64.1
17932	11	0005:27	65.2
17946	12	0010:00	66.4
17960	13	0014:32	67.6
17974	14	0019:05	68.7
17988	15	0023:37	69.9
18002	16	0028:09	71.1
18016	17	0032:41	72.2
18030	18	0037:13	73.4
18044	19	0041:45	74.6
18058	20	0046:17	75.7
18072	21	0050:49	76.9
18086	22	0055:21	78.0
18100	23	0059:53	79.2
18114	24	0104:24	80.4
18128	25	0108:56	81.5
18142	26	0113:28	82.7
18156	27	0117:59	83.9
18170	28	0122:30	85.0
18184	29	0127:02	86.2
18198	30	0131:33	87.3

OSCAR 7 ORBITAL INFORMATION FOR OCTOBER

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
31462	1	0111:20	100.1
31474	2	0010:37	84.9
31487	3	0104:51	98.5
31499	4	0004:08	83.3
31512	5	0058:22	96.9
31525	6	0152:35	110.5
31537	7	0051:53	95.3
31550	8	0146:06	108.9
31562	9	0045:23	93.8
31575	10	0139:37	107.4
31587	11	0038:54	92.2
31600	12	0133:08	105.8
31612	13	0032:25	90.6
31625	14	0126:39	104.2
31637	15	0025:56	89.1
31650	16	0120:09	102.7
31662	17	0019:27	87.5
31675	18	0113:40	101.1
31687	19	0012:57	85.9
31700	20	0107:11	99.5
31712	21	0006:28	84.4
31725	22	0100:42	97.9
31738	23	0154:55	111.5
31750	24	0054:12	96.4
31763	25	0148:26	110.0
31775	26	0047:43	94.8
31788	27	0141:57	108.4
31800	28	0041:14	93.2
31813	29	0135:27	106.8
31825	30	0034:44	91.7
31838	31	0128:58	105.3

OSCAR 8 ORBITAL INFORMATION FOR OCTOBER

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
18212	1	0136:04	88.5
18226	2	0140:36	89.7
18239	3	0001:56	65.0
18253	4	0006:27	66.2
18267	5	0010:58	67.4
18281	6	0015:29	68.5
18295	7	0020:00	69.7
18309	8	0024:31	70.8
18323	9	0029:02	72.0
18337	10	0033:32	73.2
18351	11	0038:03	74.3
18365	12	0042:34	75.5
18379	13	0047:04	76.6
18393	14	0051:35	77.8
18407	15	0056:05	78.9
18421	16	0100:35	80.1
18435	17	0105:06	81.3
18449	18	0109:36	82.4
18463	19	0114:06	83.6
18477	20	0118:36	84.7
18491	21	0123:06	85.9
18505	22	0127:36	87.0
18519	23	0132:06	88.2
18533	24	0136:36	89.4
18547	25	0141:06	90.5
18560	26	0002:25	65.9
18574	27	0006:54	67.0
18588	28	0011:24	68.2
18602	29	0015:54	69.3
18616	30	0020:23	70.5
18630	31	0024:53	71.6

✓See List of Advertisers on page 114

HAM HELP

I need a schematic and any possible information on a Model 305 Stewart-Warner radio made about 1928. I will pay any reasonable price.

Charles D. Simmons W6PDH
PO Box 6238
Buena Park CA 90622

I need a supply source for a solid-state HV rectifier diode (25 kV) for a TV CRT.

Joseph A. Kramer WA9DJR
Box 246
Earlville IL 60518

I need a replacement cabinet back for a Hallicrafters Model S-38B shortwave receiver. If anyone can supply one, please quote price.

C. D. Prewitt K4ZCD
129 N. Maysville St.
Mt. Sterling KY 40353

I am in need of Collins equipment, either for parts or units which can be repaired.

H. F. Shnur
115 Intercept Ave.
North Charleston SC 29405

I need a schematic and/or service manual for a Tennalec MS-2 crystal-less scanner. If you have either, please send a postcard and let me know what you have. Thanks.

R. Latini
Box 6109
Hamden CT 06517

I would gladly pay copying cost for schematic and parts lists for a Boonton 260-A Q-meter and a Muzak STR-100 SCA receiver.

Dave Overton
1709 W. 30th St.
Austin TX 78703

Can anyone help me find info and schematics on an RCA Berkshire multiband (.5-22 MHz) AM/FM auto-tune receiver? It's part of a radio and projection TV system available in Secretary or Regency (contemporary and modern) cabinets. It is similar to the Army AR-T8 system. The auto-tune won't work and the factory has been no help. I will pay for any info.

Larry A. Rickard WB2BIS
23 Campbell Ave.
Jamestown NY 14701

Help is needed in keeping "pulses" generated by a Bearcat 210 scanner from interfering with nearby two-meter receivers. If you have a cure, please contact me.

Charles L. Kelsey WB2EDV
RD #2, Elmwood Avenue
Mayville NY 14757

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Whiting NJ 08759

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GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7A	7	7	7	7	7	7	14	14	14A	21
ARGENTINA	14A	14	7	7	7	7	14	21	21A	21A	21A	21
AUSTRALIA	21	7A	7B	7B	7B	7B	7B	7B	7B	7B	14	21
CANAL ZONE	14A	14	7	7	7	7	7A	14	21	21A	21A	21
ENGLAND	7A	7	7	7	7	7A	14	21	21A	21A	14	14
HAWAII	21	14	7	7	7	7	7	7B	14	21	21	21A
INDIA	7	7	7B	7B	7B	7B	7A	14A	14	14	14	7A
JAPAN	14A	14	7A	7B	7B	7	7	7B	7B	7B	14	21
MEXICO	14	14	7	7	7	7	7	14	14A	21A	21A	14A
PHILIPPINES	21	14	7B	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	7A	7	7	7	7	7	14	14A	21A	21A	21	14
SOUTH AFRICA	14	7	7	7B	7B	7A	14	21	21A	21A	21A	14
U. S. S. R.	7	7	7	7	7B	7B	7B	14	21A	14	14	7
WEST COAST	21	14	7	7	7	7	7	14	21	21A	21A	21

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7	7	7	7	7	7	14	14	14A	21
ARGENTINA	21	14A	14	7	7	7	14	14A	21	21A	21A	21A
AUSTRALIA	21	14	7B	7B	7B	7B	7B	7B	7B	14	14A	21
CANAL ZONE	21	14	7	7	7	7	7A	14	21	21A	21A	21A
ENGLAND	7A	7	7	7	7	7	7A	14	21A	21	14	14
HAWAII	21A	14	7	7	7	7	7	7	14	21	21	21A
INDIA	14	14	7B	7B	7B	7B	7B	14	14	14	14	14
JAPAN	14A	14	7A	7B	7B	7	7	7	7B	7B	14	21A
MEXICO	14	14	7	7	7	7	7	14	14A	21	21A	21
PHILIPPINES	21	14	7B	7B	7B	7B	7B	7	14	14	14	14
PUERTO RICO	14A	7	7	7	7	7	7A	14	21	21A	21A	21
SOUTH AFRICA	14	7	7B	7B	7B	7B	14	21	21A	21A	21	14
U. S. S. R.	7	7	7	7	7B	7B	7B	14	21A	14	14	7B

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14A	14	14	7	7	7	7	7	7A	14	14A	21
ARGENTINA	21	14	14	7	7	7	7	14	21	21A	21A	21A
AUSTRALIA	21A	21	14	14	7A	7	7	7	7	7B	14	21A
CANAL ZONE	21	14	7	7	7	7	7	14	21	21A	21A	21A
ENGLAND	7B	7	7	7	7	7	7B	14	21A	21	14	14
HAWAII	21A	21	14	7A	7	7	7	7A	14	21	21A	21A
INDIA	14	14	14B	7B	7B	7B	7B	7B	14	14	14	14
JAPAN	21A	14A	14	7	7	7	7	7	7	7	14	21A
MEXICO	21	14	7A	7	7	7	7	7A	14	21	21A	21A
PHILIPPINES	21A	14A	14	7B	7B	7B	7B	7	14	14	14	21
PUERTO RICO	21	7	7	7	7	7	7	14	21	21A	21A	21
SOUTH AFRICA	14	7B	7B	7B	7B	7B	7B	14	21	21A	21A	14
U. S. S. R.	7	7	7	7	7B	7B	7B	14	21A	14	14	7B
EAST COAST	21	14	7	7	7	7	7	14	21	21A	21A	21

First letter = day waves Second = night waves
A = Next higher frequency may also be useful
B = Difficult circuit this period F = Fair
G = Good P = Poor * = Chance of solar flares

SEPTEMBER

SUN	MON	TUE	WED	THU	FRI	SAT
		1 G/G	2 G/F	3 G/G	4 G/G	5 G/G
6 G/G	7 G/F	8 G/G	9 G/G	10 G/G	11 G/G	12 G/G
13 G/G	14 G/G *	15 F/P	16 G/F	17 G/F	18 G/F	19 G/F
20 F/F	21 G/G	22 G/G *	23 F/P *	24 F/F *	25 F/P *	26 P/P
27 F/F	28 G/G	29 G/G	30 G/G			

October 1981 $2.95

73 MAGAZINE FOR RADIO AMATEURS

10

74470 65946

INFO

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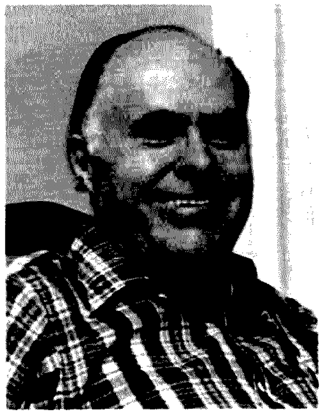
oct. 81

SPECIAL CONTEST ISSUE!

Cover: K1OX's multi/multi station is a contester's dream (article begins on page 18). Photo by Paul Grupp KA1LR.

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green



THE OLD OLD-TIMERS

While talking with someone about the sudden stopping of growth of amateur radio in 1963, when the "incentive licensing" proposal was put to the FCC, I was able to put this situation in better perspective by making a simple calculation.

From the period of 1946 to 1963, a seventeen-year period, amateur radio grew at the rate of 11% per year. This was fairly steady growth. Then it instantly stopped, with a net loss in hams over the next ten years. Since then, it has been growing again, but very slowly. Today, 18 years after incentive licensing was proposed, our growth is only where it would have been by 1965, two years later. We've lost almost a whole generation of hams. . . sixteen years worth!

Let's put that further into perspective. This means that on the average, hams have gotten sixteen years older. Well, I think we see that at clubs and hamfests. We have a huge proportion of retired hams these days. I think this has a lot to do with the drop in the buying of ham equipment, since retired people are for the most part trying to eke out an existence from Social Security and are in no position to spend a thousand dollars or more for a new station.

We see it also in the drop in the inventiveness of hams. Most retired hams are not up with the latest in technology and are not able to do much to keep up the ham reputation for inventiveness and pioneering. . . which is a young man's game. We shut the young men out for a sixteen year period, so we don't have many of them any more. No wonder amateur radio has produced so little in the way of innovation in the last 20 years.

The ham inventors and pioneers were, for the most part, youngsters. I was 26 when I got going strong on NBFM and RTTY, running beacons on 6m and so on. Copthorne McDonald was a young chap when he developed slow-scan television. Oh, a few old-timers hang in there, working away. A recent article on Reinhart told about his inventions. . . well, he was still going strong right up until he died. He wrote articles for *73* in the early 60s. And Bill Hoisington did tremendous UHF developmental work in his 60s and is still going strong in the Philippines. But these up-to-date old-timers are few and far between. Most older hams are still thinking tubes and kc instead of ICs and GHz.

With over one million electronics engineers and technicians kept out of the American work force because they never got into amateur radio, it is no wonder that our country is getting further and further behind Japan in electronic technology. Our hobby and our country are paying the price for that loss of a generation of hams.

If we just want to try to catch up with the growth that we would have had were it not for the incentive licensing disaster, we will have to grow at the rate of 33% per year for the rest of this decade. If we can figure out how to do that, I think that American technology could catch up with Japan. Other than that, I see no serious hope of our country ever regaining our ground.

Should we just shrug our shoulders and give up? Or is this something worth fighting for? This is something which I can't do alone. . . and which no one of you can do alone. But it is something which all of us together, if we really want to, could tackle and win.

I am not going to butt my head against the wall trying to do something which most hams don't care about. We *can* get amateur radio growing again. We can even get it into a 33% growth pattern. . . if we really want to. It will mean cooperation and a dedication of purpose which we have not seen in amateur radio in many years. It seems to me that we're going to need to have every ham possible join a club, and see that we get every high-school student we can into our license classes.

In a recent talk with the FCC, I brought up this situation and I believe that our fight may be helped from the highest office. . . the White House.

My own preference is to tackle the problem with new ideas. I realize that by far most hams are opposed to a no-code ham license, no matter how fantastic this has been for the Japanese. . . and what great operators they are. . . and how much this has packed their research labs with enthusiastic ham engineers who are pushing their country ahead of ours. Okay, if you don't want to even think about that. . . what *do* you propose which could get us growing?

Could we help the FCC by taking over both the teaching and the granting of ham licenses as a function of our ham clubs? This would cut FCC expenses enormously and might bring new life to ham clubs. Hams have always shown that they can be responsible and self-governing. Well, perhaps it is time to take that next step.

What are *your* ideas? Is it worth the bother?

W2NSD/1 ON-THE-AIR SCHEDULE OCTOBER, 1981

1	15-20 Phone
13	20m RTTY
20	20-40 Phone
27	15-20 CW

Response to our 15- and 20-meter phone sessions has been especially strong, so we have scheduled additional time on these two bands. On both phone and CW nights, look for us in the first 25 kHz of the General portion of each band. We'll be on the higher frequency band first, from 7:00-10:00 pm eastern time.

DF BREAKTHROUGH

Readers should be aware that construction or use of the direction-finding system described in the article "DF Breakthrough" which appeared in the June, 1981, issue of *73* may possibly be an infringement of US Patent #4,041,496, issued to Paul Norris.

Any unauthorized construction or use for commercial purposes of a patented invention is an infringement of that patent. Construction of a single unit for the experimental or personal use of the constructor is not considered commercial use.

ST. LUCIA

Against my better judgment, we took off a few days and zipped down to St. Lucia. No negatives as far as the island is concerned; it was mostly worry about keeping up with the work load brought on by the introduction of a new magazine: *Desktop Computing.* When a new magazine is being started, there is al-

most an infinite number of details which have to be cared for. There are the subscription letters, the advertising brochures, the mailing lists, the letters to authors (looking for articles), the quick trips to shows to rustle up more articles and more advertising, the hiring of editors, writers, more graphic arts people, the expansion of our buildings, new typesetting equipment, new presses for the in-house printing, more ad sales people, and so on. Add to that trying to cope with the growth of Instant Software, where ever more people, equipment, and space are needed, plus two very healthy computer magazines which are growing, and the boss, me, has his hands full.

We went to St. Lucia anyway, and it was worth the trip. It was worth it many times over. Firstly, there is no way that I will ever be able to thank the St. Lucian hams enough for their attention, their help, and their interest in making the visit enjoyable. In addition to Sherry, Tim Daniel N8RK of the *73* staff went along, as did Chuck Martin WA1KPS of Tufts Electronics. The ham business was slack in June, so Chuck said what the heck and joined us on the trip.

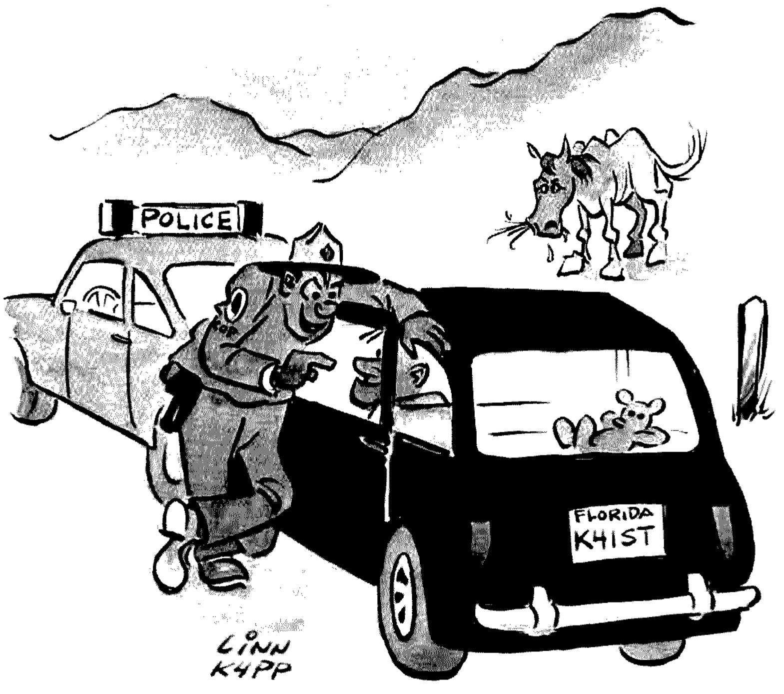
Though we arrived late at night, we were met by a bunch of the local hams, complete with a cooler full of beer, champagne, and even some soft drinks. It was warm, so the refreshments were a great beginning for our visit. When they offered to drive us to the hotel, that seemed like a good idea... and it sure was. We had no idea that the hotel was on the other end of the island, an hour and a quarter drive over a twisty, narrow potholed road. It was like driving a high-speed obstacle course at night, whipping around deep holes in the pavement every four hundred yards. Fortunately, there is little traffic on the St. Lucia turnpike, which is just two cars wide and goes through mountains just about all the way.

Our hotel, recommended by Eastern Airlines, was a bit of a disappointment. It was wonderfully located, right on a gorgeous sandy beach with palm trees. But the meals were uninspiring. There we were in the middle of a tropical paradise, with fruit at every turn, and the hotel couldn't manage a banana or any other fruit for breakfast. Canned orange juice.

The rooms were clean and some of the air conditioners worked, so I had no complaint about that... nor the ocean

Continued on page 175

Well... I Can Dream, Can't I? by Bandel Linn K4PP



"I saw your license plate! There's a traffic jam ahead! Follow me and I'll lead you around it!"

Jeff DeTray WB8BTH
73 Magazine Staff

Contesting from VP5

—the other end of the pileup and how to get there

It began as a fantasy in August, 1980, and ended seven months and 8,100 QSOs later as a contester's dream-come-true. Tim N8RK had just returned from a week in the Caribbean, where he'd been working with other hams to assist the devastated island nation of St. Lucia to recover from the effects of Hurricane Allen (See "Hams vs. Hurricane Allen," *73 Magazine*, November, 1980). We were examining a detailed map of the Caribbean, discussing his trip, when one of us turned to the other and said, "I wonder which of these islands is rare enough to be a good spot for a DXpedition?" It was just idle chatter, or so we thought. As it turned out, none of the easily-accessible islands could be considered really rare. However, a couple of places, notably the Turks and Caicos Islands (VP5), were heard less often than most of the others. An idea began to grow. What if we did an expedition? Pretty heady stuff, that! After all, weren't DXpeditions the business of such DX luminaries as Don Miller, Gus Browning, and the Colvins? We set out to prove that a couple of average guys could do it, too.

Our first view of the Turks and Caicos—the tiny island of Grand Turk. Note the airport runway, which runs from shore to shore.

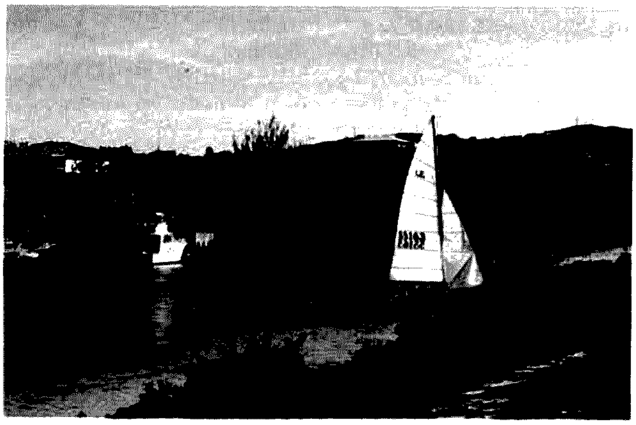
Getting Organized

As with any complex project, proper planning became the key to success. In order to give ourselves sufficient time to bring together the hundreds of details, we selected the first week of March, 1981, as the departure date, giving us a full seven months to organize our trip. This date also coincided with the phone weekend of the annual ARRL DX Competition, in which we planned to enter the multi-operator, single-transmitter category. We still didn't know for sure where we were going, but at least we knew when!

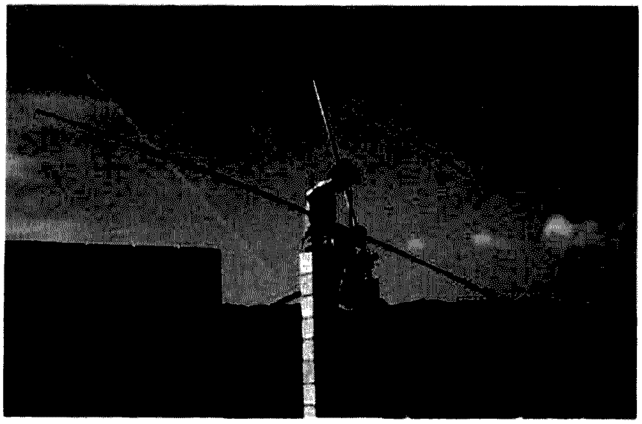
From the outset, planning the trip was an unwieldy exercise in long-distance communication. Tim returned to Terre Haute, Indiana, in late August to continue the pursuit of a degree in electrical engineering, while I remained in New Hampshire. We would not see each other again until March 1st, two days before leaving for VP5-land.

The following seven months were busy, punctuated by long QSOs on 20 meters, lengthy letters, and late-night telephone calls. Tim's acquaintances in the midwest and mine in New England thought our remote-control organizing of such a trip was more than a little unusual, especially since neither of us had ever before been involved in any sort of expedition.

Tim set to work researching the licensing procedures for VP5 and several other countries, while I investigated travel and accommodations throughout the Caribbean. At this juncture, a chance conversation with Joe WB4OSN saved us weeks of work. Joe had visited the Turks and Caicos Islands several times, and he heartily recommended this tiny British possession as an ideal destination for our DXpedition. He spoke with special favor of a place called the Third Turtle Inn, on Providenciales Island (forever after known as "Provo"), one of the largest islands in the Turks and Caicos group. As if this weren't enough, Joe even provided information on air connections to Provo, which was handy, since the commercial airlines do not yet fly there directly from the U.S.A. After educating our



The Third Turtle Inn on Grace Bay, site of our VP5TDX/VP5JDT operation. Built into the side of a cliff, the inn is a popular spot for DXpeditions. We stayed in the small building at upper left.



A partially-completed cinder-block wall provided a sturdy support for our tribander. Here, Tim prepares to hoist the antenna into place on a protruding piece of reinforcing rod.

travel agent on the whereabouts of the islands and getting his assurances that rooms were indeed available at the Third Turtle, the die was cast... we were going to VP5!

We soon learned that the Turks and Caicos in general, and Provo in particular, were the home of some of the world's very best snorkling and scuba diving. Throughout the winter of 1980-81, first one and then another skin-diving magazine sang the praises of Provo and the Third Turtle Inn. We decided we had picked the right place.

Meanwhile, Tim was discovering conflicting information on the best route for obtaining our reciprocal operating permits. In fact, we came up with no less than three plausible ways of getting a VP5 license. Fortunately, while Tim's first attempt failed to bring a VP5 license, it did bring the correct information from the Magistrate's office in Grand Turk, the capital city. It was a tight squeeze, however, with our licenses eventually arriving less than three weeks before D-Day. Having these precious documents in hand was a tremendous relief.

It appears that, in the absence of any special request, the Magistrate issues callsigns based on the applicant's initials. Thus I received VP5JDT, while Tim came away with VP5TDX. Applicants who ask for particular suffixes seem to get them, as long as they have not been issued previously.

Details, Details

From the first, every bit of advice that came our way emphasized the importance of careful equipment selection and organization. Coming up short on something as simple as PL-259s could completely ruin an otherwise well-planned trip. The list of required items, from transceivers to suntan lotion, grew almost daily for six months. It eventually occupied seven pages in the small notebook that became my constant companion. In many ways, it was like planning a large Field Day effort, except that the nearest junk box or ham store was 750 miles away.

Early on, we decided to take along a pair of transceivers from the same manufacturer. We reasoned that this would allow us to exchange components in the event of rig failure. It also made all microphones, headsets, keyers, etc., interchangeable without rewiring connectors when going from one rig to another.

In the end, we chose Kenwood gear: a TS-520 loaned to us by good friend Bill W1HCS and an 830S from the OM himself, W2NSD/1. Antennas would be a trap vertical (again courtesy of HCS) and a Cushcraft A3 triband beam. Telex ProComm 200 headset/boom mikes, an MFJ antenna tuner, and a remote vfo for the 520 completed the inventory of major gear.

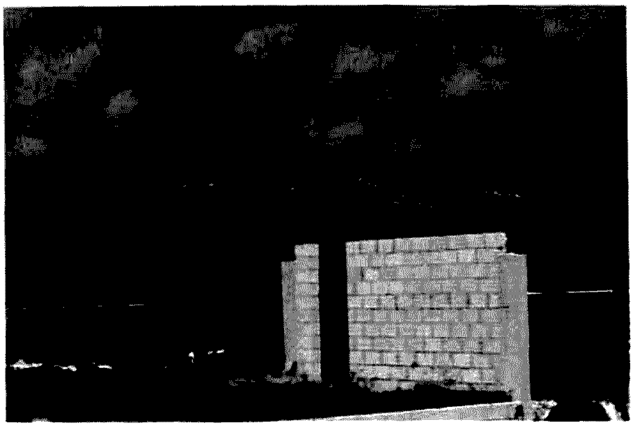
W1HCS also volunteered his address as the mail drop for the many incoming QSL cards that were certain to follow our trip. Both Tim and I had changed our mailing addresses so often in the past few years that our *Callbook* listings were accurate only in the most recent editions. It may seem like a very minor detail, but the use of a long-established address such as Bill's greatly simplified our on-the-air response to requests for QSL information. Bill's lovely wife, Lynn, accepted this imposition with extraordinarily good grace.

As planned seven months beforehand, Tim arrived in New Hampshire just two days before departure for VP5. Those last 48 hours were spent carefully packing the four suitcases and two antenna bundles which comprised our gear. A fifth bag held all our personal items. The trap vertical and most of the beam were stowed in a red, white, and blue ski bag. Aside from getting us a lot of strange looks in the sunny Caribbean, this proved to be an efficient way to carry those dozens of aluminum tubes. It also had the advantage of sticking out like a sore thumb amongst the piles of baggage at the airports through which we passed; no chance of losing that one. Just in case, however, we decided to carry a minimal station with us aboard the aircraft. On Monday afternoon, March 2, we dashed through our several-hundred-item checklist one last time. Then, it was off to Boston's Logan Airport for a night flight to Miami.

Slowly, Slowly

After seven months of anticipation and a frantic last two days, Tim and I were on a natural high as we flew first to Miami, and the next day, on to Grand Turk, the only place in the Turks and Caicos served by jets from the U.S. We had booked reservations on the Turks and Caicos National Airlines (TCNA) for a connecting flight to Provo, our final destination.

Although the runway at Grand Turk spans the entire width of the island, it's still a short one. Our small 737



Once atop the wall, the antenna was tied off to prevent the ever-present tropical breezes from tearing it to pieces. Kansas is dead ahead.

jetliner used all but the last 100 feet or so in making a smooth landing. After clearing customs and immigration, a task made easier when we showed officials our reciprocal licenses, the first order of business was to check the status of our TCNA flight to Provo. On this matter, there was bad news and good news. The bad news was that the TCNA plane had already departed . . . without us. The good news was that it had been filled to capacity anyway, so we really hadn't missed anything. Oh, well!

It was quickly obvious that both life and business in the Turks and Caicos ran at a somewhat more relaxed and informal pace than we were accustomed to. We began to explore alternative transportation to Provo and encountered a pilot, an American, who offered to fly us to Provo at no charge, since he lived on the island. The only hitch was that his single-engine plane refused to start, even when jumped from a truck battery. Three hours later, no apparent progress had been made, although our erstwhile pilot was still trying. His only comment was, "Slowly, slowly." We began to wonder if we'd ever see Provo.

The sun was setting behind the Grand Turk control tower when opportunity knocked in the form of charter pilot Howard Hamilton and his beautiful twin-engined Cessna. Howard was bound for Provo and announced his willingness to take passengers if we could leave immediately. Leaving the bulk of our ham gear in the hands of an airport official, Tim and I grabbed the 520, the antenna tuner, some wire, and our cameras and jumped aboard Howard's plane in the failing light. More than an hour later, we arrived over Provo in almost total darkness, at which time Howard executed a near perfect landing without benefit of runway lights or any sort of traffic control. We'd made it.

Faster, Faster

The Third Turtle Inn has played host to a number of visiting hams over the years and has one room which is ideally situated for amateur radio operations. This cliffside QTH was to be our home for the next seven days. Shortly after our arrival, Tim wandered among the bushes and small trees at the cliff's edge, rigging a very-random wire antenna. The wire tuned up just fine on 15 meters, and we were on the air within minutes.

We had decided to use Tim's VP5TDX callsign during the contest and my own VP5JDT before and after the big weekend. Since the contest was still three days away, it was VP5JDT (with Tim at the mike) which called CQ and worked W2JLO for QSO #1 of our week in paradise. A handful of contacts were made that first night prior to a wonderful seafood dinner and some much needed sleep.

By 1:30 the following afternoon (Wednesday), TCNA had managed to ship the remainder of our ham gear from Grand Turk to the Third Turtle Inn. In between excursions to the beach, we managed to get the vertical on the air, and the pace began to quicken. We settled in for some serious precontest operation that continued until 2:00 am, and whichever one of us wasn't working the pileups was bolting together pieces of the beam. We spent time on both modes and found 20-meter CW especially productive.

Things really began to hop when the beam went up Thursday afternoon. The pileups became enormous. As our proficiency grew, so did our contact rate—from 60 to 90 to 150 contacts per hour. Our beam was fixed on the center of the United States, since that's the area we'd be working in the contest. Despite this, a number of Japanese and European stations were worked, mostly as a result of superb operating on their part, especially on CW. About 1500 contacts were made by VP5JDT in the days preceding the contest weekend.

Not that we spent all our time operating. Are you kidding? This was our vacation, too, and we took full advantage of the superb beaches, fine swimming, and delicious food served up by the Third Turtle. When Friday evening rolled around, we were warmed up, rested up, and eager to have at it. At 0000 UTC, we switched callsigns to VP5TDX and plunged headlong into the fray, with KBØPR as the first of 6,300 contest contacts.

The vast majority of the contest is a blur of QRZs, signal reports, and callsigns. However, several highlights, both good and bad, do stand out.

- We made 200 QSOs during the first hour of the contest. Suddenly, we knew we'd be competitive.
- Saturday found us running 10 meters for 8 consecutive hours, averaging 189 QSOs per hour for the duration. The 10-meter propagation was superb, resulting in 2,700 contest QSOs on this band alone.
- Our initial goal of 3,000 QSOs was exceeded with more than half the contest still to go.
- With our adrenalin really pumping, neither one of us did much sleeping during the entire first night of the contest. As a result, we made a lot of mistakes on Sunday morning, and we each fell asleep at the mike at least once.
- We managed 27 contacts on 160 meters, despite the world's worst antenna—a 75′ random wire just five feet above the ground.
- Chaos reigned when the 830S gave up the ghost on Sunday morning, blowing a filter capacitor in response to an overvoltage on the power line.
- Only five minutes after the last contact (with KC4IW), our remaining rig, the TS-520, also went down for the count, popping an FET on the rf board. Fortunately, the contest was over, with 6,300 QSOs in the log. We'd averaged 130 QSOs per hour for 48 hours!

The Aftermath

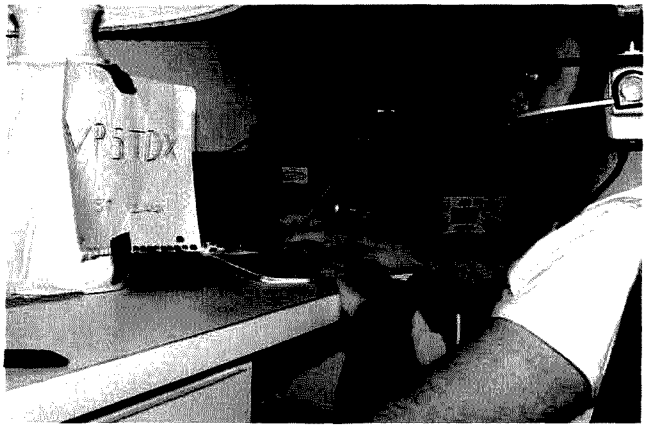
Monday morning found us hard at it, scavenging parts from the 520 to get the 830S back on the air. We succeeded and made 325 more contacts before closing down for good late

Monday night. WB2RWW was the last of some 8,100 contacts made during our one week sojourn in the Turks and Caicos Islands. All too soon, it was back to reality, and reality was a cold March night in New Hampshire, with a temperature of 35 degrees, about 50 degrees lower than in the islands.

The two of us spent three weeks duping our logs, finding about 300 stations that had worked us unnecessarily. The duping chore was greatly eased by the use of two TRS-80 microcomputers. Our final tally of 5991 QSOs and 4,924,602 points broke no records, but compared quite favorably to the high scores turned in after past contests. We should at least win the certificate for VP5!

QSLing has proved to be a very time-consuming chore. In fact, answering our mountain of cards has required the most time of any single aspect of the whole project. And lest you think DXpeditions always receive envelopes stuffed to bursting with green stamps, be advised that our income so far hasn't even paid for the extra stamps we've had to buy as a result of last spring's 3¢ postage increase. And cards are still arriving, six months later.

It's been debated whether a trip to a pleasant and not-so-rare place like VP5 should be called a DXpedition. Some prefer to reserve that term for visits to more exotic and extremely rare spots such as Spratly Island and Clipperton. But whether you call it a DXpedition, a DX vacation, or something else again, it's a fact that many of the cards we have received bear the inscription, "Thanks for the new country." As we all know, any country is rare if you haven't worked it yet.



A very frazzled WB8BTH near the end of the contest. At this stage, one rig was dead and we had run out of contest log sheets. The sign on the lamp became an increasingly-needed aid to remembering our callsign.

From our viewpoint, the thrill was in being on the other end of the pileup at least once in our lives. It means calling CQ and always getting an answer. It means a QSO rate limited only by how fast you can send or talk. It means finding out just how courteous most hams really are. It means being a celebrity, if only for a little while.

Would we do it again? In a minute! Would we do it differently? Of course; it's always easy to spot your mistakes using 20-20 hindsight. Should you give it a try? By all means! If we can do it, so can you.■

In Profile: Ted Gamlin, A Contester

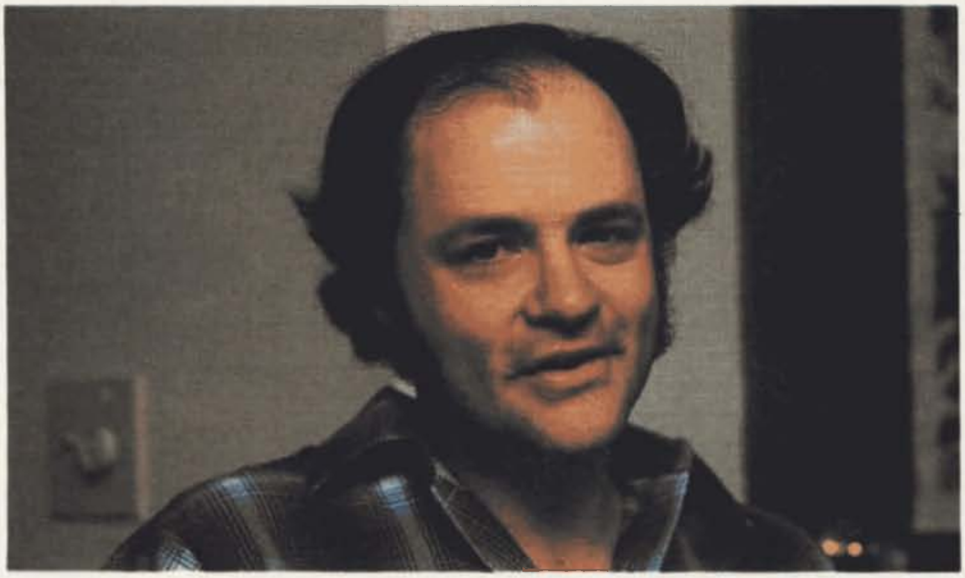
Chris Brown KA1D
73 Magazine Staff

In a darkened farmhouse on the crest of a windswept New England hill, conventional time has stopped for 13 men. For them, the hours of the day hold no importance, other than that of marking the approach of sunrise and sunset and the attendant shifts in propagation. This weekend, time is a 48-hour continuum for these men within which they must contact as many DX countries as possible, amass as many QSOs as possible, and do so on as many HF bands as possible. They measure time in the hours of the contest, not of the day.

In their kitchen, dirty dishes, scattered silverware, coffee-stained mugs and half-eaten casseroles litter the countertops like the aftermath of some great feast, but there has been no feasting. Most meals have been gulped in silence and eaten alone. In serious ham radio contesting, there are no communal suppers.

In another part of the house, the contest wing, lights brighten, then dim again, as six Alpha linears bang on and off line. Haggard operators, their voices hinting hoarseness, drive on through the night with their incessant message—CQ CONTEST, CQ CONTEST, CQ CONTEST. The refrain is always the same at Kay One Ocean X-Ray.

K1OX is both man and machine. The man, Ted Gamlin, is an affable and outgoing medical equipment salesman with an extremely competitive nature. The machine is one of the top multi-operator/multi-transmitter contest stations in America and, possibly, the world.



Ted Camlin K1OX: like a general on the battlefield.

The machine is in high gear this weekend for the phone portion of the 1981 ARRL International DX Contest. With its staff of 13, the big multi/multi contest juggernaut is bullying its way through this contest with a vengeance.

The man has a migraine that won't quit.

Stakes are high, but not in terms of dollars (though Ted Gamlin has spent quite a few in the course of adding five skylight-equipped rooms to his house for the sole purpose of contesting, and has raised six towers and twenty antennas in his backyard). The stakes are high in terms of pride. Put simply, Ted Gamlin and the K1OX machine want to kick

everyone's butt in this contest for the simple pleasure of being the best: the best in America, the best in the world.

Sitting in his darkened kitchen on Saturday night, 28 hours into the ARRL International DX Contest, Ted is putting the finishing touches on an intercom signaling system that will tie the six operating positions of his station together.

Amid the chaos that is big-time contesting, he shares his thoughts with *73 Magazine*.

73: This place is a zoo, Ted! Halfway through the contest and you're still building the station.

Gamlin: Yeah, I might finish it someday, too. It's getting to be a full-time job.

73: Speaking of jobs, what do you do for a living?

Gamlin: I'm in the medical field. I sell blood-chemistry analyzers for a New Jersey-based company called Electro-Nucleonics. And, I've been doing this for about eight years now. Man, time flies!

73: Always been in sales?

Gamlin: No. I started out in field engineering. My background is in electronics and I've got an associate degree. But, when the opportunity came up to go into sales, I just couldn't pass it up. It has worked out pretty well.

I like sales. It's a lot of aggression. I guess that's what life is now. Here we are multi/multi contesting . . . aggression at its best, in ham radio, anyway.

73: Do you do any other aggressive kinds of things . . . play sports for instance?

Gamlin: Yes, I enjoy sports. I play ice hockey in the winter, softball in the summer, and I played football and baseball in school. I generally like aggressive things.

73: Were you into hamming as a kid?

Gamlin: Yeah, I got my license in November of 1961, when I was twelve years old.

Diet Pepsi and visual aides help keep K1OX's ten-meter rate high during a morning JA run.

73: And how did you get into contesting?

Gamlin: It's kind of funny. It seemed to happen the way most things do in life: One thing led to another. I was living in an apartment, hiding all sorts of wire antennas in the woods next door, and got the urge to get a house of my own on top of a high hill. I had bolted 40 feet of Rohn 25 to my balcony without bothering to ask the landlord—when you ask, they always say no—and it was time to move. I searched for a house and finally found one. Within eight months of moving in, I was contesting. At first I just wanted to chase DX, but friends talked me into contesting because the site was so good.

"I never do anything halfway."

I never do anything halfway. Towers began going up out in the backyard, and soon I had four. We started contesting and found that we were really competitive. In the first contest we were in, CQ World Wide DX, 1976, we used the call W1RR and took third. The next time out we took second place in the ARRL contest. That was in the old house before I added the contest wing. Everything was in two rooms and halfway through most contests the well would run dry. There was always lots of yellow snow around the house in those days. I'm amazed I could get anyone to operate.

73: How about other ham activities? Do you get into traffic-handling or DXing, etc.?

Gamlin: It's funny; I'm seasonal. At certain times of the year, I chase DX like mad and at other times I could care less. It's really odd; my interests are seasonal. In the summer, I don't think much about HF. I play around with VHF on six and two.

73: Have you got any other hobbies besides contesting and playing sports?

Gamlin: One of my hobbies is body-building. I've got a full weight set in the basement and I lift heavy weights. I do the general kinds of things to stay thin and alive and healthy and happy, that's all.

73: And ready to go up towers at a moment's notice?

Gamlin: Well, you know, that's why I started body-building. In the summer, I'm always active. In the winter, I play hockey but don't do any really heavy work. So, for carrying things up towers in the winter, I wasn't always prepared the way I should have been. That's why I started lifting weights in the off-season . . . the off-contest and off-tower-climbing season.

73: What dedication!

Gamlin: Well, I lift my share of weights in the winter and when summer comes I'm ready. It works out very nicely. I think tower-climbing is one of the best exercises in the world. When you climb up, say, 100 or 160 feet straight in the air, it's amazing what it does to the thigh muscles.

73: Sounds like you're one of the few hams who enjoys tower work.

Gamlin: I do. But I try to pace myself. I climb so that I always have enough energy left to get myself out of a pickle should anything go wrong. Nothing ever has yet, although I've been in my share of binds.

Janice Gamlin: a wife who has learned to live with ham radio contesting.

73: So I understand. There is an anecdote I've heard about the assembly of your 160 footer that's pretty scary.

Gamlin: That's for sure. I built all my towers myself, including the 160-foot Rohn 45. One day, I had climbed up about 130 feet with a 70-pound section hooked to my belt. I was putting on the last few sections without a gin-pole and I said to myself, "Man this thing seems heavy!" I looked down, and the rope left on the ground had looped around another section. I was climbing with 150 pounds of tower sections hanging on my belt. I couldn't let go and I couldn't hang on much longer. The old "What do I do now?" routine.

73: You're crazy!

Gamlin: You're right. Many people have said that, too, including my wife. I've been up these towers in windstorms, total blackness, rain, you name it. I've got stories about what's happened to me on those towers that you wouldn't believe, like the time I got a wrench stuck to my tongue.

73: To your tongue?

Gamlin: Yes, on last Christmas Day. It was about 20 below zero with a wind chill of minus 60. Unbelievable! My lower 20-meter monobander in the stacked array had broken loose in the high winds and was hanging by its truss lines. Before it beat itself to death, I had to go up and secure it. That is the coldest day I've ever been up a tower. I got up to it and just ran out of hands. I put the wrench in my teeth knowing I couldn't touch it with my tongue. But, it wobbled, caught my tongue, and froze to it instantly. There I was, hanging off the tower, freezing to death, trying to pry this wrench off my tongue without giving up too much skin.

73: Speaking of towers, Ted, I've noticed a few around the house. Could you fill me in on the antenna farm?

Gamlin: OK. On 160 meters, we're using a full-size inverted vee. The apex is at 160 feet and the ends are at 90 feet.

On 80 meters, I have a pair a full-wave delta loops in phase. The apex of those is at 160 feet and the bottom legs are about 72 feet off the ground. They are horizontally fed and are on a 42-foot cross-boom. I also have a full-size, 1/4-wave vertical with 98 radials underneath it. It's a Rohn 25 tower on an insulated base. There also is a simple dipole hanging flat-top at about 54 feet and two beverages.

73: That's quite a setup. How about on 40?

Gamlin: On 40 meters, I have a four-element KLM monobander at 95 feet. I also have a two-element monobander at 75 feet which has not been performing very well.

73: And on 20 . . . ?

Gamlin: On 20, I've got a rotatable, five-element monobander at 160 feet. Fixed in the European direction, on the same tower, there is a four-over-four array made up of two four-element monobanders. There also is a four-element monobander fixed on the Caribbean on the 20-meter tower. By the way, all these antennas are switched by Transco low-loss remote relays and fed with RG-9/BU, a silver-plated, double-shielded coax.

73: I see. And on 15 . . . ?

Gamlin: On 15, basically the same situation. A six-element monobander at 105 feet, a fixed four-over-four array to Europe, and a single four-element monobander on the Caribbean.

73: And, finally, ten?

Gamlin: On 10, the top antenna is a seven-element, wide-spaced, home-brew monobander at 95 feet. Then a four-over-four array to Europe at 60 and 30 feet and in the middle of that a four-element monobander on the Caribbean.

73: Are most of the yagis home-brewed?

Gamlin: No. The fixed arrays are all Cushcraft Skywalkers and on 20 and 15 the rotatable beams are both KLMs. Only the 10-meter beam is home-brewed.

73: How about the operating positions? Does each have two transceivers and a third, spotting, receiver?

Gamlin: Yes, except for 160. Right now, I'm a victim of everyone else's equipment. Trying to set everything up in three or four hours before a contest is just murder. Surprisingly, we've had relatively few problems so far.

73: About the station, did you build it all yourself?

Gamlin: Mostly. I had a contractor do the big stuff on the new wing I've added and I'm doing most of the wiring and finish work.

73: How about the station engineering? That, too?

Gamlin: Yes. That's the hard part. Inter-station interference can be very tough to get rid of.

On all bands, you have to have suck-out filters that null the second harmonic of each transmitter, plus bandpass filters all over the place. We've found that the Japanese equipment is very susceptible to overload. Great pains must be taken to keep the level of all that garbage down, and especially no broadbanded transmitters. They are the worst.

I'm really happy with the way everything has turned out, though. It's funny. This

thing has sort of evolved. I never had a complete plan from day one. Once the addition was underway, I realized that there was going to be lots of extra room. It was then that I decided to use it for a massive multi/multi. So, I had five separate rooms framed, lots of sound-deadening insulation put into the walls, solid-core doors hung for each room. Did everything to keep ambient noise down. Ambient noise is the enemy of every multi/multi. It kills them.

With the spiral staircase I put in, I'll never be able to take queen-size beds up to the contest wing so I guess they won't make great guest rooms. They sure make good contest rooms, though.

73: Ted, you seem to have the ultimate setup here in terms of the facilities and equipment. At what point does the human take over and make the difference between winning and losing?

Gamlin: At this level, you have to have the best of both, men and machines. As far as the ultimate setup goes, I'm not quite there, yet. I'd like to have all the equipment in place so that the guys could just come in and operate. My objective here is to keep the people operating under optimum conditions, to keep it enjoyable.

Unfortunately, the building drained me financially to the point where I couldn't provide all the equipment needed. In time, I hope to have good quality radios of my own up there in all the positions. Slowly but surely, I'll get everything set up.

73: So, most of the rigs are now brought in by the operators?

Gamlin: Yes.

73: I thought that you had five Kenwood TS-830s ordered for the station.

Gamlin: I did. But, as I say, the building drained me financially and I couldn't supply an 830 at each operating position.

73: Are you pretty well sold on the 830 as the best contest rig?

Gamlin: More or less. I've looked at lots of rigs, and we have lots of different ones here this weekend, and the 830 seems to have the best receiver in it of any Japanese rig I've ever used. In all cases, we run an outboard receiver anyway so Kenwood's problem of receiver overload is minimized. I also prefer tube-type transmitters. They tend to have cleaner audio and seem more able to take the abuse we give them in a contest. At some point in the future, I'll probably have the five Kenwoods.

73: Ted, I must admit I find it a little strange that after all your effort and expense you don't operate.

Gamlin: If I did, I would be constantly interrupted. I would never be able to sit down, uninhibited, and operate because there always would be people saying "Where's this," "I need that," "What's happened, here," "This went dead."

73: Don't you ever miss operating in these big contests?

Gamlin: Not really. I think I feel more pressure on me than all of these guys. Typically, in every contest

CONTESTER'S WIFE—JANICE GAMLIN

73: As we sit here, you've got a house full of contesters. Do you think your husband is a bit crazy for inflicting these madmen on you several weekends a year?

Janice: **Not at all. I think it's a lot of fun... a lot of good constructive fun. They have all worked very hard this weekend and some are so punchy from lack of sleep they can't see straight. But I don't see it as crazy at all. They are having too much fun for it to be crazy.**

73: Ted tells me that you are studying for your Novice license. Is that true?

Janice: **Yes, I'm trying to, anyway. I go to class two nights a week and I hope to take the test soon.**

73: Any plans to get into contesting?

Janice: **Well, maybe. I probably would try it if I thought I wouldn't get in their way. They get a little... uh, excited up there during a contest.**

73: How long have you and Ted been married?

Janice: **A year this past June.**

73: And you knew about this contest business before the ceremony?

Janice: **Oh, yes. I remember when I first came over to the house, though. I looked at what turned out to be the antenna farm and said, "You've gotta be kidding! Those aren't clotheslines out there."**

Ted said, "No, dear, they're not," and then explained it all to me. I never thought that anyone could be so enthusiastic about anything. I had heard of hobbies, but never anything like this. He has it in his blood.

73: I thought it rather unusual that you had a wing added to the house for the purpose of contesting. Ted mentioned something about always having plenty of room for guests. Any comments on that?

Janice: **He told me at first that we would have five guest rooms above the new family room and two-car garage. Truthfully, I knew from day one that there was something funny about that, especially when I saw the skylights go in.**

Then, Ted told me about the wonderful spotlights he was going to put around the house. He said that they would be pointing up in the air, though, and I asked myself "Why do we want spotlights around the house that point up in the air?" Then it dawned on me: So the contest operators in our guest rooms could see their antennas at night through the skylights!

I went along with the guest-room story until he installed the operating tables, intercom units, and 220-volt wiring. I finally asked him where the guest beds were going, but I knew all along, really.

73: Do you usually have lots of guests around here?

Janice: **I mean how many guests can you have at one time? After all, we're not running a motel. Now that I think of it, most of our guests arrive at contest time.**

73: Have you met any of the other wives or girl friends of these contesters?

Janice: **Well, I have met a couple of wives. That's a problem that I'm up against. The wives of most hams that I've met do not like the hobby; they don't like the people associated with the hobby, either.**

Most wives think that because ham radio doesn't bother me and that I'm happy for Ted, that there is something wrong. They look at me like I'm on their (the hams') side. That's a difficult thing, because I sometimes don't know where I fit in. I have felt that animosity and it's no fun.

73: What do you think the problem is? Why don't wives like their husbands' hamming?

Janice: **It competes with them for their husbands' time. We have 13 guys here this weekend who are not at home with their wives and families. Ted has been working on his station every night for the past two weeks. That kind of commitment can get to you.**

73: But it hasn't gotten to you?

Janice: **If I were the type of person who got upset about things like that, I probably wouldn't have married Ted.**

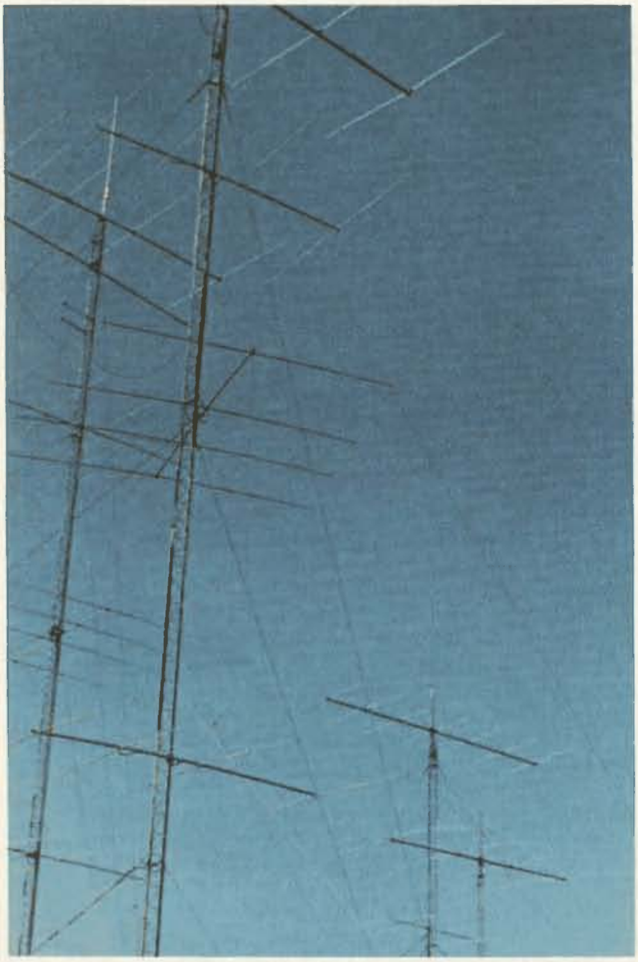
Band	W2PV, 8.43M points QSOs	Multi-pliers	K1OX, 7.8M points QSOs	Multi-pliers	K2UA, 6.94M points QSOs	Multi-pliers
160m	19	14	13	11	14	12
80m	171	72	141	67	113	63
40m	214	73	253	82	281	68
20m	1525	137	1288	140	1100	142
15m	1773	141	1603	133	1441	127
10m	1300	125	1409	120	1365	127

Fig. 1. Some claimed multi/multi raw scores from the 1981 ARRL International DX Contest.

from Friday night right through Saturday night, I develop a massive migraine headache from the tension. I feel the tension and excitement of running six stations, not just one. I never could sit down and actually operate because I'd be worrying about all the problems that might occur in the other operating positions. I just couldn't give my full attention to what I was doing.

73: You do seem to enjoy being the general on the battlefield, don't you?
Gamlin: You know, it's funny you should mention that. Have you noticed the skylights in the ceilings of the operating rooms? My wife saw me looking out of one the other day and told me that I looked like Patton riding in a tank. I had never thought of that before but it came to mind again when I looked out behind the house at the heavy artillery in the backyard, all those towers and antennas. What a trip!

We'll soon find out if we can win with it. I have put together the best facility I could and I've tried to get the best operators available. Now, it's up to them.



Aluminum, copper, and blue sky over K1OX.

73: Do you have trouble finding operators worthy of the station?
Gamlin: Well, I've got to be choosy, and I import ringers when I can. I try to recruit the best operators I know. It takes special kinds of skills to operate different bands, and the ones necessary on 40 or 80 are much different from those needed on 10 or 20, or even 160. Low-band contesting demands lots of endurance. It really can get tedious after a while.

73: So staffing is a problem?
Gamlin: Not really. Lots of guys want to operate from a big multi/multi. It's the highest category and demands a tremendous effort. But, it takes a special kind of operator for each band.

The 10-, 15-, and 20-meter operators have to be able to handle those high morning rates, to be able to pick calls out the first time and ask for a minimum number of repeats to run them as fast as possible. Those early-morning runs to Europe and Asia are wicked.

73: I noticed that you've got a 10-meter operator who speaks Japanese.
Gamlin: Oh, A1 W1FJ. Yes, he was stationed over there at one point. Those JA runs are another thing. You need someone who isn't intimidated by the little S2 mash of Japanese fellows calling, all running 5 and 10 Watts each. It kills you 'cause you're 20 over 9 to them and they are barely creaking through the noise. It takes guys with ears and stamina who can maintain concentration and handle it for hours and hours. Speaking their language doesn't hurt, either.

73: So you are choosy?
Gamlin: Yes. This station is only as good as the operators behind it, and these guys are great.

73: I'm curious, Ted. What are your goals in contesting, both short- and long-term? What do you want from it?
Gamlin: Obviously, I want to win. I think we have all the artillery here: I think we've got some of the best operators around, the facility is convenient, and the inter-station interference is down to nil. I've covered a lot of ground very quickly and now I want to win.

73: Fine, but in terms of competition, are you looking at domestic stations or are you looking internationally?
Gamlin: Internationally is where I enjoy competing but there are some situations, like NP4A who sits just off the coast and racks up some outrageous scores, that are tough to compete against. He's in a different situation than I and, in a way, a different league.

73: And, domestically . . . ?
Gamlin: Domestically, my goal is to beat everyone else in the states. A guy like W2PV has been at it for years. For me to beat him my second time out with this station would be a phenomenal achievement. Whatever happens in this contest, I'm sure it won't be a runaway. If he beats me this time, it's gonna be a squeak-through and he knows it.

At 9:00 pm on Saturday evening, about half-way through the contest, the

running scores are tabulated. Since each operating position at K1OX keeps a constantly-updated multiplier check sheet for its particular band, interim scores are always available. In addition, each operator keeps track of a "need list" for bands other than his own and arranges skeds for the K1OX operation on other bands with as many multiplier stations as possible. An intercom system ties all the operating positions together.

Though Ted's big multi/multi is doing well, it is running slightly behind its chief rival, W2PV. Ted has arranged to exchange scores with W2PV via a two-meter repeater and, as the numbers come in, it becomes obvious that K1OX is not performing up to snuff on 10 and 15 meters. Behind in multipliers (DX countries), K1OX hopes to make up the deficit in Qs (QSOs).

73: Do you normally exchange scores halfway through contests?

Gamlin: No, this is the first time we've been linked by the repeater. It can be very helpful in picking up multipliers, but not enough guys have been using the machine to its full advantage. We should be hearing about more multipliers on it. I'm going to plunk myself on that mother through the last half. I'll tell you that.

73: Would you rather be ahead or behind at this point?

Gamlin: Obviously, I'd rather be ahead. I always want to be ahead. This is only our second time out, though, and while we've got most of the bugs out, it's still a matter of making the operation efficient, flawless. The station which has the most flawless operation, coupled, of course, with the propagation, is going to win.

73: I guess I was thinking in terms of strategy down the stretch. When they might tend to slack off due to fatigue, is it good for your guys to know that W2PV's numbers were a little better than K1OX's so that they will push harder in the last half?

Gamlin: I took great pains to go into each room and show these guys that we are behind, so there is some psychology involved. I hope it will fire them up.

73: Of course, the competition reports the real numbers . . . you don't think he's using some psych of his own do you?

Gamlin: No, no. He's telling it like it is. There's no doubt in my mind.

73: Where is the difference in scores coming from?

Gamlin: 10 and 15 are the biggies. We have had problems with one of the radios on 15 throughout the contest which have hurt us. We would be doing a lot better if it weren't for that.

73: How about strategy, Ted? Do you have a scenario which you are trying to follow during this contest?

Gamlin: A strategy sheet would be important in a single-op or multi/single situation. These operators have got to know when to change bands in order to follow the propagation. In a multi/multi, we are on all bands at all times, so it isn't a matter of puzzling out when to be where. Our key is to monitor the propagation on a given band and get a jump on where to have the antennas pointed to take advantage of shifts.

"In every contest . . . I develop a massive migraine headache. I feel the pressure of operating six stations, not just one."

73: So a multi/multi operation is simpler in terms of strategy than a multi/single or single-operator effort.

Gamlin: Well, in a multi/multi, there is some strategy to consider, but my guys are chosen for their operating strengths on each band.

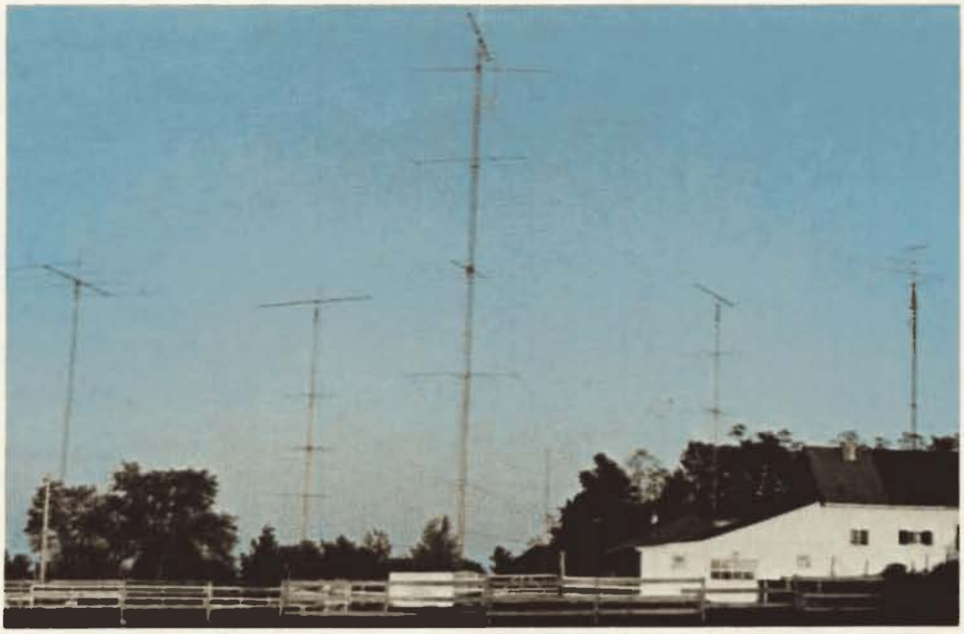
For instance, Jeff Briggs K1ZM, who is on 20 meters, always has won 20 for me in the past. He's just a great 20-meter operator. He's extremely aggressive, one of the most aggressive of the bunch, though I have some close contenders. I've nicknamed him "Animal."

He's great at holding the frequency and driving other stations off it when necessary. He goes 48 hours straight and never seems to get tired. He always amazes me. I don't know how he does it but, I'll tell you one thing, I'm sure glad he's on my team and he better remain on it in the future.

73: About the future—any big plans for K1OX?

Gamlin: As far as antennas, I could go to longer booms, but the severe weather on this hilltop would cause problems and, in the long run, I don't think it would be worth the grief.

Right now, I have no plans. Well, maybe a seventh tower will go up or another 40-meter beam, I'm not sure. I really can't improve much on what I've got. I'm kind of catching my breath financially, too. I'd like to get some carpets on the floor—that kind of



What a multi/multi needs in order to be heard in the world of big-time contesting.

thing. In general, get everything I already have working right. Oh, yes, and finish these blasted intercom signaling units.

73: I get the impression you're going to stay with contesting.

Gamlin: After every contest, I'd say "Never again." But, every year when contest time rolled around, the fever would strike. It's hopeless, I love it.

73: Does you wife have the fever, too?

Gamlin: Would you believe that Janice is working on her Novice ticket? She goes to class two nights a week.

73: Really?

Gamlin: Oh, yeah, I don't think she'll ever be an avid contester, she's much too nice for that. She does get a kick out of it, though. She loves to entertain and to feed everybody. She is a very special lady. Every day I realize how lucky I was to have stumbled upon her.

Ted Gamlin and the K1OX machine did not realize their goal of winning it all the second time out. As the raw scores accumulated on an 80-meter, postmortem contest net (see Fig. 1), it became obvious that K1OX had not been able to regain the half-million point deficit it had amassed early in the contest.

Ted Gamlin was stoic in his appraisal of the outcome. He simply said, "We'll be better prepared next year."■

The K1OX Crew

160m	Ted Gamlin K1OX
80m	Fred Hopengarten K1VR
	Bob Cunningham K1XR
40m	George Briggs K2DM
20m	Jeff Briggs K1ZM
	Bruce Rusch W1HNZ
	Ken Wolff K1EA
15m	Bill Way W1HD
	John Lindholm W1XX
10m	Mark Pride K1RX
	Rex Lint K1HI
	Richard Newell AK1A
	Al Rousseau W1FJ

The Kenwood TS-530S HF Transceiver

—sophisticated performance at a not-so-sophisticated price

Paul Grupp KA1LR
73 Magazine Staff

When Kenwood announced that the TS-520S was about to be discontinued and replaced with a new model, I was somewhat apprehensive. For many of us, the venerable 520 was an old friend, a perfect example of what an economical transceiver should be—short on bells and whistles, but long on dependability and performance. Would the TS-530S be a worthy replacement? I had to find out, and you just might be interested in what I discovered.

Kenwood's TS-530S.

For those who are not compulsive ad watchers, here is a brief description of the basic features of the new 530. As expected, all amateur bands (160-10 meters) are included. The output stages conform to the *de facto* industry standard for transceivers with tube finals—two 6146Bs and a 12BY7 driver. Both analog and digital frequency readout are provided. The digital readout is the traditional Kenwood blue and displays to 100 Hz; the analog dial is accurate to within a couple kHz. Speech processor, VOX, semi-break-in CW, XIT (transmitter incremental tuning), and full metering are all standard. The receiver section boasts a noise blanker with a variable level control, fast or slow agc, an rf gain control and attenuator, i-f shift, RIT, and a 25-kHz crystal calibrator. Not a bad inventory! The manual is typical of those packed with recent Ken-

wood equipment—good operating instructions and enough schematics and block diagrams to get you into trouble. A complete service manual is also available.

Our 530 arrived in perfect working order, which is somewhat unusual for equipment from almost any manufacturer these days. We immediately installed it in the *73* shack alongside its more expensive brother, the TS-830S. The first thing that strikes you about these two rigs is their similarity. They are built on exactly the same chassis and housed in the same cabinet. Even the rear panel holes are punched in the same place, so the 530 has a few empty spaces where the 830 has jacks.

The similarities between the 530 and the 830 are more than skin deep, however. They share identical final sections, power supplies, vfo, digital readout, and rf boards. Almost all accessories are completely interchangeable, making the 530 a logical choice for a backup rig in an 830-equipped station. Moreover, most of these accessories will also mate with the diminutive TS-130S. Such interchangeability throughout their entire line of HF transceivers is a thoughtful step which might cost Kenwood a few sales of accessories to owners of two or more of their rigs. It will pay off because Kenwood will earn the loyalty of customers who don't wish to replace the entire station each time they upgrade to a new transceiver. Another blow against planned obsolescence!

The 530 is not quite a carbon copy of the 830. In the bells-and-whistles department, it has an audio rather than an rf speech processor, and it lacks the transverter jacks, VBT, tone control, notch filter, and digital hold switch of the 830. On the positive side, the 530 allows both CW and SSB filters to be switched in and out at will. Its big brother only accepts one or the other. Performance? Kenwood rates the 530 receiver's i-f rejection and the transmitter's sideband suppression each 10 dB worse than the 830. All other specifications are the same.

How important these differences are depends entirely on individual operating habits and tastes. Some may miss the extra features of the 830 sorely, but others will balk at spending the approximately 125 dollars more that the 830 costs to get them. One thing's for sure—the 530 has a lot more to offer than the 520 did!

On the Air

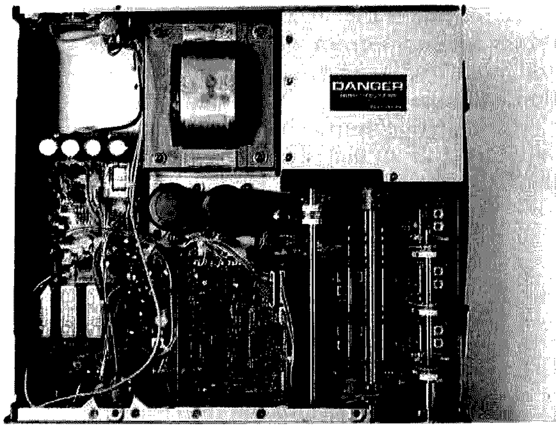
We could talk about features and performance until I ran out of paper and you ran out of patience, but it would all be meaningless if the radio in question didn't "play." The 530 plays! The 530S held a position of honor (front and center on the operating desk) for its entire stay at the *73 Magazine* ham station. One of the things that makes it so successful is the sensible layout of the front panel. Every control has its own knob—there are no concentric controls to fumble with. If you adjust the carrier control, you don't run the risk of messing up the setting of the mic gain control. Nor will you go through an operating session where the band appears to be dead, only to discover that you inadvertently turned down the rf gain control while adjusting the volume! This clean front panel layout should make the 530 an excellent choice for a contest station. Our test was in the summer activity doldrums, so the only contest we could run it in was the Field Day weekend. The QRM, pressure, and excitement were all there, and it performed admirably.

Receiver audio bears the distinctive Kenwood trademark of wide frequency response with a broad midrange peak for added presence, with or without a good external speaker. Hams with good ears who have done a lot of listening to different transceivers could probably pick out the Kenwood every time in a blindfold comparison test.

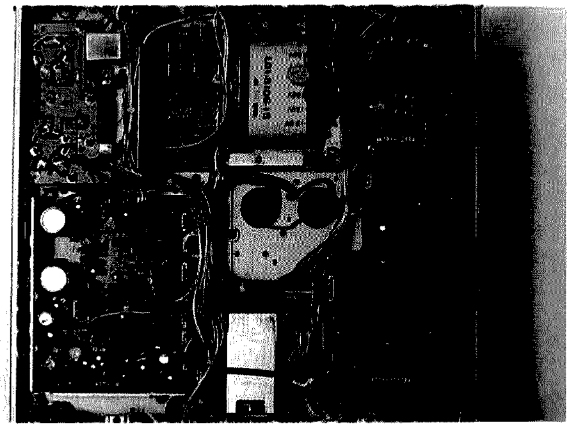
I was very pleased at how easy the 530 is to tune up. I generally prefer solid-state finals, but the 530 is so easy to tune that I didn't mind a bit. Complaints? A particularly rabid CW operator (AG9V/1) felt that the 500-Hz filter didn't have enough ultimate rejection. On the other hand, it is well known that he is hopelessly attached to the 250-Hz filter installed in his S-line at home!

Conclusions

What constantly surprised everyone here who used the 530 is how well it fares in comparison to Kenwood's top-dollar flagship, even though they are not necessarily designed to compete. The TS-520S would not compare as favorably, even though a digital-readout-equipped version retailed for quite a bit more than the 530 does! Kenwood has a worthy successor for the venerable TS-520S, a successor that has a lot to offer at a reasonable price. For more information, contact *Trio-Kenwood Communications, Inc., 1111 West Walnut, Compton CA 90220.* ■



Top view of the TS-530S.


Bottom view of the TS-530S.

Sam Rappold WB6ZYK
PO Box 4678
379 Briceland Road
Redway CA 95560

Folded Unipole for 160

—Top-banders, take notice! Here's a top-loaded radiator with the government's seal of approval.

The more you consider and study antenna phenomena, the more you become fascinated with the flow of ideas about radiation devices and their possibilities. Here is just one such interesting antenna type along with its development, which occurred step by step using a lot of published antenna information and much on-the-air discussion and revelation.

This is an uncommon but very effective antenna type that could interest most low-frequency hams. Zoning height restrictions are admittedly something else, though this antenna idea works well at even a 35′ height restriction. It works somewhat better at 70′ to 130′—and even to 200′ if you can arrange it. And, conveniently, it fits most real estate situations. So, it isn't necessary to miss out on the fun of 160-meter operation because you don't have room for a full-sized horizontal antenna.

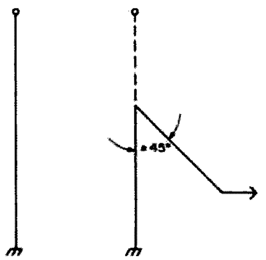


Fig. 1. Basic folded vertical.

Now, short antennas have been proven less efficient than full-size resonant antennas even though the former often provide fair to good communications on occasion. The top-loaded folded unipole (TLU) is a form of shortened antenna that is constructed by folding down the vertical portion to achieve low resonance (because of some height limitation), while increasing resistance and bandwidth and retaining most of the properties and benefits of a high radiator (see Fig. 1).

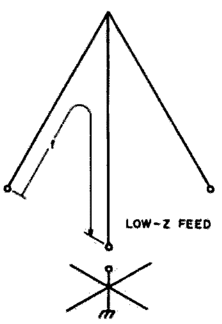


Fig. 2. Series umbrella.

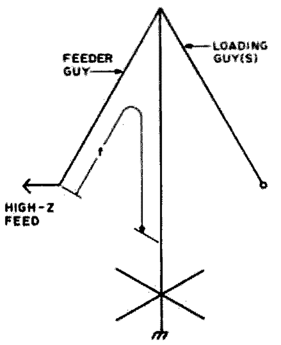


Fig. 3. Grounded umbrella.

Lots of hams have existing towers, poles, trees, or buildings from which to hang this efficient, effective, broadband, and easy-to-use-and-adjust antenna. And, happily, this is a low-cost way of getting up a really good low-band radiator—a real problem for most hams on city-size lots; a 30′ to 50′ TV push-up mast works well in this configuration.

The TLU is just one of many types of vertical antennas. It uses top feed and loading, which gets the antenna current up in the air where it belongs for maximum radiation efficiency. It differs from the series-fed vertical (Fig. 2) that is fed at the bottom, and is coil-loaded at the bottom, center, or top. The TLU is similar to the "umbrella" vertical that is grounded (Fig 3), then fed at the top via the sloping guy wires which come down near to the ground adding length to the system and thus lowering the resonant frequency while simultaneously feeding the antenna. This TLU gives considerably higher impedance to the antenna structure than does the series- or gamma-fed vertical (Fig. 4), a most important consideration. The TLU is a grounded vertical structure (Fig. 5) that is simple, follows the basic engineering principle that simplest is best, and easiest. This antenna is remarkably free of bugs.

This article covers my application of the radiator designed by the U.S. Navy at the Corona, California, antenna range for ship and shore use. Navy Captain Paul Lee (ex-K6TS) describes the principle of the antenna type in his book, *Vertical Antenna Handbook*, pp. 28-31, published by CQ.

It is a very low-angle and broadband vertical. Mine has a 400-kHz bandwidth and I have worked the world with it on 160. It also performs very well on 40 and 80 at a 70′ height. On 160, this vertical (at 70′) tunes with either just a series variable capacitor (when the resonant frequency of the entire structure is 3/8-wave, 160′ to 200′ total) or by adding a coil to ground the feedwire with a ceramic rotary switch, forming an L network. This may be necessary with various antenna heights, volumes, grounding systems, etc., and is required on 40 and 80 to resonate the structure.

The structural basis for this TLU vertical is a grounded metal tower, tree, pole, building, or wood tower of from 30′ to 200′ in height for the 160-meter band, but should be as high as possible to reduce losses and to lower radiated wave angles. We can't always have a tower of optimum height for one reason or another, but a most effective radiator can be achieved with this TLU principle.

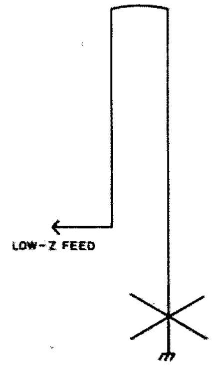


Fig. 4. Gamma feed.

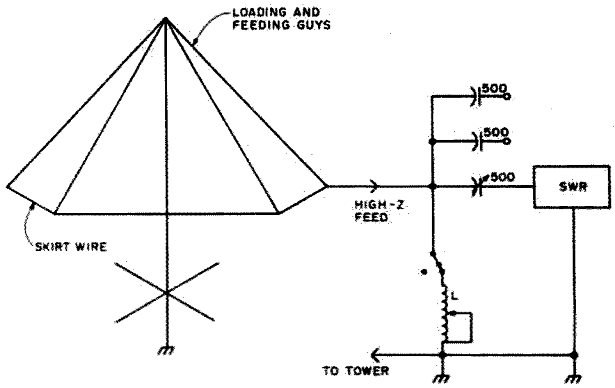


Fig. 5. High-Z umbrella (top-loaded folded unipole, or TLU).

Height, tuning, and loading can vary considerably with a TLU for efficient, effective performance and ease of adjustment. This radiator is simply a big, grounded, closed-loop, similar to any folded antenna, of up to a full wavelength in circumference, much like a grounded quad or triangle. The sloping (and loading) feeder and top guys descend at just under a 45° angle. The sloping line thus becomes part of the radiating portion of the antenna itself, much like the (higher-impedance) "umbrella" vertical that is fed at the bottom (series feed). In both cases, the top guy(s) bonded to the tower top increase the radiator's length and lower the antenna's resonant frequency.

The feedline (and any top-loading guys) descend to guy posts (trees or other guy anchors) at about ten feet above ground. Any guy angle higher than 45° introduces horizontal components into the radiated signal. The higher angle may better suit the purposes of those hams seeking higher-angle coverage for close-in contacts of under about 1000 miles. For serious DX work (low-angle radiation) a less-than-45° angle is a must. Further, the TLU has a considerably higher impedance than the series-fed vertical. Top-loading guys, long used by commercial and military stations, raise the impedance to over 50 Ohms, a highly important and desirable factor. Resonating the antenna of course increases radiation efficiency. Q of the TLU is low—the bandwidth is about 200 kHz with only one feeder-guy. With 4 or 5 such loading guys, bandwidth is near to 400 kHz on 160.

The vertical portion of the antenna (a tower) can be simulated by hanging a grounded wire from any of a variety of structures (trees, buildings, etc.) and the feeder wire brought down at the 45° angle. A tower with beam atop simply becomes a more top-loaded vertical, the beam(s) increasing "top-hat" capacitance loading and further lowering resonant frequency. All this, in combination with some sort of ground system, has proven to be a top performer on all three of the low bands.

Vertical polarization has consistently proved to be optimum over the years under all sorts of propagation conditions on frequencies below about 8 MHz for more than, say, about 3000 miles. Any horizontal antenna on 160 meters would have to be about 130′ up (1/4-wave) for consistent, effective DX work beyond about 3000 miles. This is obviously not an easy height to attain in urban areas, consequently, the desirability and need to go vertically. This TLU is not only a top performer on the lower frequencies but is a very uncomplicated structure.

Inasmuch as the high-current portion of an antenna does most of the radiating, get current up at the vertical's top. In the TLU, the drooping and radiating guys do this current raising well even when the vertical tower is not very high, but, of course, the higher the better (up to 5/8-wave high). A top-loading coil in a coil-loaded vertical is a lossy device and acts like an rf choke, though the coil-loaded and series-fed vertical can be very effective within its narrow bandwidth of 15 to 18 kHz on 160 meters.

It is, of course, a bit of a chore to have to run out in the back yard to adjust the base-matcher in the cold, wind, rain, sleet, snow, and maybe trip over lawn furniture, etc., or fall into the swimming pool in the dark (160 being a nighttime band), not to mention mosquitoes, stray dogs, etc. This, to me, seems to be the hard way to QSY beyond that 15 to 18 kHz and still keep your solid-state finals happy (low swr). Besides, by the time all this has happened, any DX pileup has gotten bigger and deeper. Imagine operating in a contest this way, all over the band—all night.

This TLU is a real convenience and can be adjusted right beside you in the shack. While any artificially loaded antenna is a compromise, this wire-loading using folded-down sloping and radiating guys is a least-lossy compromise. This configuration becomes a sort of multiple-sloper, and acts as a 2-element driven array with maximum radiation (and some gain) along the tower-to-guy axis.

These guys descend to a point about ten feet above ground to where they are secured to guy posts, trees, etc. These guys are bonded to the tower top, and continued down the tower, bonded to the tower every few feet, down to ground level to be bonded into the grounding system—fencing, metal well-casing, etc. Connect these to the shack ground, radials, screen, etc., to complete the circuit and minimize losses which will make the system more broadbanded. These guy wires and/or feeder are tied together at the guy posts' level by a skirt wire which further adds capacity to the structure and feeds directly into a matching network. See Fig. 5.

I feed this antenna not from a gamma match device at the tower top as recommended by the developers, but from the skirt wire as it passes near the shack window about ten feet above ground. It is fed directly using an swr bridge through a series-variable capacitor (about 500 pF)

with three 500-pF fixed capacitors added as required by a ceramic rotary switch.

All this has raised my signal by three S units on local and long DX contacts. The swr bridge is grounded to the station ground system and is connected by heavy cable to the grounded tower, all of which forms that big grounded loop. Spacing of the tuning capacitor plates of the matcher can be of the receiving type for power up to 200 Watts dc input. The higher impedance of the antenna makes it more flexible and easier to adjust.

The grounding system of a vertical radiator performs like the other half of a balanced antenna. As with most vertical radiators, the ground system is indispensable in balancing the system properly, fully grounding the vertical, and increasing conductivity of the soil or ground plane as much as possible to reduce losses

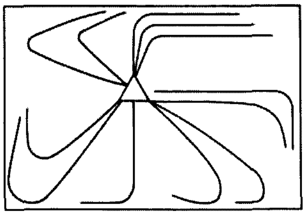


Fig. 6. Radial installation.

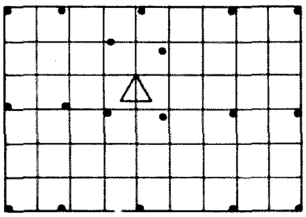


Fig. 7. Ground screen and ground rod installation.

and to bring down the angle of radiation. The grounding system may consist of only one ground rod, particularly in circumstances where there is not access to even a tiny patch of soil ground, but the grounding system should be as extensive as possible.

The first step in establishing a ground system is usually to install one or more ground rods, then add as many quarter-wave radials as possible to the tower, up to about 120. Some antenna experts claim that radials do not have to be any longer than the physical height of the tower, and do not necessarily (and ideally) need to be laid out symmetrically similarly to a fan or uniformly-spoked wheel. Also, that it is better in the case of a less than 1/4-wave vertical to have, say, 20 1/8-wave radials than to have 10 1/4-wave radials.

I am on a city lot, 50′ × 100′, with the tower in the exact center of the lot. I've "copper-plated" the entire lot with 51 82′ radials (0.15λ on 160) spread out as symmetrically as possible and curved around clockwise to fit onto my lot (Fig. 6) Then, covering the entire lot, is a 3′ mesh ground screen laid down over the buried radials—under the house, garden, and unpaved driveway! Oh, what a job! But the results make it all worthwhile to the striving, resourceful, dedicated ham.

The wires become invisible when they sink down in the earth from the original burial depth of 1″ to 2″ to more than 6″ after the first rains of the season. All of this was secured to the ground by 14 ground rods strategically placed (Fig. 7). Four more rods were put down around the tower ten feet from each other and from the tower. Old iron pipe (4′ lengths) will be quite adequate.

To extend this ground plane as much as possible within my circumstances, I even stapled four 135′ radials to the side of my wood-frame house. I put them just a few inches above where the cement foundation joins the wooden house siding, a few inches above ground, and spaced them about 2″ apart. These also could be put up under the house eaves. The idea is to make that ground plane as extensive and dense as possible. All this means longer DX paths and contacts for your signal. The rig will load and perform better, too.

There are those experts who claim that an extensive ground system will add nothing to the receiving capabilities. But it has been my experience that after the ninth radial was put down I suddenly began hearing DX that I had not been able to hear before and that DX which had been regularly heard before became clearer (less "watery"), more distinct, and stronger.

Some have even buried large masses of metal like old car bodies, copper tubs, tubing, pipe, metal mats, fencing, etc., obtained from a junkyard. And, of course, connect to your lawn sprinkler system (and maybe that of an obliging neighbor), metal water pipes, and fences. I have worked hams with radials laid in their swimming pools or put down a well casing who get top results even though the antenna theorists belittle such ground systems.

Try studying your situation at length, be adventuresome and imaginative, and you may well surprise and delight yourself with the results, as many of us old-timers have. So in spite of what the experts say about grounding systems, just get down whatever metal you can. There is a great deal of testimony and evidence about the validity of these grounding ideas. Every little bit of buried metal will pay off.

My "loop" is approximately 3/8λ wave in circumference, tuning fully with only a series capacitor of 1500 pF total. For larger or smaller "loops," an L network may have to be formed by switching in a coil from feeder wire to ground as shown in Fig. 5.

This also will have to be done on 40 and 80 meters to resonate the TLU to those bands. The coil should be tappable, mine is 50 turns of #16, 2″ diameter × 5″ long. Or, try using your commercial tuner of whatever type. I have successfully used pi and parallel networks as well. This will give a 1:1 swr across the entire band. With my feeder plus four top-loading guys and skirt wire, the bandwidth is excellent, as shown in Fig. 8.

I have tried various gamma-feed systems with this TLU with only fair results. The on-the-air reports were materially increased (3 S-units) both locally and on far DX by feeding the skirt wire rather than using a gamma-feed. The bandwidth becomes more than doubled with the same structure, which gives still better overall performance.

Even though an antenna can be properly matched and loaded, that antenna may or may not radiate the rf at desired angles. By folding down and, in a sense, diminishing by about half the vertical structure, this TLU method does not seem to materially degrade low-angle performance of a vertical antenna. Further data

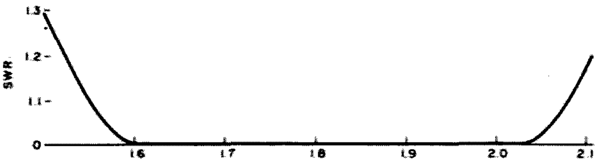


Fig. 8. System bandwidth.

may confirm this.

I keep large maps of the northern hemisphere and of the great circle on the shack wall beside me, and place colored-headed dressmaker's pins on the maps when contacts are made on 160 to record and check performance of my radiated signals. Interestingly, it became very evident that in the directions along the tower-to-radiating guy axes the transmitted signal is maximum, with various diminished reports from between those axes. Consequently, it would no doubt be a more uniform signal pattern if up to 12 nearly equally-spaced top-radiating guys were installed in order to better cover the entire 360°. I have yet to try this.

Utilizing wood towers, poles, buildings, trees, etc. (Fig. 9), from which to hang a TLU, makes for an unobtrusive antenna, especially when a tree is used, which larglv hides a TLU. This antenna also can be hung from a building of suitable height or between buildings if necessary. This TLU has proved over the years by many to be a flexible and most worthwhile antenna, and its only limitations have occurred whenever the band is not open (long skip) to my area.

It is an effective DX-getter when the top band is open. Further, this is not a noisy receiving antenna as are most solely-vertical antenna structures. This is probably because of the 40° slanting guys, which pick up less noise (which generally is vertically polarized, thus readily flooding into a vertical.)

Whatever remnants of noise do get picked up are cut out with audio filters plugged into the output jack of the transceiver. So, I am hardly even aware of QRN. (See my article in *73 Magazine* for February, 1980.) Besides, I like to use this TLU structure for receiving because there is 900′ of wire and metal surface up there in the air which seems to capture more wave-front energy than do the low receiving antennas of several types in use here. QSB does not seem to be as critical, either, as when using those low receiving antennas, perhaps also for the same reason (sloping feeder and guys).

In considering antenna performance in the case of 160 meters, there is the tendency to pass judgment quickly after only a short trial, giving a false or incomplete impression of actual performance potential, particularly under "closed" band conditions, and not being mindful of the variations—highs and lows of propagation conditions. Receiving and radiating phenomena should be observed over a sufficient period—a week or month—to allow for the inevitable change in propagation

At times I have wondered if any of my rf was going anywhere, but because I waited to make structural changes for some reason (weather, no time, or being just lazy), propagation conditions would change, the 160 band would suddenly open, long-skip DX would come roaring in as occasionally happens on 160, and my calls were answered with big signal reports. The antenna would thus be vindicated and saved from unwarranted changes.

So, do yourself a big favor and be slow of antenna judgment on 160, a band of continual amazement, confoundment, and strong personal reactions. And another thing: On 160, those "openings" can be greatly selective, occurring only in some areas of any given state or region. There is also the "pipeline" phenomenon to be considered.

After more than 50 years of ham radio and watching variations of band conditions on 160, it becomes apparent that conditions vary very widely even during a single hour of nighttime consideration. This type of grounded antenna (TLU) has been a fine if not outstanding performer, and is well worth trying.■

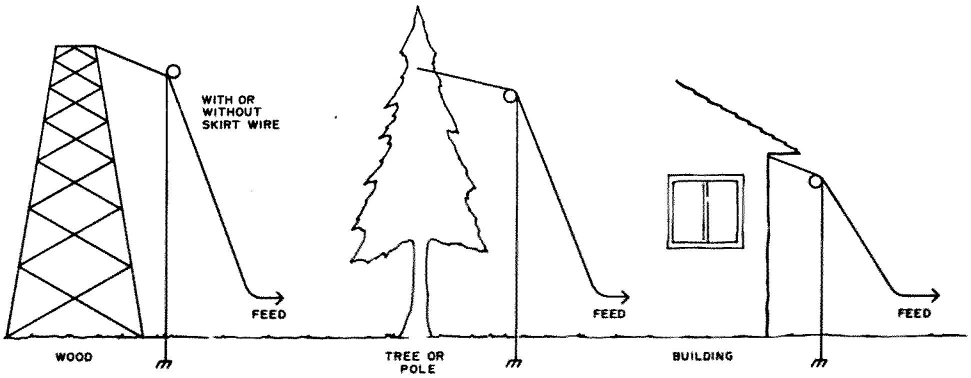


Fig. 9. Simulation of a metal tower.

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The VIZ WD-747 Digital Multimeter

—low cost plus high performance equals success

Although the name VIZ may seem to many readers a rather recent addition to the list of manufacturers of test equipment, it is not. For many years, this company maintained a low profile as a test equipment contractor for RCA. Now on their own, VIZ has announced a complete line of low-cost, technician-oriented test instruments.

The new WD-747 digital multimeter is an example. An innovative feature is the inclusion of a transistor hfe (Beta) tester. The DMM is housed in a rugged, bright orange Cycolac™ case. It is intended for one-hand operation, equipped with a line of squeeze buttons along the side, much like the popular Fluke instruments. The large (half-inch), 3½-digit LCD exhibits outstanding contrast, even in dim light. Settling-down time on all ranges is quite rapid.

The circuit is built around the ubiquitous Intersil ICL7106 chip, and features auto polarity and auto decimal (not autoranging, however). Power is derived from an internal 9-volt battery (supplied) or from an external ac adapter (optional).

Dc current consumption is very low—only 15 mW—and 200 hours of continuous operation may be expected from a conventional zinc-carbon battery. Even longer life should be forthcoming from an alkaline replacement.

Sampling rate under test conditions is 2.5 times per second. If an overload condition appears at the terminals, all digits blank except an initial "1" and the decimal point.

Direct current voltages may be selected from the following ranges: 200 mV, 2 V, 20 V, 200 V, and 1000 V. Accuracy is ±0.8% plus one digit. Full overload protection is present on all ranges, and input resistance is 100 megohms.

Alternating current ranges of 200 V and 1000 V, each with a resolution of 0.1% and accuracy to 1.2% of reading + 10 digits, is claimed (40-500 Hz). Full overload protection is also provided on this scale, and input impedance is 5 megohms.

Five resistance ranges—200, 2k, 20k, 200k, and 2M—feature resolution to 0.05% and accuracy to ±1% of the reading plus 2 digits. Current across the resistive circuit under test is extremely small (a fraction of a milliampere on most ranges), with open-circuit voltage less than one volt (except 2.3 volts on 200-Ohm scale).

Direct current measurements are also divided into five ranges: 200 uA, 2 mA, 20 mA, 200 mA, and 10 A. Resolution is 0.1% and accuracy is ±1.2% of reading plus two digits. The current scale is fuse-protected from accidental voltage applications, and a spare fuse is included.

Either PNP or NPN transistors may be measured for current gain (hfe) static forward current transfer ratio. Direct readout is provided on the digital display.

Three distinct features of the VIZ WD-747 made the greatest impression to this reviewer: the crisp, contrasty LCD display, the rapid settling time on all ranges, and the wide selection of measurement ranges, all neatly grouped and color-coded for rapid, goof-proof selection.

At $89.95 suggested retail, the VIZ WD-747 is a serious contender in the field of low-cost, high-performance test instruments. For more information, contact *VIZ Manufacturing Co., 335 E. Price St., Philadelphia PA 19144*. Reader Service number 486. ■

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The Winning

—days in the life of a contester

The contester is one of ham radio's most intriguing characters. For the better part of the year, he mostly lies dormant, occasioning a few club meetings and every once in a long while idly tuning the bands, looking for some hint of lost excitement.

The contest weekend hits. The resultant flurry of activity is of such a contrasting nature to his normal laconic presence that a casual observer would probably write the contester off as some sort of weirdo.

I've been what I thought was a contester for the past two years, only to learn—by way of a meeting with the Potomac Valley Radio Club, almost all the members of which are contest fanatics—that I was a mere piker. Shortly thereafter, my curiosity became aroused and I decided to investigate the experience of dedicated contesting.

"Experience" somehow falls short of expressing what actually happened. When you enter a contest for the purpose of winning, you have to assume a new being. You have to become . . . *The Contester*! Da-dum! The Contester, as such, gets *Psyched Up* for each and every point in each and every contest. Hypnotism is preferable, but a mite expensive. Zen is cheaper, but *very* deep and, as a result, more than a trifle difficult. So, the Contester usually musters the old standbys: power of concentration and physical conditioning.

Taking this in the literal sense, I decided that for the contest I chose, I was going to be Psyched Up *and* In Shape. What followed was a rigorous schedule of fitness-engineering designed to impress Muhammed Ali. For a month prior to the contest, it was up every morning at five, run several miles, eat a big breakfast, work out in the gym, rest, and lunch around noon.

In the afternoon, it was a daily session of meditation, mentally chanting the mantra, WIN . . . WIINN . . . WIIINNN! Later in the day, more working out and speech lessons (for the phone portion). Dinner was followed by CW work optimistically designed to improve my code speed to 40 wpm. By the end of the month I was a physical marvel. Well, almost.

The mental portion of my training, including the meditation, wasn't quite as easy. As I have mentioned, I would engage in my meditative session right after lunch. Aside from an occasional burp, there shouldn't have been much to distract my attention (especially with such an absorbing mantra). But, alas, I was to be foiled (for a while) in terms of one of the most crucial aspects of contesting: power of concentration.

Now, don't get me wrong. Contesters are very dedicated people, but most have one major flaw—they're dreamers. If they aren't dreaming about how nice that plaque would look just above the homebrew 4-1000, then they're dreaming about getting new and better equipment.

These comments are typical of what one might expect to hear at a contest-oriented club meeting: "Get an automatic CW machine, boy. You'll work 'em faster and log 'em easier. And while you're at it, get yourself a new speech processor. Ya need more punch. You'll cause more excitement, get more contacts, and *make more points!*"

Ah, yes, I remember it well. My mind was wandering terribly during those first few meditation sessions. I was constantly dreaming of mortgaging the house so I could get a surplus 350-foot tower topped by 5-element monobanders for 40 through 10 meters (only 4 elements for 75). I also considered coaxing the Contest Advisory Committee to allow for a new operator/station category: single operator, multi-transmitter. Just think! I could have two programmable CW machines going at once, with a tape recorder taking all the calls. On phone, I could run pretaped reports by using cassette recorders remotely controlled and coordinated by computer. Wow! Wow! Woowww!

See what I mean? Finally, through sheer willpower, I began to channel my mind toward constructive thoughts of winning. I was just beginning to get my head straightened out when the big day was upon me.

I spent all of contest eve tuning and retuning my station to a fine pitch. I still have scars on my legs from

shinnying up and down the trees in my yard in a last-ditch attempt to get the swr for my entire antenna farm down to a dB-encouraging 1:1. Now, before the state-of-the-art crowd protests that I was chasing the ghost of an old wives' tale, let me say that, with *this* Contester, old ideas die *very* hard. If nothing else, I was determined.

For a full hour before the contest was to begin, a well-rested, well-fed Contester-to-be sat in a lotus position, chanting and concentrating on making points. Finally, I leaped up, and screaming, *"I'm psyched!"*, ran into the shack. Immediately I began to throw switches with such ferocity that I almost ruined forever the front panels of my precision-tuned Vehicles-to-contest-Victory equipment. Notice the capitalization of the Vs. Man, I was ready!

Since this contest was a one-weekend, one-shot, DX affair, I had to cram hundreds (preferably thousands) of contacts into 48 hours of living. Operation on all HF bands on both CW and phone was allowed. I decided to tear into the CW portion first and was pleased that my code speed was up to par as I racked up contacts left and right.

After a few hours of dah-ditting my way into contest history, I decided to switch to phone and, in my most mellow, pious voice, began calling "CQ Contest."

Twelve hours and a gallon of coffee later, I knew I had to take a break. I could feel the weariness creeping in rapidly and was beginning to have problems with my CW fist. I had planned two two-hour breaks so as to unwind from each fourteen-hour operating period (or spasm, as the case may be). I immediately hit the sack, but due to all the excitement and coffee, was unable to get to sleep. It seemed like two minutes later when the alarm went off and I rolled out knowing I should have had more sleep and less coffee. Of course, it wasn't long before I rationalized that sleeping wasn't important, but points *points*, POINTS were! Back to the coffee urn. The XYL was graciously cooking some wing-dinger meals that could be consumed in 5 minutes or less without indigestion.

As I began my second period of operation, I noticed that the band conditions were kind of flat and, consequently, my QSO rate was pretty slow, at best. Later, as evening brought better propagation and more operation, things began to pick up. But by now I was beginning to feel the effects of my lack of sleep. My QSO rate seemed to be rocketing along at a snail's pace. Time was dragging so badly that I began to wonder if I was in a radio contest or a tractor-pulling event. Ten hours into my second period of operation, my dupe sheets began to send bad vibrations to my brain. With every call I heard I thought to myself, "I *know* I've worked him before. That call sounds so familiar." Then I'd furiously scan the dupe sheet with a disbelieving attitude. If the guy's call wasn't on the sheet, I'd think to myself, "I must've left it off when I worked him before." *POOF!* went my mental state.

At last my second "spasm" was over. Only one more to go. I cursed myself all the way to the bedroom, berating that insane man who not more than a month ago decided that he wanted to be "The Contester." Where was he now?! Why, the little beggar crawled off into a hole somewhere and was sleeping regular hours, eating regular meals, and watching the boob tube! Left in his place was an empty 4-1000A of a man. A glass bottle that you could see clear through. Man, did I need sleep!

Two hours later, I groggily switched off the alarm and, feeling as though I'd managed to collect only one or two or my marbles, flopped out of the sack and into the dining room. The XYL timidly served my meal (was it breakfast or dinner?), not too sure of what my mood would be. I was courteous, but quiet. After eating, it was back to the shack for the last grueling episode in this very strange "experience."

My senses began to function just long enough for me to realize that it was around 8 am, Sunday. Most people on the east coast would be on their way to church, so maybe my competition won't be too bad. Fat chance! I'd forgotten all the other people in this contest were maniacs just like me, and church was out of the question.

My memory of what happened for the next 12-13 hours is very blurry. About the only thing that comes back to me is the feeling that my fist and mouth were molded from solid lead—very hard, very heavy, and quite immovable. Looking back on my logs, what I can read of them, I see that I managed to run a respectable QSO rate, considering my condition. I didn't even work too many people that I'd worked before.

However, my XYL's memory and description of the events during and after the third period of operation were a lot sharper. Apparently, I occasionally stumbled in and out of the shack with glazed eyes, mumbling something she was afraid to listen to. She claims my voice sounded like the buzzsaw at the local lumber yard, and there were times when she would look in and see me sitting at the desk going through the motions of speaking and sending CW at the same time, but actually doing neither. The keyer wasn't in my hand, I wasn't near the mike, and I wasn't saying anything! WOW!

At last the contest was over and, according to her, I got up, turned on my heel with military drill-team precision and proceeded to walk straight into the wall. She then quietly led me down the hall and tucked me into bed. All the while I was quietly saying, "dah-dit-dah-dit dah-dah-dit-dah," over and over again.

I can now say for the first time in my life, that I fully appreciate what it means to "crash." The youth of our nation are to be praised for coining such a descriptive term. I crashed so hard that it took me 18 hours to wake up and another 24 hours of very peaceful surroundings to come fully to grips with myself.

It's been months since the contest and I haven't dreamed of the "single-operator, multi-transmitter" category for a long time. In fact, I haven't really been on the air since the contest. Even so, I've occasionally gone into the recreation room, looked at the weight-lifting equipment that I had worked on so hard, remembered those hours of meditation, and smiled. Then, of course, I would turn and walk away. Until today.

When the mail arrived, the contest results were in the ham magazine that sponsored the event and, what's this? I placed third in my section? I beat out a whole raft of more experienced operators? WOW! If only I hadn't snapped out in the waning hours of the contest! Let's see, if I add another ten-foot section to the tower, how many dB of gain will that yield? When's the next contest? Only six weeks away? Oh man, here we go again! WIN . . . WIINN . . . WIIINNN! ■

John Ackermann AG9V/1
73 Magazine Staff

The GU-1820 Ac Generator

—100 pounds of portable power from Heath

A major problem in any emergency planning or Field Day preparation always seems to be finding a generator. Most commercially-available gas generators are either too large or too expensive to be practical for most hams to own. Finding a generator to borrow or rent isn't always easy, either. Now Heathkit™ has helped to solve this problem with the introduction of the Heath-Watt portable generator.

The Heath-Watt uses a five-horsepower four-cycle engine to drive a generator capable of providing 2200 Watts of continuous ac power. This is more than ample to power, for example, a complete two-transmitter Field-Day operation if linears aren't used.

The only assembly involves mounting the engine to the main frame and assembling and mounting the generator itself to that frame. When the packages containing the kit arrived at the *73* ham shack, the question arose as to who should put it together. I am fairly handy with a soldering iron, but it is widely known that I am dangerous with a socket wrench in hand. It was therefore decided that I should be the kit builder—the others felt that if I could do it, *anyone* could!

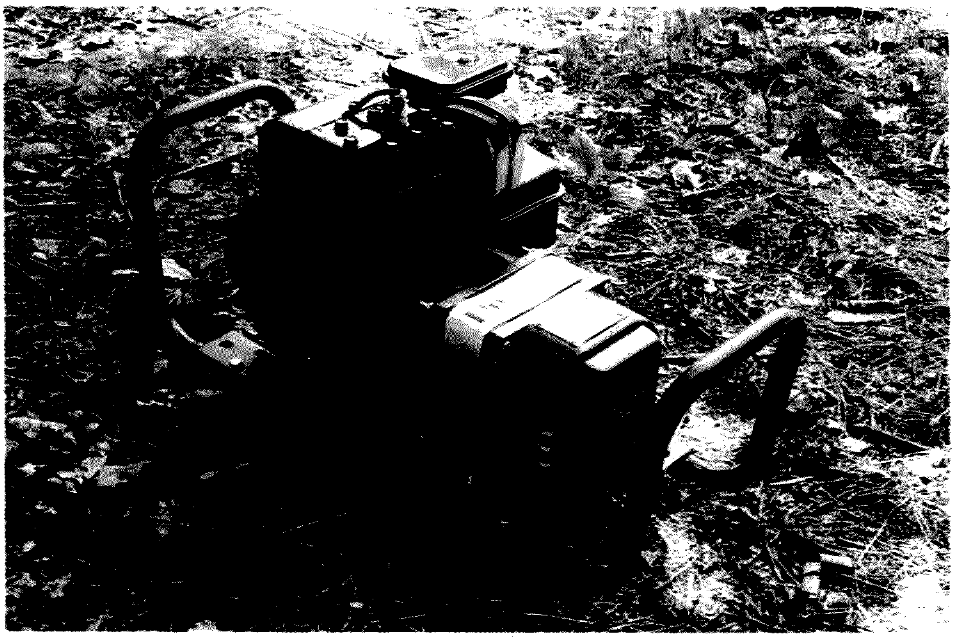
Well, I did it. The total assembly time was about six hours, although that time included several delays for rag chews, refreshments, and snide comments from the more mechanically-adept members of the staff. This was not, however, the most enjoyable time I have had putting a Heathkit together.

I've always had a suspicion that the Heath technical writers are at their best when describing electronic assembly and not so hot on mechanical steps. This kit seems to prove that hunch correct. Don't get me wrong—if you follow the manual, you will end up with a working generator, but I feel the instructions are not as clear and straightforward as I've come to expect from Heath. Part of the problem is that the terminology of generators is not as familiar to most of us as is the language of electronic construction. I found that frequent reference to the pictorials both for parts identification and for an understanding of what each step entailed was necessary.

Construction of the Heath-Watt itself presented few problems. The only real difficulty encountered was in forcing a bearing into the end casing of the generator. Heath provides a wooden dowel to use with a hammer to drive in the bearing, and the instructions note that "it may be necessary to strike the wood bearing driver with considerable force to seat the bearing properly." The instructions are correct on that point. It took such "considerable force" to drive the bearing in that the wood dowel split in half long before it was seated properly.

In fact, we never could get the bearing in flush with the end casing and, as a result, a plastic bracket that mounts over the bearing ended up with a slight bow. This problem caused us some concern, but did not appear to affect the perfor-

Continued on page 51



Heath's GU-1820 ac generator.

Radio Rehab

—how ham radio helps young offenders

Robert Stuart Zamalin WA6VIP
7012 Newlin Avenue
Whittier CA 90602

Can ham radio be used as a means of rehabilitating young offenders? Attorney Steve Stevens KD6BS believes that it can. He belongs to the Volunteers in Parole, a variation of the Big Brother organization, which pairs young parolees from the California Youth Authority and volunteer attorneys. The goal of the VIP is to help parolees to adjust to the outside world and become productive citizens after being released from the custody of the California Youth Authority.

Attorney Steve Stevens KD6BS in his shack.

Steve, who has been involved in radio since 1953, believes that ham radio is an excellent means of diverting the young parolee's interest from criminal activities into something constructive. He believes that the various activities in ham radio can help the parolee to associate with individuals outside his own peer group. Because of the fact that the hobby cuts across income, occupational, and ethnic boundaries, it is an excellent way of mainstreaming the parolee into the world outside a correctional institution.

The Volunteers in Parole grew out of the suggestion of Supreme Court Chief

Justice Warren E. Burger that lawyers get involved in the correctional system and help it become something other than a revolving-door process. The first VIP programs were set up in Los Angeles and Santa Clara in 1972, and since then, San Diego, Sacramento, and San Francisco have started VIP programs.

The parolees are matched up with volunteer attorneys who have the same basic interests in similar hobbies and sports. The attorneys are asked to spend at least five hours per month with their parolees over a period of six months. In reality, they often spend more time than that with their charges, absorbing a lot of the expenses out of their own pockets.

Motivating the parolee is not difficult if you try to set up a positive role model, claims Steve. "If you get a relationship with the kid and if the kid is trying to emulate you, it is not difficult to motivate him. With the right type of relationship, he wants to try what he sees you doing."

Currently, Steve is working with a parolee named Kelvin, helping him to get his Novice license. This is the first parolee he has gotten involved in ham radio. He brings Kelvin to his house so that he can see firsthand what ham radio is all about. Steve is also considering setting up a Novice class at two of the juvenile detention facilities in California's Santa Clara County, locally known as the Boys' Ranch and the Girls' Ranch.

As much as he feels ham radio is good for diverting young people from criminal activity, he has serious reservations about using ham radio in rehabilitating adult offenders. "Most of the adult offenders would probably see it as a way of communicating with each other as to whether or not the cops were coming—or something like that," he cautioned. "I don't want to run that risk."

Elaborating further, he indicated that "statistics show that normally 25 years of age becomes a turning point in life. An individual either gives up a life of crime altogether or he becomes a criminal for the rest of his life. What I am concerned with primarily, therefore, is catching those youngsters before they get to the big time."

Steve is well qualified for this sort of activity. He received his communications training in the Air Force in 1953. He has been teaching a Novice class for the past year, and he runs a 10-10 net. He is very active on two meters. His many pieces of equipment include a KLM Multi-2000 which is his all-mode base station, a Tempo VHF/One Plus which serves as his mobile rig, a Santec handheld that he uses when traveling, and a old Polycom that he uses when monitoring his favorite DX repeater. His interests also branch out to microcomputers, and he plans to purchase one to interface with his gear and so keep home accounts.

It is very important for young people who have been involved in criminal activity, especially those who have served time, to keep busy with constructive activities so they don't have time to revert back to their old behavior patterns and make the "big time." Fortunately, there are people like Steve who care enough to help young parolees coming out of the system and divert them from criminal pursuits to other, more worthwhile, activities like ham radio.■

✓See List of Advertisers on page 130

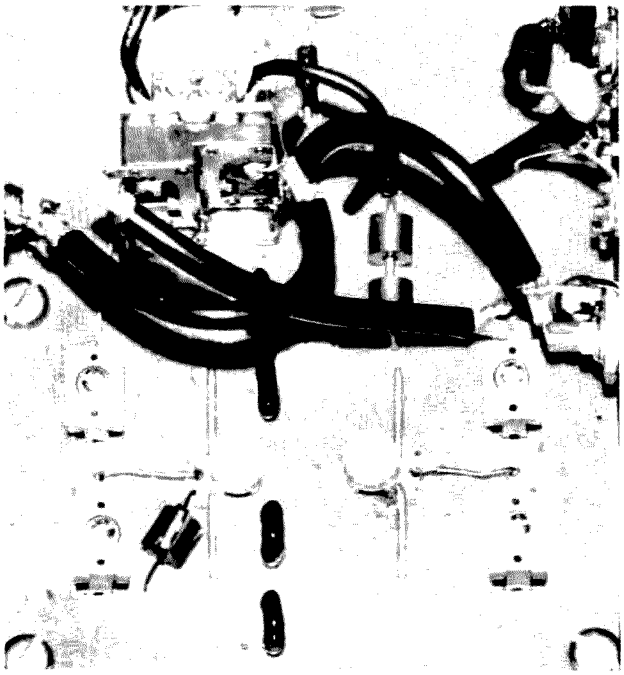
Heath's HA-202 Goes to 220 MHz

—power up with this simple mod

Kent Britain WA5VJB
5809 Stageline
Arlington TX 76017

Do you enjoy 220-MHz operation but find you don't have the power to access those few-and-far-between 220-MHz repeaters? I did, and since I couldn't afford a new amplifier, I decided to experiment.

This is an easy modification to an inexpensive piece of equipment and will give you what you need in those fringe areas. More time will be spent taking off and putting on the case than on the changes themselves!



The completed modifications for 220 MHz.

The HA-202 two-meter amplifier can be turned up at swapfests for about $40. The more recent HA-202A uses a different output circuit and requires a more extensive modification which is not covered by this article. The HA-202 is used because its 2N5591s are usable to 250 MHz.

Before this modification can begin, the PC board must be exposed. To do this, perform the following steps in order!

1) Remove the C-shaped cover.
2) Remove the two nuts securing the power transistors to the heat sink.
3) Remove the six bolts securing the heat sink, sides, and the PC board.

To begin the modification, refer to Fig. 1. Remove L1, C3, C6, and C8 from the input circuit. On the output circuit, remove L9, C11, and C12. Save C12 for later use.

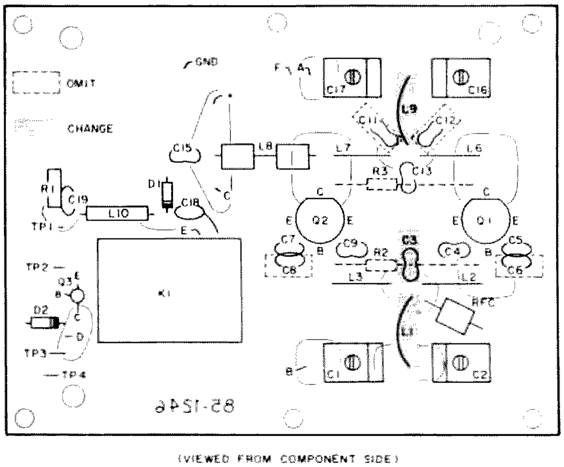


Fig. 1. Component location.

Now replace L1 and L9 with a 3/4" piece of straight wire (similar to L2 and L3). Next, use a 22-pF capacitor you just removed from C11 or C12 to replace C3.

Since the case is already off, now's your chance to install a disaster-preventing reverse-polarity protection diode from B+ to ground just inside the case (see Fig. 2). Just about any silicon diode rated three Amps or larger will work. Be sure that the cathode band is connected to B+.

If you're like me and have just got to get that extra Watt out of an amplifier, then use a 5-to-30-pF ceramic trimmer is place of C3 and C13.

Now reinstall the PC board, but do not replace the C-shaped cover. Tune your HA-202 for maximum output starting with the output section. Typically, the HA-202 produced 40 Watts out with 10 Watts of drive on two meters. On 220 MHz there is a slight reduction in output power, but you can still expect 30+ Watts out.

My thanks to WB5WRR for confirming that this modification is an easy, inexpensive way to generate some power on 220 MHz. Also, my thanks to KA5GWL for knowing how to put words together. ■

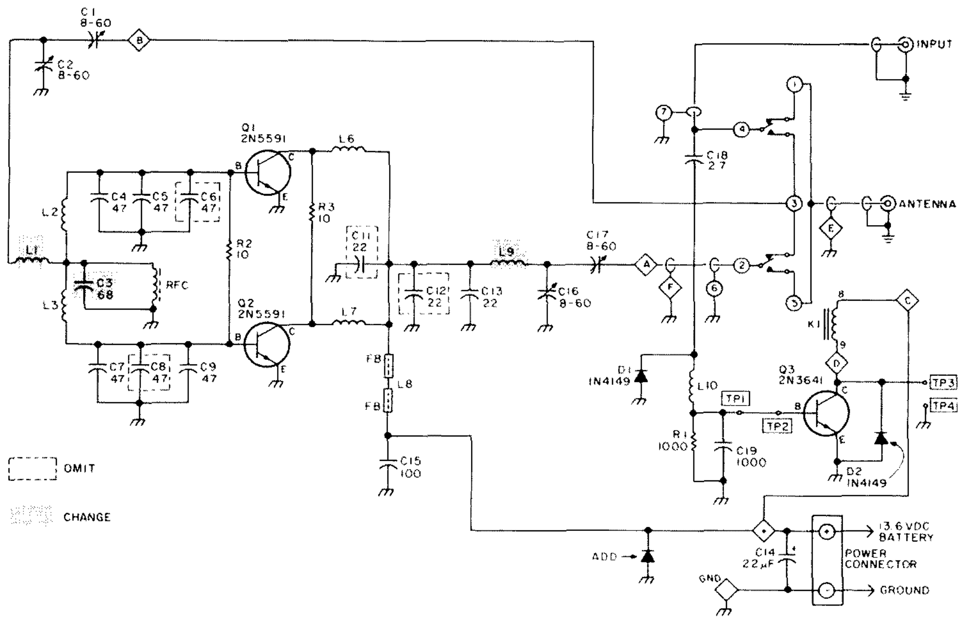


Fig. 2. HA-202 amplifier schematic.

See List of Advertisers on page 130

Paul Grupp KA1LR
73 Magazine Staff

The Mirage B1016 Two-Meter Linear Amplifier

—for those times when you have to be heard

When I moved to New Hampshire from the midwest a year ago, the repeaters out here really took me by surprise. The coverage is phenomenal by any standard I am accustomed to, but so are the dead spots when a mountain gets between you and the repeater! Clearly, 10 Watts of power is not enough for reliable communications. The final straw came when I became interested in 2m SSB—I had to have an amplifier, and preferably one that included a receive preamplifier. After pricing the market, I decided that I might as well go for something really "loud," and one of the most powerful amplifiers this side of a homebrew 4CX-250 is the Mirage B1016. For the uninitiated, this particular model is capable of putting out 160 Watts with only 10 Watts drive and is an extremely compact package measuring 12" × 3" × 5.5". It appears to be very conservatively designed and is covered by a five-year warranty on everything but the rf power transistors (which are covered by a one-year warranty).

When the B1016 arrived, I immediately installed it in my car. An amplifier that produces this much power is not to be taken lightly, so I took the precaution of installing a short, heavy run of #10 wire directly to the battery. RG-58/U is not really designed to handle 160 Watts at two meters, so I fitted my Larsen roof-mount antenna with a good grade of RG-8/X. All front-panel switches may be remoted using an optional control box, permitting the amplifier to be installed in an out-of-the-way location, with a remote-control box conveniently at hand.

The Mirage B1016 two-meter linear amplifier.

It should have come as no surprise, but it was nevertheless exciting to discover that 160 Watts allows me to talk through repeaters I couldn't even kerchunk before. I had grown accustomed to losing contact with my favorite repeater along certain stretches of highway—from these same spots I was now into the machine with a reasonable level of quieting! Importantly, the B1016 is fitted with a very good 10-dB gain receive preamplifier. Switching it in kicks up the S-meter several units and quiets the received signal noticeably. The preamplifier does its best work on SSB. It never made a totally indecipherable FM signal readable, but it frequently allowed me to communicate with SSB stations that I couldn't otherwise copy. I have yet to encounter a multi-mode two-meter transceiver that won't benefit from the Mirage preamplifier.

How Do I Key This Thing?

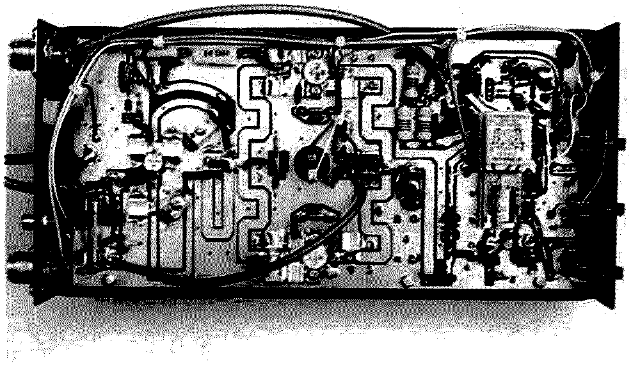
You'll notice from the photograph that there is an FM/SSB switch on the front panel. Since the amplifier is biased for linear operation in both the SSB and FM modes, this has absolutely nothing to do with the linearity of the amplifier. It merely selects no delay rf-sense switching in the FM mode and adds some delay in the SSB mode. Rf switching is convenient but is really an unsatisfactory compromise. If you set the hang time long enough so that the amp doesn't cut in and out between words, it takes an uncomfortably long time to switch to receive after you let up on the PTT. Moreover, the Mirage has separate relays for the preamp and amplifier sections so that everyone has to listen to two relays chattering away. Do yourself a favor and wire up for direct keying when you install the amplifier. In only takes a moment, and think of the fun you'll have scaring your know-it-all friends every

time you operate SSB with the delay switch in the FM position!

The B1016 can draw over 20 Amps of power (it's fused for 35) at 13.6 volts dc, so care should be taken in choosing a power supply. For a VHF contest weekend, I used a hefty Astron RS-35M supply, rated at 20 Amps continuous duty, and it barely got warm. The heat sink on the amplifier itself gets pretty hot after three or four hours of screaming "CQ contest" into the microphone, but at no time did I cause the temperature-sensing protective circuitry to cycle. At 170° F., a thermostat shuts the amplifier off, and doesn't return it to normal operation until the temperature drops to 140° F.

Who Needs 160 Watts?

Even in the flatlands of the midwest, a powerful amplifier is useful for FM operation. It is comforting to know you have an extra margin of power when mobiling at the fringe of a repeater's coverage area, and it's a pleasure to carry on simplex conversations over distances that would normally require a repeater. Nevertheless, two-meter SSB is where the B1016 really shines. You haven't lived until you've worked some two-meter SSB DX, and the B1016 will allow you to do it on a regular basis! For more information, contact *Mirage Communications Equipment, Inc., PO Box 1393, Gilroy CA 95020.* Reader Service number 488.■



Bottom view of the Mirage B1016.

GU-1820 *from page 42*

mance of the generator. A suggestion to Heath: Either manufacture the metal parts with slightly greater tolerances or provide the bearing already pressed into place.

After assembly and fueling, the gang stood back and held its collective breath while the starter cord was pulled for the first time. The engine started beautifully, and the light bulb connected to the output lit just as Heath said it would. After letting the engine run long enough to make reasonably sure that the mechanical parts were working correctly, we hooked the output (through a step-down transformer) to an oscilloscope to have a look at the waveform. It definitely wasn't as clean as the mains, but the frequency was very close to 60 Hz and the line voltage was right on the money at 117.

After ensuring that it was safe to connect equipment to the output, we hooked up a transceiver to see how the Heath-Watt would do at providing useful power. It did very well. The TS-530S ran just as it did when connected to New Hampshire Public Service. The nicest news of all was that the receiver suffered no interference at all from the generator—it was just as quiet as when running from the mains.

The generator's first real test came a few weeks later at the *73* gang's Field-Day site, where it was the sole source of power for our class 2A station. The Heath-Watt ran flawlessly for well over 24 hours and, although it was possible to tell by the sound of the engine when a rig was keyed, it handled the load of two transceivers, assorted keyers, lights, and rotors with no trouble whatsoever.

As generators go, the Heath-Watt was rather quiet. We set it up about one hundred feet from the operating tent behind a large boulder and had no noise problems at all. The hundred foot hike through the brush for refueling did make that part of Field Day more exciting than usual. Heath says that the generator's half-gallon gas tank will provide about 1¾ hours of operation at 50% load. That estimate seems conservative, and there were times when it seemed as though the gas would last forever (those were usually the times an operator was waiting anxiously in front of a battery-powered rig to take over when the generator died). It would be nice if a still-larger gas tank were available—a generator should not really have to be fed every couple of hours during an emergency. A tank twice the size would produce half the aggravation.

The Heath-Watt seems to be the ideal answer for an individual or group wanting to have emergency power capability at a reasonable cost. This generator is relatively inexpensive for the amount of power it produces and is small and light enough so that storage and transportation are not a real problem; one man can easily move it if necessary.

For more information, contact *Heath Company, Benton Harbor MI 49022.* Reader Service number 487.■

More Punch for the Hot Water 101

Steve Eigsti K5SE
Menlo Park CA 94025

The Heathkit SB/HW-100 series of transceivers is one of the most popular lines in the ham market. Unfortunately, the SB-100 line has been discontinued, but the HW-101, with the identical circuit minus some bells and whistles, lives on. Having owned an SB-101 for a dozen years, I found that the transmit audio was just barely adequate, and if a mike with low output was used, it was downright weak. External preamps are handy but involve extra batteries or power supplies, and are generally a nuisance.

After examining the SB-101 schematic, I noticed that I had an auxiliary crystal oscillator which I never used. The circuit uses half of V5, a 6EA8. With a few modifications—wiring and not cosmetic—the triode section of the 6EA8 can be used as an audio preamplifier. When I looked at the schematic of an HW-101, I discovered that it did not have the auxiliary crystal circuit. In fact, the triode half of V5B is not even used! It's sitting there waiting for you to add three resistors and capacitors to make it an audio preamp.

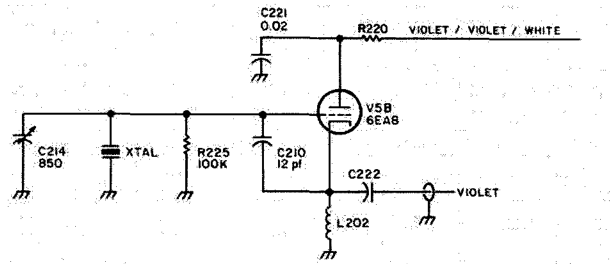


Fig. 1. Original SB-101/102 circuit.

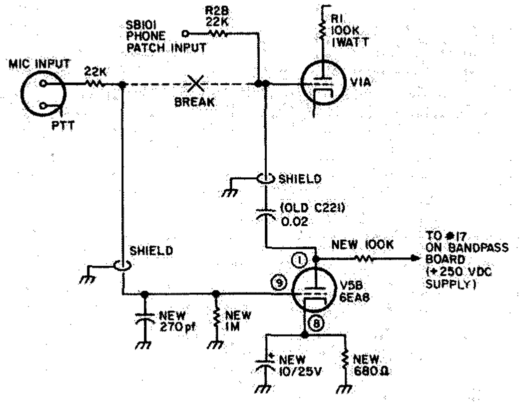


Fig. 2. Preamp circuit for HW/SB-101 using V5B.

Preparing the SB-101

If you have an HW-101, skip this step. If you have an SB-100 series rig, you must first remove the oscillator circuit parts. Carefully unsolder resistors R225 and R220 along with L202 and capacitors C214, C222, and C221. (See Fig. 1.) Save C221 as it will be used for the coupling capacitor in the preamp. The violet cable and violet/violet/white wire should be disconnected and taped carefully out of the way.

Wiring the HW/SB-101

Fig. 2 shows the new circuit. There are three resistors to install and three capacitors (one is C221 from the SB-101). Some of these parts can be installed in the available circuit board holes. The 100k plate resistor is connected to a wire which is soldered to the number 17 hole (+250 V dc) on the bandpass board.

The lead from the mike connector to V1A is broken and routed to the preamp, as per the diagram. Use shielded cable (and I installed a ferrite bead on V5B's grid lead to prevent rf pickup). The SB-101 has a phone-patch input paralleled with the mike input. Break the lead and install the preamp before the phone patch, unless your phone patch has a low-level output.

While you are inside the rig, I recommend changing R1, the plate resistor on V1A, to a 1-Watt resistor. The half-Watt original does not dissipate enough heat and may change value. I found that mine rose to 300k and cut the audio even further.

The modification is simple and can easily be removed if necessary. I have had this circuit in my transceiver (SB-101) for a number of years and get consistently good audio reports. Be careful that you do not overdrive the rig, as there will be substantial gain. I run the mike level at about 9 o'clock, one-fourth of the way up. ■

Tim Daniel N8RK
73 Magazine Staff

Gunnplexer Cookbook

Why aren't you operating on 10 GHz? Surely, you have heard of the Gunnplexer, a Microwave Associates' product aimed at making the average ham a master of microwave magic. Despite its availability, reasonable price, and simplicity, the Gunnplexer is about as popular as an AM signal on 20 meters. Now there is new hope for discovering life on 10 gigs. The *Gunnplexer Cookbook* blows the top off the subject, eliminating the problem of finding information and applications.

Authored by Bob Richardson W4UCH, the book goes beyond the whys of Gunn diode theory and delves into the hows of putting this technology to use. The sixteen chapters start with the basics and end with the design and construction of a computer or TV video link. Along the way, you'll learn about range, bandwidth, i-f amplifiers, antennas, and anything else that has to do with the practical aspects of life on 10 GHz.

The joy of W4UCH's book is that you can duplicate the projects. There are detailed plans for building frequency and power meters, power supplies, waterproof enclosures, parabolic reflectors, and temperature controls. These building blocks can be combined into a Level 1 or a Level 2 communications system. The author worked alone, at home, so he was forced to devise inexpensive and readily-available substitutes for exotic microwave gear. The text is supplemented by photos, diagrams, printed circuit layouts, and even information about suppliers.

If you have mastered the easy applications and are ready for experimentation, check out the *Cookbook's* discussion about making the Gunnplexer sing on single sideband. The proposed phase-locked-loop "crystalmatic" scheme has attracted some skeptical comments from other microwave aficionados. But the critics are sorely lacking when it comes to suggesting alternatives. Another one of Richardson's ideas calls for using a conventional AM television to receive FM video signals. Common sense dictates that this cheap and dirty approach won't work, but the proof is in the viewing.

Still not convinced that 10 GHz is the place to be? Then maybe you should dust off that old AM rig. All jokes aside, The *Gunnplexer Cookbook* is the definitive source for information and inspiration for aspiring microwavers. It costs $9.95 and is available from The Ham Radio Publishing Group, Greenville NH 03048. ■

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Rockville MD 20853

The Green Gallon

—an HW-101 look-alike (except for those four 811As)

This article describes a project which evolved into a 1-kW linear amplifier. The unit has been several months in the making. The effort put forth in building this project is dedicated to the amateur who enjoys the satisfaction of creating, building, and operating his own professional equipment.

The parts and subassemblies required to fabricate the amplifier were obtained from local hamfests or were reluctantly surrendered from junk boxes by fellow amateurs. It is intended that the theme of this article shall emphasize layout rather than circuit design.

The housing of four 811As, with filament, relay, and bias supplies into an HW-101 cabinet was preceded by many hours of planning. The power supply is housed in a separate box and connects to the linear via the control cable.

The Green Gallon linear amplifier is designed to be packaged into a Heathkit® HW-101 cabinet. The new assembly thereby creates a tabletop twin for my HW-101 transceiver.

Prior to building this amplifier, it was necessary to send a shopping list in the form of an order blank to Benton Harbor, Michigan. The Heath Company is very accommodating about selling piece parts. The top and bottom cabinet sections for the HW-101, three large, and two small skirted knobs were major items purchased. Minor items included four rubber feet and two plastic risers; all items added up to a cost of $35.00. Other front-panel parts such as the 1-1/4"-square panel meter, rotary bandswitch, and power on/off switch were purchased at local hamfests.

After surveying the available tubes, the 811A was chosen for this design. The reasons for the selection were twofold: (1) The tubes are relatively inexpensive and readily available, and (2) They can be operated at a relatively low plate voltage of 1500 volts, thereby making the power supply components less expensive. The disadvantage of using the tube is that four are required for full legal input power.

With this major decision out of the way, consideration was given to the tank-circuit components

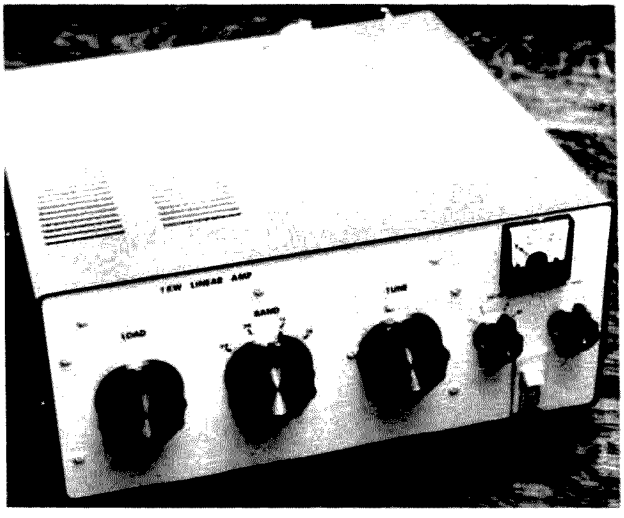

Photo A. Front view of amplifier showing all controls and taped top louvers.

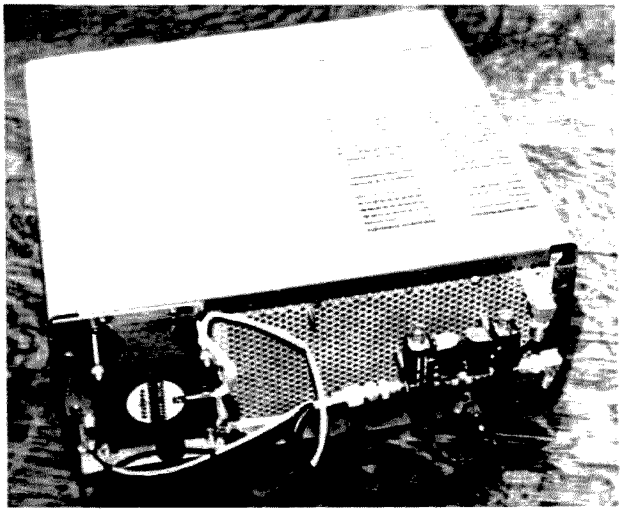

Photo B. Back view of amplifier showing cooling fan and dual coaxial relays.

because their physical size would dictate the entire layout. The tuning capacitor, a Cardwell, was purchased for $8.00, along with the large four-contact bandswitch for $1.00. The capacitor is a large unit with counterbalance weight, rated at 220 pF at 3-kV spacing. The four-position switch was part of a US Navy tuning unit and may be undesirable to some, but it did not cause any great problem in my shack because 40 through 10 are my prime bands of operation. For different bands, the tank could be modified easily to suit the individual's needs. The output loading capacitor is a conventional broadcast type with the three gangs wired in parallel, giving 1500 pF.

I constructed the main chassis using a sheet of 3/32" aluminum mounted on three angled pieces having dimensions of 1" on a side. Considerable thought was given to the layout and shielding of the rf input and output compartments. As shown in the photos, the four tubes were staggered horizontally in order to conserve space.

Orientation of the 811As is very critical due to their internal grid-support structure. The tubes must be placed with the grid-support posts aligned atop each other to prevent grid sagging and possible shorting when the tube is hot. The *ceramic* tube sockets are mounted to a piece of formed sheet aluminum.

The rf input circuit is completely enclosed, using a modified aluminum chassis and perforated aluminum sheet. A 10" × 5" × 3" standard chassis was cut lengthwise to make a 10" × 5" × 1-1/2" open shell. Next, the bottom side was removed so that a U-shaped shell remained which could be pop-riveted using L-brackets to the tube support. Although this may sound complicated, it is hoped that the photos reveal its simplicity.

The rear of the amplifier consists of a modified chassis box used as an rf input compartment, in which the 811A tube sockets were mounted. This chassis is covered with a perforated aluminum shield to complete the input enclosure. Input switching and tuned cathode circuits were eliminated because of space limitations. The decision was made knowing full well the risk of increased intermodulation distortion and high swr between exciter and amplifier. Prior to mounting the rear shield, the two Dow-Key coaxial relays were bolted to it with spacers.

The 6.3-V ac, 20-Ampere filament transformer was mounted toward the rear of the amplifier, providing its large secondary wires a short connection directly to the filament feedthroughs on the inner side of the rf shield. The feedthroughs were constructed using #6 machine screws and nuts, solder lugs, and insulating washers.

The bias and relay power

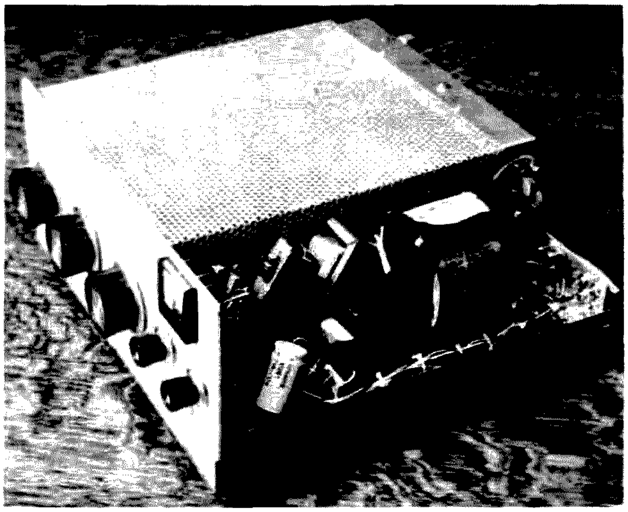

Photo C. Side view with top cover removed showing filament bias, and relay supplies.

transformers with their associated components were mounted directly in front of the filament transformer. The bias-supply uses a 6.3 V ac, 1-Ampere standard filament transformer in a reversed hookup, and feeds a simple half-wave filtered section. Components for the two supplies are mounted to lugged terminal strips. For simplicity, I pop-riveted the strips to the inner final rf cage.

The front panel was made from a piece of 1/8" aluminum obtained through the courtesy of a fellow ham with a free junk box at the local fest. The piece was cut to 14-1/2" × 6-1/4", and its corners were filed round to match the HW-101's front panel. Now, the panel must match the color of the 101, so I searched at the local automobile parts outlet for one of those spray cans of touch-up paint. An acceptable green was found at $1.00 a can (GM part #DS-GM 283). One can will supply several coats with some left over. Before spraying, remove all grease

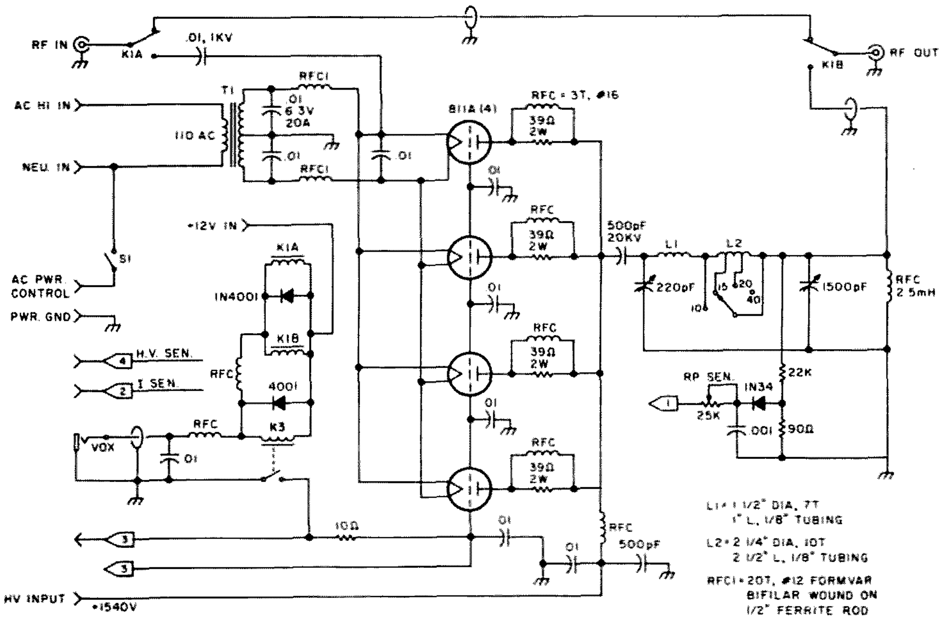

Fig. 1. 1-kW linear amplifier.

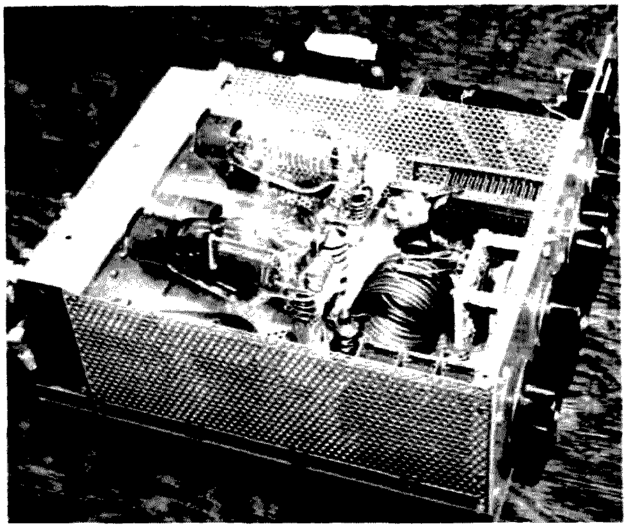

Photo D. Side/top view with top of rf cage removed showing 811As and final tank circuit.

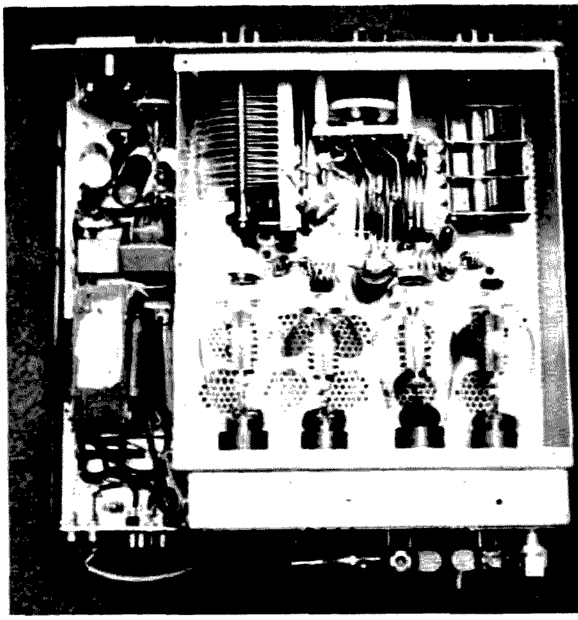

Photo E. Top view with rf cage removed, showing placement of rf tank components plus power supplies.

with a suitable solvent and then apply two coats of a suitable primer.

Like the HW-101 but unlike the SB-220 or SB-200, the power supply is housed in a separate box with a power control cable plus HV cable running between it and the amplifier. The heart of the power supply is the Berkshire 6181 transformer—all 30 lbs of it. This transformer has a dual primary to accommodate 120- or 220-V ac input and a single secondary rated at 1100 V and 550 mA. The unit was purchased directly from the manufacturer at a cost of $58.00 including postage and handling.

The rectification is handled by twelve 3-Ampere, at 1-kV diodes with 1/2-Watt carbon resistors in parallel with spike-preventing capacitors. A series of four capacitors, with bleeder/equalizing resistors, filters and increases the 1100 volts to 1540 volts. This level will drop about 100 volts when the amplifier is pulling its full plate current of 600 mA. Incidentally, I bench-tested the power transformer at 1100 V with a 1-Ampere load with no apparent heating. The power supply is energized via a control relay in the power supply and a power switch located on the amplifier's front panel.

Surge protection for the bridge diodes is assured by relay K2, with its contacts and a series resistor in the transformer's primary circuit. Time delay is about six seconds with 250 Ohms and 110 V ac on the primary. Sense resistors for the plate current and voltage are located in the bleeder-resistor string.

All metering is handled by a 100-uA meter. The meter function switch is a five-position ceramic type with the center position grounded. This gives a convenient meter-disable position between two active positions on each side. If a different meter movement is used, the calibration resistors will have to be altered accordingly. The meter face was re-scaled with 0-2 and 0-1 markings. The grid current and plate voltage use the 0-2 scale which provide 200-mA and 2000-volts full scale readings. The plate current and relative power output use the 0-1 scale, with 1000 mA and 1000 Watts, respectively.

When the power switch is activated, the grid bias supply immediately applies −125 V ac to all grids,

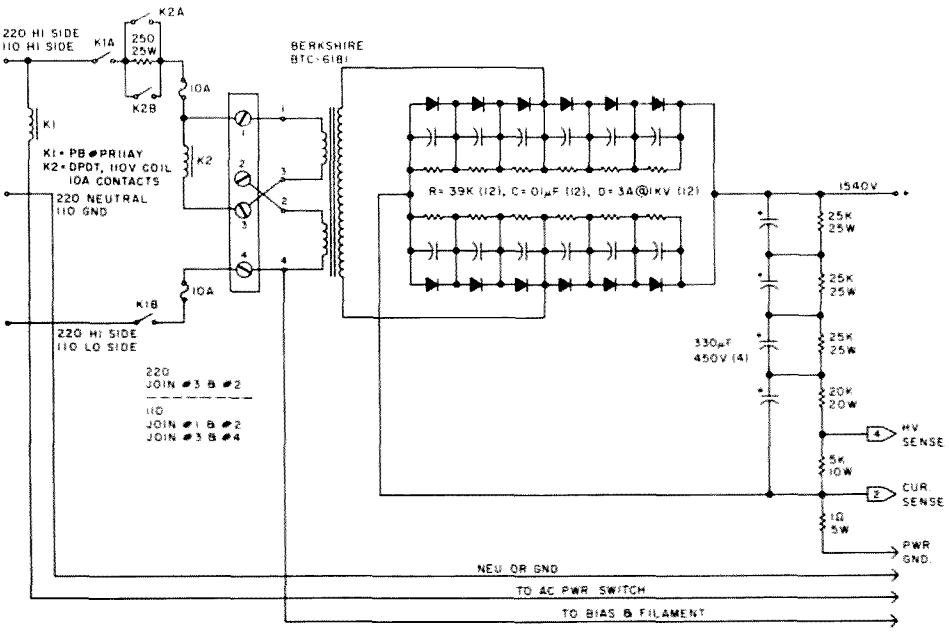

Fig. 2. Power supply.

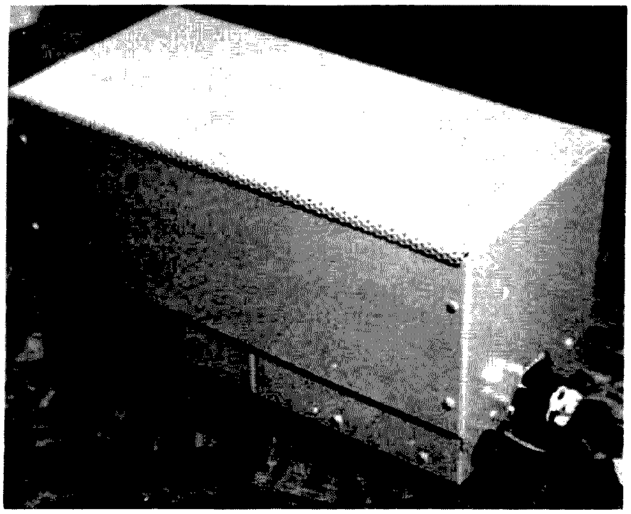

Photo F. High-voltage power supply with cables.

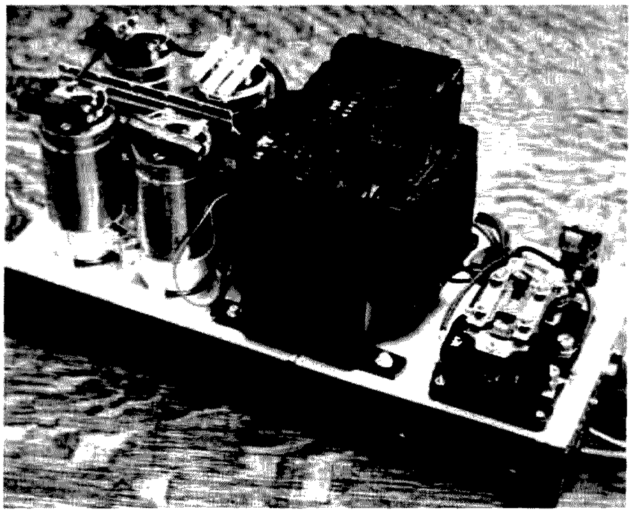

Photo G. Layout of high-voltage power supply. Rectifiers are on PC board mounted between the filter capacitors.

thereby cutting off all plate current flow during tube warm-up. The bias is controlled by a 12-V relay, K3, located in the rf input enclosure. Notice that both sides of the coil have rf chokes and disc capacitors ahead of the side wall feedthroughs. When the transceiver is operated, its auxiliary relay contacts are wired so that a contact closure to ground is generated thereby grounding one side of the bias relay coil and the two coax relays.

Cooling of the amplifier is achieved by using one miniature, high-speed muffin fan. The fan is mounted externally on the rear, fixed to the top cover. Direction of air flow is out of the amplifier, with the input path controlled. To gain maximum benefit from the fan, the louvers were taped closed on the inside of the top cover. Specifically, the right side and top right half were sealed. This action forces most of the input air to be pulled through the left-hand louvers into the rf output cage, picking up heat from the 811As and exiting it through the opposite side of the rf cage. The fan's motor cable was equipped with a male two-prong plug for easy removal. Incidentally, the amplifier can be operated with the top removed (hence no cooling) for short periods of time. With the cover removed, full rf input and output shielding is maintained making very easy the *dummy load* adjustments in the metering; bias, relay circuits, etc.

Tune-up and placing the linear on the air is made quite simple with the aid of the built-in relative-power meter. After allowing a nominal tube warm-up of, say, 15 minutes, key the transceiver with the mike gain at a minimum setting. The meter function switch should be placed in the plate current position. Increase the mike gain until plate current reaches about 200 mA.

Do not keep the transceiver keyed for periods longer than 10 to 20 seconds at a time due to the heat generated by the 811As.

After a brief period, turn the function switch to the relative-power position while alternately adjusting the tank circuit and loading capacitors to peak the relative-power output. Now switch back to plate current and increase this value to about 600 mA, which is about the 860-Watt input level with 1440 volts on the plates. This allows for an additional 100 Watts of driving power, keeping the total dc input power slightly less then 1 kW. A retouch of the tank controls may be required at this time using the relative-power position. Typical CW operation on 20 meters shows a plate current of 600 mA with a grid current of about 40 mA.

The amplifier has been in use for several months on both CW and SSB. Although the rig is mostly used for CW, its linearity is acceptable for SSB operation. As with all grounded-grid linear amplifiers, the loading is a bit critical, but after you get the hang of it, operating becomes a pleasure. ■

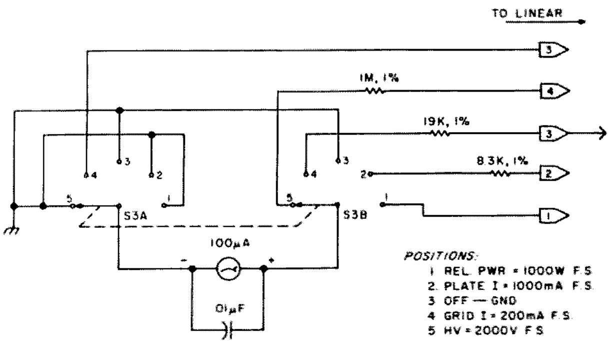

Fig. 3. Meter-function circuit.

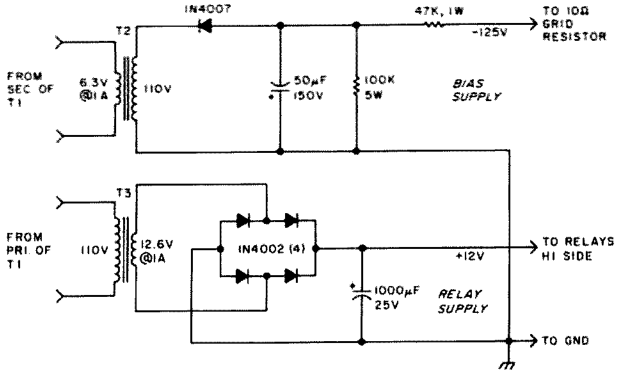

Fig. 4. Bias and relay supplies.

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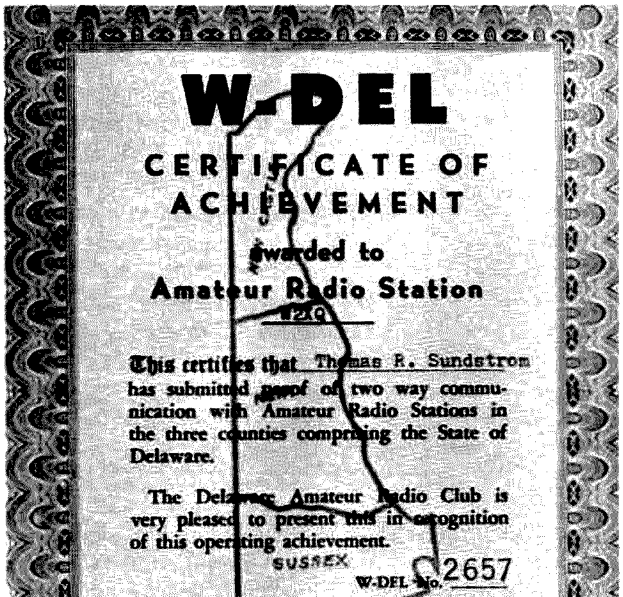
Vincentown NJ 08088

Controlled Chaos

—getting the most out of state QSO parties

How would you like to be a sought-after station on the low bands? How would you handle a pileup when you, a stateside station in W2- or W4-land, call CQ?

Often the situation is reversed. A rare DX station has probably worked thousands of US stations in all 50 states, so why should he work another W2, W4, or W6? But, once or twice a year, it can be your turn to be the hunted and have the choice of all who call you!


W-DEL
CERTIFICATE OF ACHIEVEMENT
awarded to
Amateur Radio Station
W2XQ
This certifies that Thomas R. Sundstrom has submitted proof of two way communication with Amateur Radio Stations in the three counties comprising the State of Delaware.
The Delaware Amateur Radio Club is very pleased to present this in recognition of this operating achievement.
SUSSEX
W-DEL No. 2657
Date 19 June 1978
Certified:
K3JL
President

One of many certificates available for participating in state QSO parties.

A controlled-fun kind of chaos, not quite as intense as the worldwide DX contests, is found in the state QSO parties. You, in the sponsoring state, are the station being sought by others. It's especially fun if you are in the county that has a small radio amateur population.

State QSO parties occupy relatively little spectrum space. Unlike the big DX contests or Field Day where every band disappears under a barrage of CQs, the state QSO parties tend to cluster around preannounced frequencies in the phone and CW subbands. Unlike the big contests, there is plenty of room for those who choose not to contest.

Table 1 lists all 50 states. Only 32 states have separate QSO party contests, but another 16 are represented in regional QSO parties listed in Table 2. The data listed is obviously subject to change (about 6 contests changed weekends this past year); detailed rules are publicized well ahead of time in *73* and most other amateur radio publications.

Weekend Activity

All QSO party contests are conducted on the weekends. The data shows state and regional QSO parties in every month of the year except April. May has six contests, September and March have five, and February has four. State QSO parties will not compete with the major international and national contests such as CQ Worldwide or ARRL Sweepstakes.

The hours of operation are *usually* very convenient for those who have worked parts of Saturday or Sunday. Most contests do not begin until midday Saturday, have a rest period from late Saturday evening to late Sunday morning, and end around dinner time Sunday evening. There are, however, some contests that run the full 48 hours and some others that do not have the Saturday night-Sunday morning rest period, so be sure to check.

The Exchange

The contest exchange

varies from contest to contest. Tables 1 and 2 summarize the exchanges.

Elements include a signal report, a serial number, county, state or ARRL section (see page 8 of any *QST*), or country.

An amateur in a sponsoring state would send a signal report and county, plus a serial number if required. On CW, for example, in the New Jersey QSO party, I would send:

CQ NJ CQ NJ DE W2XQ K
W2XQ DE W2NSD/1 K
W2NSD/1 DE W2XQ
599010 BURLINGTON BK
W2XQ DE W2NSD/1
599001 NH BK
QSL QRZ DE W2XQ K

In this example, 10 is my QSO number; for W2NSD/1, it's number 1. Regardless of band changes, QSO serial numbers continue consecutively and increment by one of each QSO.

Object of the Contest

The object is for in-state amateurs to contact as many other stations as possible, with an emphasis on out-of-state and DX stations. Not all contests permit in-state-to-in-state QSOs. Out-of-state amaeurs look only for amaeurs in the sponsoring tate.

Due to the relatively low umber of stations particiating (100 or more is a lot), good deal of comradeship evelops. For example, in he 1980 New York QSO arty, six New York stations n six different counties ran roundtable first on 75 meers and then on 40 meters ver several hours. Anyone who wandered into the QSO could work W2TU, WB2SJG, WB2KEX, KB2DE, WB2IVX, and WB2IPX within two minutes flat! During slow periods, stations tend to cluster onto a few freuencies and call CQ in turn; as a newcomer answers, all those on the freuency can take turns in working the newcomer.

Contest Scoring

Most QSO party contests are scored by multiplying the number of QSOs times the number of multipliers. For an in-state contester, a multiplier is each different state, or ARRL section, and DX country. If in-state-to-in-state QSOs are permitted, then each county is also a multiplier. For out-of-state contesters, each county worked is a multiplier.

Most contests count multipliers once regardless of the number of bands they are worked on.

For those intending to submit a contest entry to the sponsoring organization, you can see why a rare county is very popular, especially if that station comes on the air in the later hours of the contest and the county has not been previously heard from. The out-of-state stations create one pileup and, if in-state QSOs are allowed, the stack of calling stations grows even larger. That could be you in that rare county picking through the pileup. It's a fun experience.

Other Rules

Most contests permit one station to contact another station once per band per mode. Continuing with the example above, W2NSD/1 and I could work each other on phone and CW on each band from 160 to 10 meters for a total of 12 QSOs. For multipliers, however, I can count New Hampshire only once; W2NSD/1 could count Burlington county only once.

Florida's QSO party is one notable exception to this. The phone and CW entries are compiled separately; the scores are not added together if one station submits two logs.

Another standard rule is that the same in-state station may be worked more than once per band per mode if the in-state station changes counties. For example, in the 1979 New Jersey QSO party, K2NJ/mobile operated on 40 CW from all 21 counties in the course of the weekend; an out-of-state station could have worked K2NJ 21 times. In the 1980 Florida QSO party, I managed to work WD4INQ/mobile on 20 CW in six of the more-than-20 counties he ran through.

State	Month	Weekend Number	Serial Number Required	Out-of-state contesters send: State	ARRL Section
Alabama*					
Alaska*					
Arizona*					
Arkansas*					
California	October	1	x	x	x
Colorado*					
Connecticut	December	1	x		x
Delaware	November	2	x		x
District of Columbia	September	3	x		x
Florida*	May	3		x	
Georgia*	May	2	x	x	
Hawaii					
Idaho*					
Illinois*	August	1		x	
Indiana*					
Iowa*					
Kansas	May	3		x	
Kentucky*	September	3	x	x	
Louisiana*					
Maine	July	3	x	x	
Maryland	September	3	x		x
Massachusetts	May	3		x	
Michigan	May	3	x	x	
Minnesota*	June	1		x	
Mississippi*					
Missouri*	November	3		x	
Montana*	October	2	x	x	
Nebraska*	March	2		x	
Nevada*					
New Hampshire	February	2		x	
New Jersey*	August	3	x	x	
New Mexico*					
New York*	May	1	x	x	
North Carolina*	December	1		x	
North Dakota*	March	4	x	x	
Ohio	August	4	x	x	
Oklahoma					
Oregon*					
Pennsylvania	September	3	x		x
Rhode Island	August	3		x	
South Carolina*	February	1		x	
South Dakota*					
Tennessee*	March	4		x	
Texas	January	4		x	
Utah*					
Vermont	February	4	x		x
Virginia*	March	2	x	x	
Washington*	September	3	x	x	
West Virginia	January	3	x	x	
Wisconsin*	March	4		x	
Wyoming*					

*Table 1. State QSO parties. All amateurs send a signal report and amateurs in the sponsoring state send the county. *Some states have both individual and regional or district QSO party contests—see Table 2.*

Operating Strategies

For those wishing to submit contest entries, a high QSOs-per-hour rate is desirable, without forgetting about multipliers. Some contests also award 2 or 3 points per CW QSO, but only 1 point for phone; others award 2 or 3 points per DX QSO. Given those factors, time is probably most effectively spent on 20, 40, or

80/75 meters. With a decline in the MUF, 10 and 15 probably won't be as profitable in the QSO rate.

The frequencies used in the QSO parties generally are in the sections of the bands where General class licensees are permitted. Some of the larger contests also specify frequencies in the Novice bands for Novice/Technician participants and allow 5 points per QSO to encourage participation.

Obviously, the choice of bands will depend upon the distance between the sponsoring state(s) and the out-of-state participant and the time of day. The season also will have some bearing on the choice. For example, the 1980 Florida QSO party was held in May, and that weekend had very high static levels, rendering 40 and 80/75 meters useless for me in New Jersey; most of my operating time was spent on 20 CW. In the 1979 New Jersey QSO party, 40 meters gave me the highest QSOs-per-hour rate, but 20 meters gave me the most multipliers in other states and countries.

Many more stations seem to be around at the beginning of a contest than at the end. As a strategy, I suggest picking a band and mode to work on multipliers and pick up the distant states early in the contest, then pick up the nearby stations on the lower bands later.

It should be emphasized that power amplifiers and large antennas are not always necessary to "play the game." Properly constructed wire antennas or verticals and a barefoot transceiver can be competitive. Don't forget that most stations only have wire antennas on 40 and 80/75 meters, and compared to 20 are great equalizers. The large antennas and amplifiers probably help in marginal conditions, but then you are probably better off on a lower band with a higher QSO rate anyway.

In Closing

Some of the contest sponsors have a number of good ideas I'd like to see others adopt. More contests should encourage participation by Novices and Technicians. Most sponsors award certificates to first-place finishers in each county and state, section or country, but some combine multi-operator entries with single-operator entries. That's not really fair to the single operators, and separate awards should be given.

Another "nice" idea used by the Tennessee QSO party sponsors is sending a reminder message about the upcoming QSO party to each participant of the previous year's contest. A book of messages is put into the ARRL National Traffic System timed to be delivered about a month before the upcoming contest. The Florida sponsors also use the ARRL NTS to send the book of messages acknowledging receipt of contest entries.

In most cases, an entry consists of nothing more than sending a photocopy of your logbook, as long as all the required data is recorded. Attach a summary sheet showing the calculation of the score, your name, call, and address. Most sponsors also require a checksheet if more than 100 QSOs are made, to ensure that duplicate QSOs have been eliminated from the score calculation.

As a general rule, it also is suggested that you send along a No. 10 business-size SASE for contest results and your certificate, if you qualify.

If you don't feel like submitting an entry, that's OK, too. Just come in for the fun of it. If you are in the sponsoring state, your participation—even if for 10 or 15 minutes—will be appreciated. Figure out what the contest exchange is and jump in for a few minutes whenever you have the time at the beginning, middle, or end of the QSO party. QSO party contesters and county hunters will appreciate it.

See you in the New Jersey QSO party! ■

Call area or ARRL division	Month	Weekend Number	Serial Number Required	Out-of-state/region contesters send: State	ARRL Section
2nd call area	February	2		x	
4th call area	August	4	x	x	
7th call area	July	1	x	x	
9th call area	October	2		x	
0 call area	January	1			x
Delta (AR, LA, MS, TN)	September	4	x		x
Rocky Mountain (CO, NM, UT, WY)	May	2			x

Table 2. Regional QSO parties. All amateurs send a signal report and amateurs in the sponsoring states send the county.

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The General Electric Programmable Clock Radio

—sweet dreams for the broadcast DXer

What, you say, a mere clock radio reviewed in the pages of one of America's foremost communications magazines? Yes, since GE's intriguing, frequency-synthesized Model 7-4885, creatively dubbed the "Great Awakening" by the manufacturer, represents a very positive step in filling a need: that of a *bedside* communications receiver with a built-in clock function. As an avid hobbyist who's a "softie" for *anything* programmable and digital, I knew I had to have one of these gems when the ads first appeared.

A few communications-quality receivers boast clock features. For example, a number of the fine 1950s and 1960s-vintage Hammarlund receivers had built-in clocks, and recent offerings such as the Yaesu FRG-7000, FRG-7700, and Kenwood R-1000 all contain digital clocks which provide some degree of receiver and accessory control, such as turning on the receiver, and an external tape recorder for unattended, late-night DX recording.

To date, however, the author isn't aware of any communications receiver that's also a true clock radio suitable for bedroom use. But the GE offering comes very, very close, and should be of definite interest to the sophisticated AM broadcast band (BCB) DXer and FM-skip listener, as well as to the ham who would like to own a clock radio that's got practically every imaginable feature.

The Model 7-4885 replaces an earlier, but littl known GE programmabl unit that has been aroun since about 1977, the model 7-4880. The earlier se was similar, but was channelized to accommodat only the present 10-kHz A BCB channel splits. The newer version, in addition to incorporating more complex microprocessor-control circuitry, allows th user to instantly adapt the set for the possible adoption of 9-kHz channel spacings by the FCC in the not-too-distant future (more on this later). In a nutshell, th new GE radio is a dream t program and operate, and it especially appeals to individuals such as myself who are fascinated by microprocessor-controlled radio equipment.

The most prominent feature of the GE radio is a easy-to-use calculator-typ

General Electric programmable clock radio features precision and convenience not usually found in consumer-electronics products. Microprocessor-based circuitry affords direct keyboard entry of time and radio frequency, memory for six radio stations, multiple sleep/wake-up settability, and fluorescent digital display of AM/FM frequency and time. (Photo courtesy General Electric Company)

touch keyboard used to program the digital timekeeping functions and frequency readouts for AM and FM tuning; there is no tuning knob to be found. Other features include direct digital readout of AM and FM frequencies, updown scanning (search) of both AM and FM bands, direct keyboard entry of exact time and PLL-controlled radio station frequency, six programmable channel memories, two separately programmable memory "wake-up" circuits, automatic panel brightness control, and dual audible and visible power failure indications.

Essentially, the GE set does everything a conventional clock radio does, plus a lot more. It boasts some unusually sophisticated "fun" features including provisions for going to sleep listening to one radio station and waking up to another, having "his" wakeup alarm set to a certain time and station and "hers" to another time and station, punching-in your own desired interval between the wake-up start of music and the time the alarm jolts you to consciousness, and the ability to program the "snooze interval."

An even more important feature is that once set, all these complicated functions are retained, even through a power failure. Two user-supplied, standard 9-volt transistor-radio-type alkaline batteries provide power for the memory-holding system. This allows the radio to be unplugged and moved around yet keep track of time and maintain programmed radio stations and alarm times. Hold time is good for up to 8 hours using fresh batteries, according to the manufacturer. Should the batteries fail, the automatic power failure indicators will come online when power is restored, helping to prevent a late wakeup.

Although this is a sophisticated consumer-oriented radio rather than a true communications receiver, there obviously was some thought given in the design to more than casual use. For example, there is provision for an outside FM antenna for reception in fringe areas, as well as a ground connection. However, there is no provision for connecting an outside AM antenna, though this probably could be done by inductive coupling to the set's internal antenna. A rear-apron headphone jack is provided, a real convenience for late-night DXing. Selectivity, especially on the AM band, is particularly good, with stations standing out with little or no apparent crosstalk when the radio is scanned (stepped) through the band in the preprogrammed 10-kHz intervals. Selectivity is better than is presently required since the radio is designed to accommodate the narrower 9-kHz spacing mentioned earlier, which would place an added demand on good channel separation and "9-kHz whistle" suppression. A slight bit of RFI from the microcomputer circuit was noticeable, especially when scanning through quiet channels, though it was not objectionable.

Perhaps the most forward-looking feature is the user-selectable 9/10-kHz channelization. By sliding a small, screwdriver-accessible switch on the cabinet bottom, the user can adapt the radio to the possible new standard broadcast format. Doing so will alter the spacing increment as the radio is electronically scanned or frequencies programmed in, from the usual run of frequencies from 530 to 1610 kHz, to 531 to 1611 kHz. Under the existing allocations, all AM stations in the US (and most of North and South America, but not the rest of the world) currently broadcast on frequencies with 10-kHz spacing, such as 540, 550, 560, 570, and 580 kHz, and so on. Under the proposed new arrangement using 9-kHz spacing, stations would operate on frequencies such as 540, 549, 558, 567, and 576 kHz, etc.

The compressed channelization scheme could allow as many as 1400 new stations to operate on the standard broadcast band, in addition to the 4000-odd now operating. However, many of the 450 million radios now in homes across the country would be rendered at least partially obsolete since their selectivity would be inadequate to handle the narrowed spacing. Many station owners claim that they would have to spend huge sums to retool their equipment for the new standards. Interestingly, the proposed change by the US may be welcomed by many foreign governments, particularly if other nations in the hemisphere go along, since we are now "at odds" with the 9-kHz spacing used in most other areas of the world. This disparity results in annoying inter-station heterodyning and beating, being most noticeable in coastal areas where transoceanic medium wave (MW) signals are most frequently received.

Living some distance from both the east and west coasts, I didn't try this, but the intrepid MW listener might want to experiment using the radio in the 9-kHz mode to try to snag overseas stations operating on what are presently odd-split channels to us in the US. For example, the radio would be a natural to attempt to receive such DX catches as the 1.5 megawatt, 657-kHz station at Kangnam, North Korea, the 135-kW, 666-kHz outlet in Lisbon, Portugal, Japan's 500-kW powerhouses on 747 and 774 kHz, Istanbul's 1.2 megawatt station on 1017 kHz; or the West German 800-kW outlet on 1593 kHz. The set's stability and sensitivity (although not measured by the author) were found to be quite acceptable and thus suitable for this kind of uncommon bedside DXing. No spurious signals could be detected on either the AM or FM bands. Apparently, GE's engineers thought the set might see double-duty as a DXer's bedside machine, since the radio's instructions even recommend that the user refer to *White's Radio Log*, a periodically-updated listing of all Canadian and US stations referenced by location, frequency, and call letters. The log is published as a part of *Communications World* magazine, a Davis annual.

The next and perhaps inevitable step is for GE or another enterprising manufacturer to crossbreed the programmable clock radio with a scanning programmable portable of the Sony ICF-2001 class for digital bedside shortwave and ham-band listening and wake-up. That step surely isn't far away. In the meantime, one can have a great deal of pleasure playing with GE's flexible and functional programmable, available at discount-stores for under $90. The radio will also make an excellent gift for the inveterate gadgeteer or BCB DXer, since the radio lets him both start and end his day with his favorite hobby.

Only one problem remains: How do I convince my wife to study the not-too-complex instruction manual and remove her wind-up alarm clock from atop the radio? After all, I've offered her the use of the Number 2 "hers" alarm. ■

Propagation Prophecy

—you, too, can calculate the MUF

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Des Moines IA 50317

One of the most fascinating attractions of HF communication is the idea that a movement of miniature electrons which we never see produces an invisible signal which travels up into the sky, bounces off some atoms at a height most of us could never hope to reach in an airplane, and then returns to a friendly ear in a distant land. Our voices, our messages, can arrive almost instantaneously, at almost any place in this giant world. Indeed, if conditions are right, it is possible that they could make their way to many distant and exotic lands at the same instant. Then, the real fascination comes when we receive a return message.

Recommended Amateur Band	Calculated MUF in MHz	Signal Destination
40	10	New Orleans
20	17	Merida, Mexico, Guatemala, or British Honduras
15	25	Panama
15	25	Maranon River, northern Peru
10	32	Lima, Peru
10	30	Caldera, Chile
10	33	Buenos Aires, Argentina
10	29	Straits of Magellan
15	22	Antarctica
15	21	Antarctica (a little deeper into the continent)

Table 1. MUFs for a southern path from Des Moines IA, September, 0000 UTC, solar flux 154.6.

This radio skip is a natural and yet unseen wonder of our world which has been the backbone of our worldwide communications. Without it, all frequencies would act much like VHF. The long-distance communications which have saved millions of lives in various world catastrophies never would have been possible. Who knows, satellites might have been invented sooner, and maybe even eleven meters might be a little more subdued.

But try to predict where your signal is going to land, and what shape it's going to be in when it gets there, and you have a fascinating problem.

When I first became interested in this propagation of our radio waves, I sought some practical knowledge I could use to make a reasonable prediction, based on all the information available on a given day. That was about 15 years ago. Then, as now, the major source of information, *The Radio Amateur's Handbook*, advised you to listen to the ARRL's predictions and explained that the topic is so complex that it cannot be covered in just a few pages. I found out that that just isn't so and will show you what I discovered in the next few pages.

One of the major pieces of advice one gets from reading the *Handbook* is that propagation is dependent on the daily solar flux indexes broadcast by WWV. Unfortunately, after they tell you that you should watch the flux, they

don't tell you how you can use that value to substantially improve the monthly predictions published in *QST* and other magazines.

Perhaps you have wondered, as I have, just what it means when the WWV announcers say that today's solar flux is 210, and yesterday they said it was an even 200. Can I use this figure to improve my estimate of the day and hour 10 meters will become useless? Can I use this to help aim my beam in the right direction to add excitement to an evening at the dial? Can I use it to help me find the best circuit to talk to that YL in Moscow, Idaho?

As you've probably guessed by now, I intend to show that predictions of communications circuits to almost any place in the world, short distance or long distance, are about as complex as getting a solid contact with the ham down the street when you both are using a kilowatt. Frankly, if you can tune your transceiver, you can predict a communications circuit MUF (maximum usable frequency) from your shack to any place in the world, for any day and any hour of any month of any year.

The first step you'll want to take, besides reading this article, will be to go back to the *Handbook* to review some of the basic terminology. You'll want to know that the D layer of the ionosphere is the primary absorber of energy, while the E and F layers provide the skip. The E layer, which is the lower of the two "skippers," provides communication links over short hops, while the higher F layer provides the major long-distance skip opportunities.

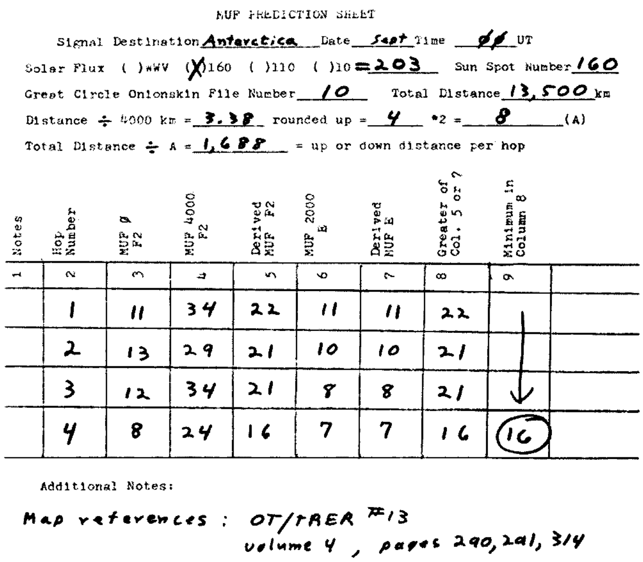
During the day, the F layer splits into the F_1 and F_2 layers, and the F_2 layer becomes the primary provider of long-distance com-

	Month	Pradioted Sun Spots	Predicted Solar Flux	Aotual Maximum Flux	Aotual Upper Quartile Solar Flux	Actual Median Solar Flux	Actual Lower Quartile Solar Flux	Aotual Minimum Solar Flux	Pct. Deviation of Actual Maximum to Predicteo	Pot. Deviation of Actual Minimum to Predicted
1980	Jan	157	200	231.7	217.9	200.5	174.4	153.4	15.6%	23.5%
	Feb	159	202	201.2	175.2	169.5	161.9	139.3	18.7	17.8
	Mar	160	203	249.9	237.3	187.2	162.5	137.3	33.5	26.7
	Apr	156	199	223.1	211.1	201.4	191.9	185.9	10.8	7.7
	May	152	195	292.8	264.6	200.6	181.4	165.7	46.0	17.4
	Jun	145	190	251.5	223.1	188.8	155.1	146.7	33.3	22.3
	Jul	142	187	258.0	235.2	188.4	142.8	130.9	36.9	30.5
	Aug	143	188	232.1	207.6	191.9	173.0	153.8	20.9	19.9
	Sep	142	187	253.3	205.4	182.9	167.7	153.8	38.5	15.9
	Oct	144	189	273.9	255.4	214.9	196.1	177.2	44.9	6.7
	Nov	143	188	253.2	206.1	185.9	172.4	161.6	34.7	16.3
	Dec	146	190	273.0	231.5	209.9	164.6	153.9	43.7	23.5
	0000 UTC WWV Solar flux, September, 1980, including all but seven days of numbers reported:			269				157	44.0%	16.0%
	Calculated estimate of September, 1980, sunspots:			222				113		

Table 2. Comparison of actual vs. predicted solar flux. Predictions are from the Institute for Telecommunication Sciences, as quoted in QST. *Actual data are for 2,800 MHz solar flux reported by the* Solar Geophysical Data Bulletin, *National Oceanic and Atmospheric Administration, Environmental Research Laboratories. Monthly data are from the 15th of the month shown to the 14th of the following month.*

munication. There are two excellent references on the subject. First, there is the National Bureau of Standards' Monograph 80 on *Ionospheric Propagation*. Unfortunately, it is no longer available through the US Government Printing Office. I discovered my copy buried among some old technical books I bought in 1965. You may be able to obtain a copy at your local library through the interlibrary loan program.

A second reference is the four-volume set called *Telecommunications Research and Engineering Report 13, Ionospheric Predictions*. Sadly, this set is also no longer available through the US Government Print-


MUF PREDICTION SHEET

Signal Destination Antarctica Date Sept Time 00 UT

Solar Flux ( )WWV (X)160 ( )110 ( )10=203 Sun Spot Number 160

Great Circle Onionskin File Number 10 Total Distance 13,500 km

Distance ÷ 4000 km = 3.38 rounded up = 4 *2 = 8 (A)

Total Distance ÷ A = 1,688 = up or down distance per hop

Notes	Hop Number	MUF 0 F2	MUF 4000 F2	Derived MUF F2	MUF 2000 E	Derived MUF E	Greater of Col. 5 or 7	Minimum in Column 8
1	2	3	4	5	6	7	8	9
	1	11	34	22	11	11	22	
	2	13	29	21	10	10	21	
	3	12	34	21	8	8	21	
	4	8	24	16	7	7	16	16

Additional Notes:

Map references: OT/TRER #13 volume 4, pages 290, 291, 314

Fig. 1. This is the work sheet I use to calculate a multiple-hop maximum usable frequency (MUF). When you wish to make an estimate for a day with other than 160 sun spots, you can use separate pages for 110 sun spots, 160 sun spots, and the final estimated maximum usable frequency.

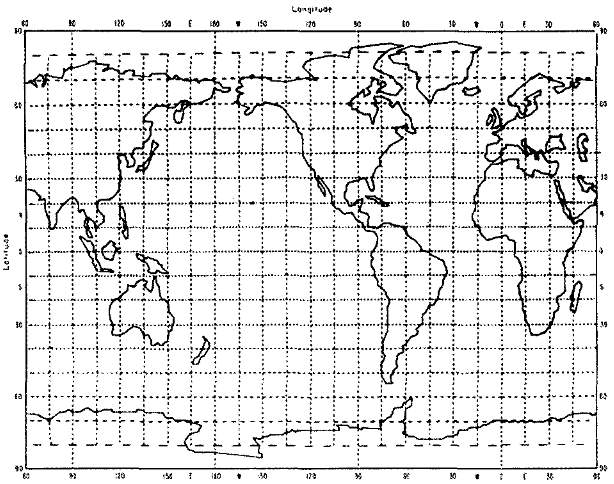


Fig. 2. Modified cylindrical projection of a world map. Use this chart to determine your location and the location of your expected contact. Source: Office of Telecommunications' Telecommunications Research and Engineering Report 13 (OT/TRER 13).

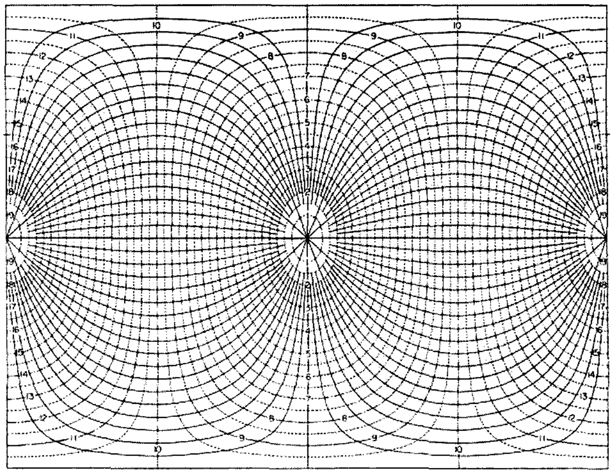


Fig. 3. Great-circle chart centered on the equator for use with Fig. 2. The solid lines represent great circles, while the numbered "dot-dash" lines indicate distances in thousands of kilometers. Use this chart to determine the great-circle distance between two points by using your onionskin paper and drawings like those in Fig. 4. Source: OT/TRER 13.

ing Office. However, there is hope. You can buy a copy of all 1,330 pages for just $12 from the Solar Terrestrial Data Center A in Boulder, Colorado. Unfortunately, the copy is on microfiche, and you'll need to find a microfiche reader at your library or at a friend's business, or perhaps you'll want to purchase your own reader for about $150.

Don't let all those dollars worry you, because included with this article are most of the materials you'll need to get started. In fact, of those 1,330 pages, I found that the whole subject is so simple that everything is explained in the first 18 pages. The other 1,312 pages are simply maps like the ones in Figs. 5 through 7 and 10 through 12. That's 18 pages of material I'll reduce to just a few pages here.

Most discussions of propagation predictions center on predictions of MUF because that is the frequency at which your signal bounces off the highest possible portion of the ionosphere and, therefore, gets you the longest distance with the fewest number of hops. But since amateur frequencies very rarely fall on the MUF, what value is there in knowing the MUF?

The reason for our interest is that the MUF for any given circuit may change as much as 14 to 15 MHz in a very short time. Also, since most of us have only a limited amount of time to spend on the air, the primary question can be that of what stations can I expect tonight if I point the antenna south rather than what time do I need to be on the air to make it to Panama? Table 1 shows an example of this: A midwestern station in the US points his antenna south at 0000 UTC on a September evening.

The table shows ten steps of approximately equal distance between here and Antarctica. Step 1 shows that if I tune up the rig on any frequency less than 10 MHz, I should be able to make a contact in Louisana. Better try 40 meters for that one. The closest available frequency to the MUF of 17 MHz should allow an opening into Guatemala, or the

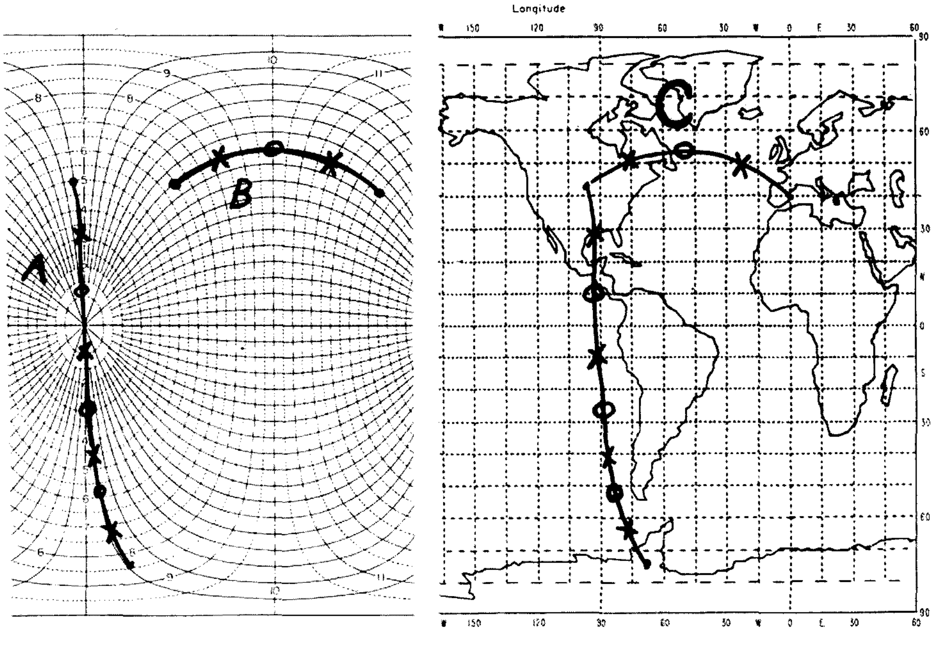


Fig. 4. Lines A and B show the great-circle projections of two paths from Des Moines, Iowa. A is a four-hop path to Antarctica, while B is a two-hop path to eastern Spain. C shows how the paths in A and B appear on a cylindrical-projection map. Source: OT/TRER 13.

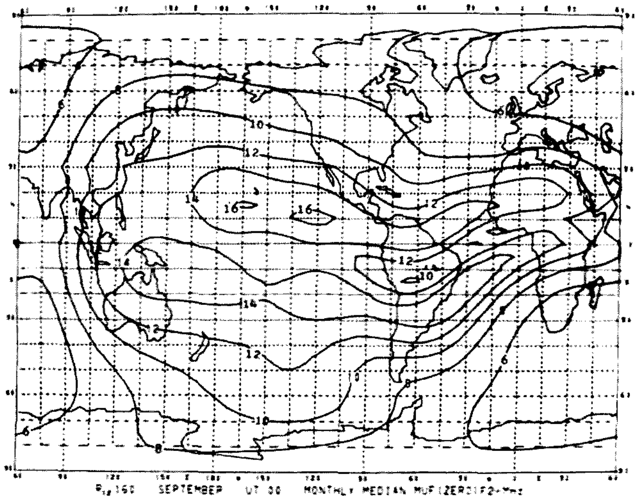


Fig. 5. Monthly median maximum usable frequencies for a signal to reach "zero" kilometers distance from the transmitter via the F_2 layer. This chart is for 0000 UTC, September, and a sunspot number of 160; a solar flux day of 203. Source: OT/TRER 13.

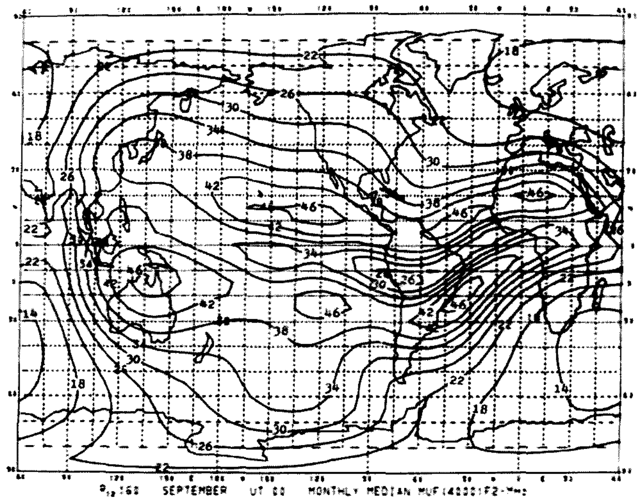


Fig. 6. Monthly median maximum usable frequencies for a signal to reach 4,000 kilometers distance from the transmitter via the F_2 layer. This chart is for 0000 UTC, September, and a sunspot number of 160; a solar flux day of 203. Use this figure along with Fig. 8. Source: OT/TRER 13.

city of Merida, Mexico. If there's a ham operator available in the mountains near Caldera, Chile, I actually might be able to make a contact on 10 meters—might be worth a try. Then, on 15 meters, I could possibly pick up the Maranon River of northern Peru or someone on the *continent* of Antarctica. That's a pretty good choice of contacts for a single antenna direction and a single hour of the day.

Checking the predictions over several hours would show about how long you can use each frequency to establish a contact to the area shown. Note that it is possible to be extremely specific about the location you may reach. At this point, you have overcome the limitation of most published predictions which show only the general area of the world you can reach and overlook many of the domestic circuits you'll want to use when trying for the closer distances, such as that YL in Moscow, Idaho, we mentioned earlier.

Another limitation of published reports is their inability to allow for an adjustment due to today's solar flux value broadcast by WWV. This can be a rather significant factor. For example, the September, 1980, predictions published in *QST* were based on a predicted median solar flux of 187. In actuality, during the period of time covered by the predictions, WWV reported daily solar flux as high as 269 and as low as 157 at 0000 UTC. This amounts to a maximum of 44% greater than the predicted median and a minimum which was 16% less than the prediction.

Table 2 shows the actual vs. predicted solar flux values sent to me by the Environmental Research Laboratories in Boulder. These daily averages also show some variation from the most currently broadcast figures you will hear on WWV. Even so, for the months shown, the flux varied upwardly about 46% and downward 30.5%. That's a considerable amount of variation from the predicted value and could have a substantial effect on some HF circuits. The procedures I'll outline will show you how to adjust for that variation.

First, there is one more concept we must briefly cover. At any given time, for any given communication link, there may be several MUF values which apply, depending on the ionospheric path you wish to use. These include a MUF for the E layer and F layers *for each* instance when the signal bounces off the ionosphere. You want to find the lowest MUF for F propagation and the highest of either the F or E MUFs. In the calculations shown in Table 1, the maximum number of hops on the signal's trip to Antarctica was four reflections off the ionosphere, and the F_2 region dominated in all cases.

The 13 steps which follow take you through the estimation process. I suggest that you may wish to read through the steps first and then go back and fol-

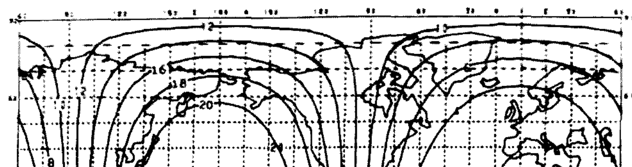


Fig. 7. Monthly median maximum usable frequency for a signal to reflect via the E layer. The chart is for 0000 UTC, September, and a sunspot number of 160; a solar flux day of 203. Use this figure with Fig. 9. Source: OT/TRER 13.

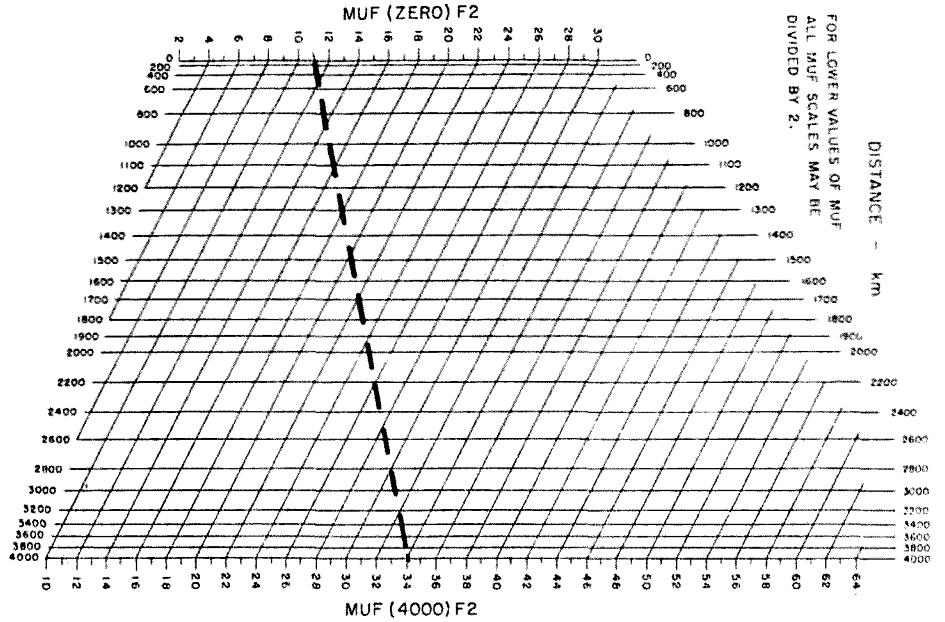


Fig. 8. Nomogram for interpolating between an MUF(0) F_2 (from Fig. 5), and an MUF(4,000)F_2 (from Fig. 6) to determine maximum usable frequencies at intermediate distances. The dashed line shows an example of a situation when the MUF(0) is 11, and the MUF(4,000) is 34. Following the line, we can see the MUF for a distance of 1,7000 kilometers is 22 MHz. Use this nomogram to find MUFS for column five of the work sheet in Fig. 1. Source: OT/TRER 13.

low along step by step. You'll be amazed at how fast you can arrive at a very accurate MUF for your communications circuit for the maps shown.

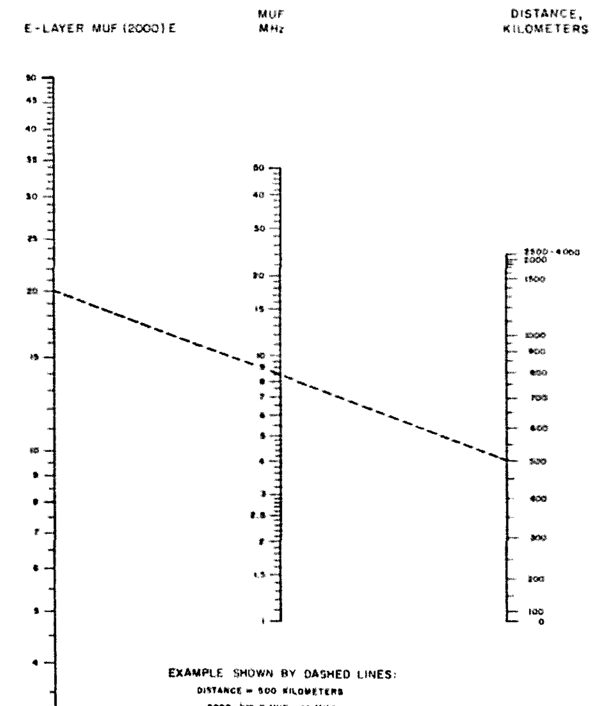


Fig. 9. Nomogram for converting the MUF(2,000)E from Fig. 7 to maximum usable frequencies at other distances. Use this nomogram to find the MUF of E-layer signals for column seven of the work sheet in Fig. 1. Source: OT/TRER 13.

1) Gather some materials together: a piece of onionskin paper or similar paper that you can see through, a ruler, a copy of the work sheet shown in Fig. 1 (I just sketch out my own sheet), and this hour's WWV solar flux value. You'll find the WWV solar flux broadcast at 18 minutes after every hour.

2) Locate your QTH and the city you wish to reach by laying the onionskin paper over the map in Fig. 2 and placing a dot on the two locations. Also draw in the equator line.

3) Move the onionskin paper down to Fig. 3 and line up the equator with the equator in the figure. Slide the onionskin paper to the left or right along the equator, until the two dots lie on the same great-circle line, similar to the east-west route in Fig. 4(B) or similar great-circle lines like the north-south route in Fig 4(A). Now, draw in the great-circle paths as shown in Fig. 4(C). If you wish, you can use one of the azimuthal maps being offered to hams in this step. It can provide an easier way to calculate distances, but may provide a problem when trying to determine the actual MUF on maps shown with this article.

4) In Fig. 3, you will notice some dashed lines and numbers. These tell you how many kilometers your dots are from the center of the chart. To find the distance between your two dots, simply count the number of dashed lines between the two dots. The lines are 500 kilometers apart, and the numbers are 1,000 kilometers apart.

5) Now you need to identify the number of reflections your signal will make off the ionosphere. I use a code here, where an "X" means the signal is reflected off the ionosphere, and an "O" shows where the signal is reflected off the Earth. To find the number of reflections, first divide the total distance by 4,000 kilometers. Then round that number up to the next largest whole number, multiply by two, and finally divide your result into the total distance. This gives you the distance traveled in either an upward path or a downward path. Mark off the upward and downward path lengths on your onionskin, beginning with an X (because your first signal must bounce off the ionosphere) and alternating Xs with Os until all reflection points are found. Note that the first and the last reflection points must always be Xs. For short hops of under 4,000 km, there is only one X at the very center of the path between the two points. Now, you can begin to fill in Fig. 1.

6) Lay your onionskin paper over Fig. 5 to find the MUF at zero kilometers for each point marked with an X. To help you through the first example, I've written the north-south values in on

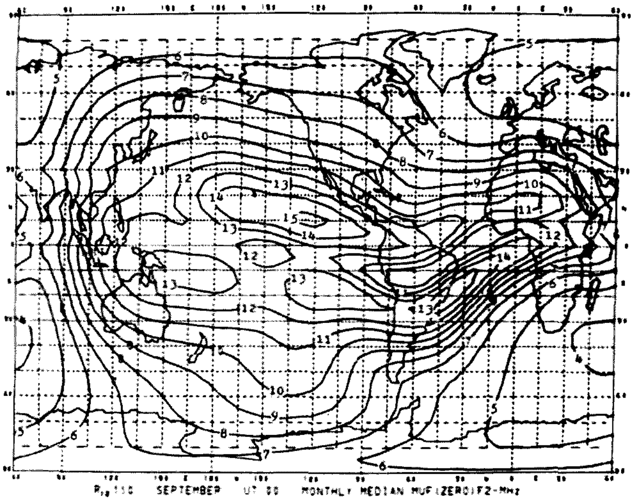


Fig. 10. Monthly median maximum usable frequencies for a signal to reach "zero" kilometers distance from the transmitter via the F_2 layer. This chart is for 0000 UTC, September, and a sunspot number of 110; a solar flux of 154.6. Source: OT/TRER 13.

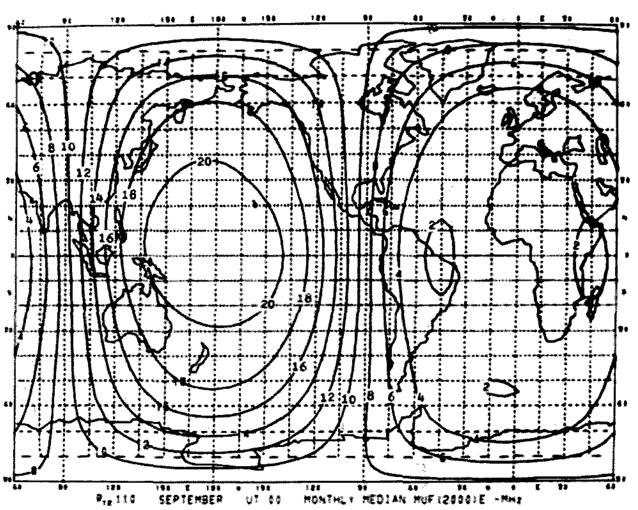


Fig. 12. Monthly median maximum usable frequency for a signal to reflect via the E layer. The chart is for 0000 UTC, September, and a sunspot number of 110; a solar flux day of 154.6. Source: OT/TRER 13.

the table in Fig. 1 under the heading, "MUF 0."

7) Using the onionskin and Fig. 6, identify the F_2 MUF values for each hop and enter them in the table in Fig. 1 under the heading, "MUF 4000."

8) Using the distance between each reflection point, go to Fig. 8 and interpolate the actual MUF you can expect on that particular hop. This interpolation between the MUF 0 and the MUF 4000 adjusts for the angle at which your signal travels to reach each of those hop points. Every reflection point in every path has a different reflection angle.

9) Finally, in your last use of the onionskin paper, lay your paper across Fig. 7 and determine the E layer MUF at each point for a 2,000-kilometer hop. Enter this value into Fig. 1. Then find the actual E layer MUF by using the nomograph in Fig. 9. Note your results in Fig. 1.

10) Now simply compare the F layer MUF value for each hop in column five of Fig. 1 with the E layer MUF in column seven of the same figure for each hop. Select the larger of the two values and put it in column eight. Then select the smallest number in column eight. Congratulations! You have just found the maximum usable frequency for a day on which there are 160 sunspots, or a solar flux of 203. Call this "MUF_{160}."

11) To interpolate the MUF values for days when sunspots are something other than 160, you first go back and do steps six through ten, using the maps for a sunspot number of 110

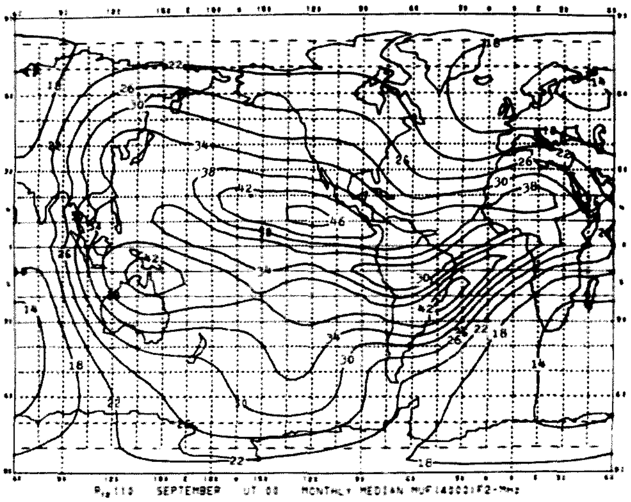


Fig. 11. Monthly median maximum usable frequencies for a signal to reach 4,000 kilometers distance from the transmitter via the F_2 layer. This chart is for 0000 UTC, September, and a sunspot number of 110; a solar flux day of 154.6. Source: OT/TRER 13.

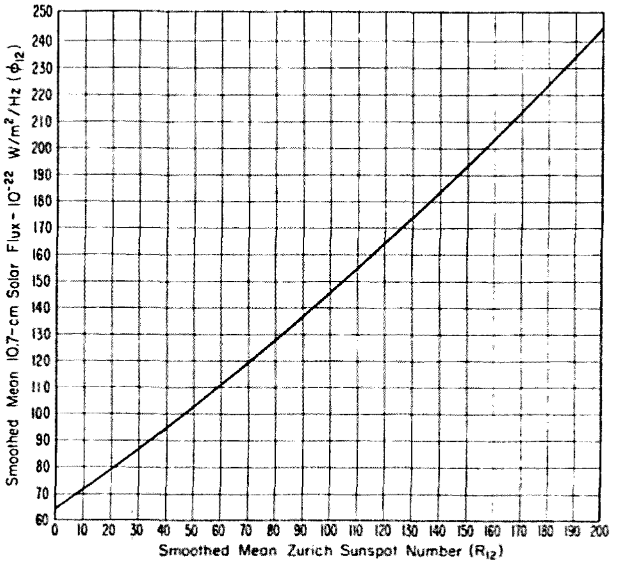


Fig. 13. Relationship between smoothed mean Zurich sunspot number and smoothed mean 10.7cm solar flux. Use this graph to convert WWV's solar flux to the daily sunspot number for use in the formula for adjusting the MUF to today's solar flux.

in Figs. 10 through 12. Call these "MUF_{110}."

12) Take today's reported WWV solar flux value and use Fig. 13 to find today's sunspot number.

13) Plug the sunspot number and your MUF values into the following formula and let your calculator or computer finish the job for you. This little calculation finally gives you the sunspot number for this hour of this day of this month, and for this part of the 11-year solar cycle. $MUF = MUF_{110} + 0.02(MUF_{160} - MUF_{110})$(today's sunspot number $- 110$).

Note: For days when the sunspot number falls below 110, you would also use maps for a sunspot number of 10, and the formula: $MUF = MUF_{10} + 0.01(MUF_{110} - MUF_{10})$(sunspot number $- 10$).

While it takes 13 complete steps to go through the process, you'll find that after two or three times, you are taking little short cuts here and there which have no effect on the outcome but make the procedure go a lot faster. It's like tuning up your radio. The first time, it goes pretty slow, while the third or fourth time takes just a short while. A good estimate with this procedure can be made within two to three minutes for a multiple-hop situation and about a minute for a single-hop situation. The maps here will get you through the month of September.

Acknowledgement

Figs. 2, 3, and 5 through 13 are from the US Government publication *Telecommunications Research and Engineering Report 13*, OT/TRER 13, by M. Leftin, William Roberts, and Rayner Roisch, volumes 1, 2, 3, and 4. ■

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Keyer Magic

—unravel the mystery of TTL circuits

In the fall of 1979, I took a course in digital electronics at the University of Arkansas at Little Rock, where I am studying for a degree in engineering technology. During the month-long Christmas break that followed, I decided to see if I could apply what I had learned. An iambic keyer seemed like an ideal project, since the circuit would be sufficiently complicated to be a genuine challenge. Besides, it so happened that my station did not already include a keyer.

You may wonder why anyone would go to the trouble of designing a keyer circuit from scratch, when it would be far easier to build a keyer based on a single IC such as the Curtis 8044. The answer is that designing a circuit based on common, general-purpose

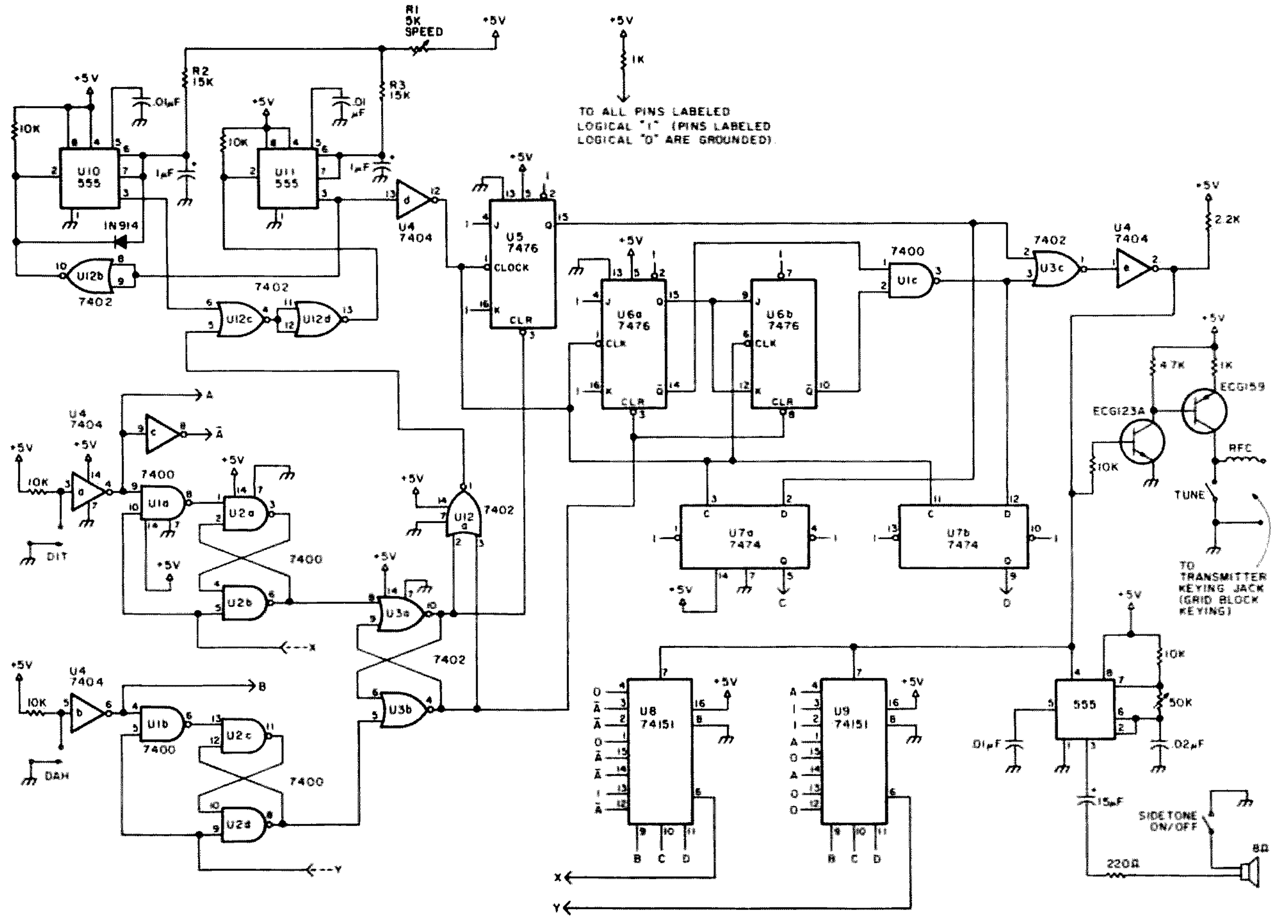

Fig. 1. Complete schematic diagram of the N5DY keyer. Pin numbers not shown are left unconnected.

digital ICs (TTL in this case) is a valuable educational experience for those who are just starting to learn something about digital electronics. I certainly don't claim that my circuit is the ultimate state-of-the-art design, but it works well. Readers who like to experiment with digital circuits may find it interesting.

Design Considerations

Let's begin by defining iambic operation in terms of what the circuit must do. At the end of each code character, a control circuit, or "decision" circuit, as I have chosen to call it, must check several circuit conditions and issue a command as follows:

1) If the dit paddle is on and the dah paddle is off, send a dit.

2) If the dit paddle is off and the dah paddle is on, send a dah.

3) If neither paddle is on, stop sending and reset parts of the circuit where necessary.

4) If both paddles are on, send a character opposite to the one just sent. For example, if the previous character sent was a dit, the keyer would then send a dah.

It is this fourth requirement, of course, that makes iambic keyer circuitry more complex than the circuitry required for a single-paddle keyer. The iambic keyer needs a memory circuit to record the last character sent, as well as control circuitry which can take command of the paddle at certain times.

In addition to the above requirements, there should be no initial startup delay between the time a paddle is depressed and the time a code character is started (other than the extremely small propagation delays in the ICs themselves), and code characters should be self-completing.

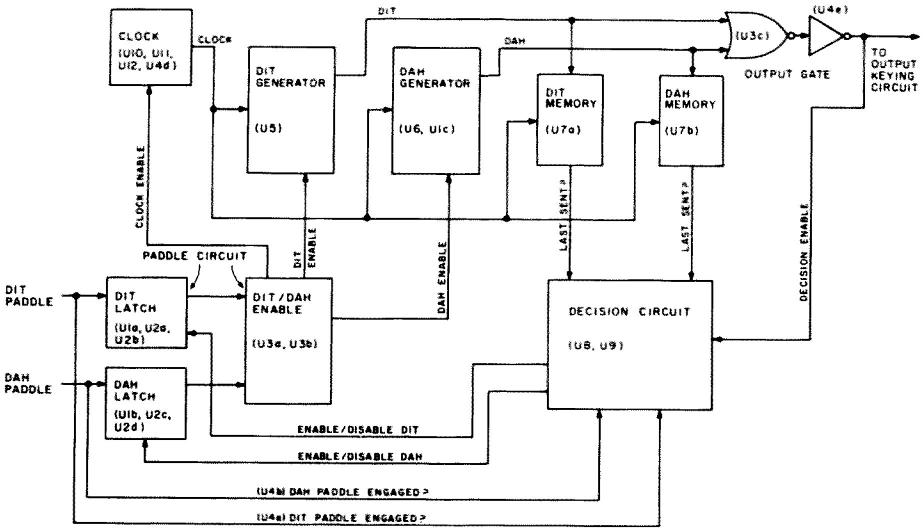

Fig. 2. Keyer block diagram.

The complete schematic diagram of the keyer is shown in Fig. 1. Fig. 2 shows the keyer in simplified block diagram form. (IC pins in the schematic diagram shown connected to "1" are actually connected to +5 volts, and pins shown connected to "0" are connected to ground. The labels "1" and "0" signify that these are logical "high" and "low" connections instead of ordinary power-supply connections. Some texts suggest that these logical "1s" should be connected to +5 V through a 1k resistor, with as many as 25 such connections sharing the same resistor; this is the procedure I have followed.)

Character Generation and Memory

There are many possible ways of generating dits and dahs. An article in the November, 1979, issue of *73* ("Son of Keycoder" by W4RNL) prompted me to start thinking about ways it could be done. In the end I chose a method that is perhaps the easiest to understand.

Let's first consider the dit generator and memory. Dits are formed by feeding a clock signal to a J-K flip-flop wired as a simple divide-by-two counter. When wired as shown in Fig. 3, the J-K flip-flop toggles whenever the clock signal goes from high to low. The output of the dit generator is monitored by a D flip-flop, which is activated by a positive-going clock pulse. Fig. 3 shows the circuit and the resulting waveforms.

Notice that the dit memory persists for half a clock cycle after each dit. The same relationship holds for a dah and the dah memory. The time between the end of a character and the subsequent clearing of its memory is the decision time, labeled t_d in Fig. 3. As will be explained in more detail later, the decision circuit will be activated whenever the keyer output goes low, such as at the end of one of the dits in Fig. 3. However, the final decision (that is, whether to send another character or stop sending) will be based on the conditions that prevail immediately before the character memory is cleared, or in other words, at the end of the decision time. The significance of this is that it gives the operator an extra half-space to get off the paddle before the keyer is committed to sending another character.

The dah generator is based on a synchronous divide-by-four counter. Two of the resulting waveforms are combined with a NAND gate to form the dah waveform, as shown in Fig. 4. (It should be noted here that in the original version of this circuit, the two J-K flip-flops were connected as a ripple counter instead of a synchronous counter, with the result that the keyer wouldn't work properly because a glitch in the dah waveform was activating the decision circuit at the wrong time. I don't intend to go into the details, but it is something that should be pointed out to those who may want to experiment with this circuit.)

The enable lines in Figs. 3 and 4 will enable the generator when high and disable it when low. The paddle circuit controls these enable lines. Whenever one of these enable lines goes high, the clock will also be enabled.

Referring to the complete schematic diagram, note that the outputs of the two generators are combined through U3c and U4e, which act as a simple OR gate.

The Clock Circuit

The clock circuit consists of two 555 monostable mul-

Definition of A, B, C, and D:

A: Dit Paddle (U4a)
B: Dah Paddle (U4b)
C: Dit Memory (U7a)
D: Dah Memory (U7b)

Initial Standby States:

A	B	C	D	X	Y
0	0	0	0	1	1

Dit Latch	Dah Latch
1	1

Dit Enable	Dah Enable
0	0

Dit Latch (U1a, U2a, U2b)

A	X	Dit Latch Output (U2b)
0	0	1
0	1	previous state
1	0	1
1	1	0

Dah Latch (U1b, U2c, U2d)

B	Y	Dah Latch Output (U2d)
0	0	1
0	1	previous state
1	0	1
1	1	0

Dit/Dah Enable (U3a, U3b)

Dit Latch	Dah Latch	Dit Enable	Dah Enable
0	0	previous state	
0	1	1	0
1	0	0	1
1	1	0	0

Note that it is impossible for both dah and dit to be enabled at the same time.

Decision Circuit (U8, U9)

Keyer Output	A	B	C	D	X	Y	BCD Address Corresponds to Input on Pin Number:
0	0	0	0	0	1	1	4
0	0	0	0	1	0	0	3
0	0	0	1	0	0	0	2
0	0	0	1	1	1	1	1
0	0	1	0	0	0	1	15
0	0	1	0	1	0	1	14
0	0	1	1	0	0	1	13
0	0	1	1	1	0	1	12
0	1	0	0	0	1	0	4
0	1	0	0	1	1	0	3
0	1	0	1	0	1	0	2
0	1	0	1	1	1	0	1
0	1	1	0	0	1	1	15
0	1	1	0	1	1	0	14
0	1	1	1	0	0	1	13
0	1	1	1	1	1	1	12
1	X	X	X	X	1	1	X

Note: X = don't care. Outputs from pin 6 are inverted data inputs.

Table 1. Truth tables.

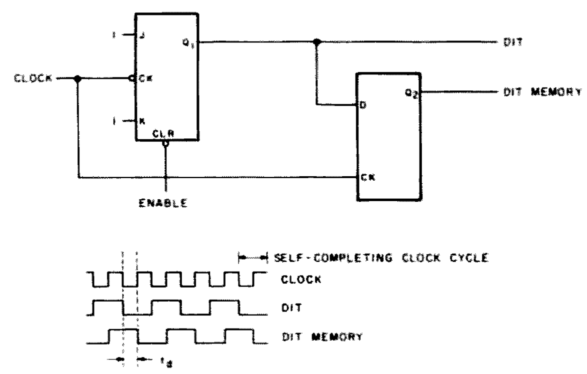

Fig. 3. Dit generator/memory circuit and waveforms.

tivibrators, wired back-to-back. It is basically an adaptation of a single-paddle, 555-timer-based keyer circuit described in *Solid State Design for the Radio Amateur* by Hayward and DeMaw, published by the ARRL. I experimented with several versions of a single 555 astable multivibrator clock circuit, but was not satisfied with any of them. With a single 555 clock circuit, the first clock pulse of a series of pulses will be longer than the pulses that follow. This is an unacceptable characteristic for my keyer circuit, since the clock is enabled and disabled along with the character generators. The twin 555 circuit described here eliminates the problem.

The complete clock circuit consists of U10, U11, U12, and U4d (see Fig. 1). Notice that the dit and dah enable lines are inputs to gate U12a. Initially, both 555 outputs (pin 3) are low, and both timing capacitors are discharged. A high signal on either enable line will trigger U11, which in turn triggers U10 through gate U12b. However, the diode in the circuit prevents the timing capacitor of U10 from starting to charge until after U11 has finished timing out. The clock circuit cannot be retriggered until after the output from U10 has returned to the low state. The result is a waveform that is entirely self-completing, with a duty cycle of approximately 50 percent with the component values shown in Fig. 1. At the end of one complete cycle, another cycle will be generated if an enable line is still high.

Readers who are unfamiliar with the 555 timer should consult *The 555 Timer Applications Sourcebook, with Experiments* by Howard M. Berlin.

The resistor and capacitor values shown will allow for code speed adjustments from approximately 15 to 35 words per minute. Readers who decide to experiment with different values should remember that the timing capacitors must be able to charge to two-thirds of the supply voltage in order to reset the timer. The safest bet would be to make R2 and R3 at least three times larger than the maximum value of R1.

The actual clock output is the inverted waveform of pin 3 of U11, which means that the clock waveform will begin with a high-to-low transition whenever an enable line goes high. This is necessary to meet the design requirement that there should be no initial startup delay between the time a paddle is depressed and the time a code character is started.

The fact that the clock waveform is self-completing means that two code characters cannot be separated by less than one space, regardless of how the paddles are manipulated. (See Figs. 3 and 4.)

Decision Circuit

The decision circuit is based on two 74151 1-of-8 data selectors (U8 and U9 in Fig. 1). Each chip has eight data-input pins and three address pins; three address pins allow for eight possible address combinations (000 to 111). There are two output pins: a data output and an inverted data output. In addition, there is a chip-enable pin (pin 7) which must be held low for normal operation.

One of the eight data inputs is selected to appear as the data output according to the address on the address pins. In Fig. 1, the data inputs to the 74151s are shown on the left side of each IC. They are arranged in order from top to bottom, starting with number 0 (for address 000) and ending with number 7 (for address 111). Note that the IC pin numbers do not correspond to this order. In this keyer circuit, the inverted data output (pin 6) is used. Pin 6 is driven high whenever pin 7 goes high, regardless of the condition of the address pins.

When the output of the keyer goes low, the decision circuit examines the following four circuit conditions, labeled A, B, C, and D:

A: Dit paddle. High if the paddle is on, low if off (from U4a).

B: Dah paddle. High if the paddle is on, low if off (from U4b).

C: Dit memory. High if the last character sent was a dit (from U7a).

D: Dah memory. High if the last character sent was a dah (from U7b).

There are sixteen possible combinations of A, B, C, and D. Four of these conditions (where C and D are both high) will not occur in normal circuit operation, but since they might turn up when power is first applied to the circuit, we must account for them to make sure the circuit doesn't get locked out when the power is applied.

Conditions B, C, and D are used to form the data-select address. Condition A, along with its complement, acts as a variable input to some of the data-input pins. There are two decision-circuit outputs, labeled X and Y, which determine what the keyer will do next. X and Y affect the state of the dit and dah latch circuits, respectively. The complete truth table for the decision circuit is included in Table 1.

The reader should refer to Don Lancaster's *TTL Cookbook* for an excellent discussion of how to design logic circuits with the 74151 IC.

Dit and Dah Latch and Enable Circuits (Paddle Circuit)

The state of the dit and dah paddles is sensed by separate dit and dah latch circuits, which also sense the state of X and Y, respectively. The dit latch consists of U1a, U2a, and U2b, with an output from pin 6 of U2b. The dah latch consists of U1b, U2c, and U2d, with an output from pin 8 of U2d (see Fig. 1). The truth table, for these latches is included in Table 1.

The outputs of the dit and dah latches serve as inputs to the dit/dah enable circuit, which consists of U3a and U3b. This circuit controls the dit and dah generator enable lines; the truth table is included in Table 1. The most important feature of the dit/dah enable circuit is that it is impossible for both enable outputs to be high at the same time.

Basically, I designed the paddle circuit to allow the X and Y decision signals to override the paddles and force the dit (or dah) latch high at critical times. When the operator is off the paddle, the X and Y signals will reset the latches to their standby states (see Table 1), which, in turn, forces both dit and dah enable lines low.

An Example of Circuit Operation

Fig. 5 shows the various logic waveforms that result when the dit and dah paddles are manipulated to create the waveforms shown for A and B. The resulting code output is the letter "F". (It should be noted that this is by no means the only way to form the letter "F".) Hopefully, Fig. 5 is a picture worth a thousand words. Table 2 is a step-by-step analysis of the waveforms at various critical times. All of the action described in Fig. 5 and Table 2 is based on the complete truth table selection of Table 1. The notes in Table 3 on the critical times noted in Fig. 5 and Table 2 should be of some help.

Additional Circuit Notes

The keyer output circuit shown in Fig. 1 is based on the circuit shown in the *Radio Amateur's Handbook* (1980 edition) for the Accu-Keyer. It is intended for use with transmitters with grid-block keying. Many variations of this circuit have appeared in ham magazines. Take your pick! The choice of transistors was dictated by what was in my junk box, but I checked the voltage rating of the PNP output transistor before I used it. My transmitter has a grid-block voltage of −55 V. The ECG159 transistor is rated for a maximum collector-to-emitter voltage of 80 V, and a maximum collector-to-base voltage of 80 V. Your transmitter may have a grid-block voltage that is too large for this transistor to handle. The safest bet would be to use a 2N5401 or equivalent. The tune switch in the output circuit is actually my old straight key.

The sidetone oscillator is a standard 555 timer circuit which has appeared in ham magazines many times. Once again, component values were dictated by my junk box. Two improvements could be made: (1) Substitute a 1k potentiometer for the 220-Ohm resistor in series with the speaker to provide for volume control, and (2) change the 50k tone control to a 100k potentiometer to provide for a greater range of tone control.

I am using a Radio Shack variable dc power supply to power the keyer, which draws nearly 200 mA of current. If I decide to build a fixed 5-V power supply for the keyer, I will make it at least a 1-Amp supply so it can power additional proj-

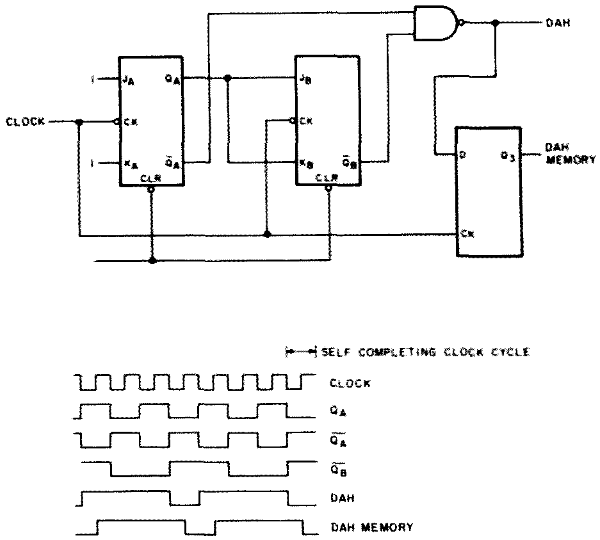

Fig. 4. Dah generator/memory circuit and waveforms.

	Circuit Conditions			Results			
Time	Keyer Output	A B C D	X Y	Dit Latch	Dah Latch	Dit Enable	Dah Enable
initial setup	0	0 0 0 0	1 1	1	1	0	0
t_1	0	1 0 0 0	1 0	0	1	1	0
immediately after t_1	1	1 0 0 0	1 1	0	1	1	0
t_2	0	1 0 1 0	1 0	0	1	1	0
t_3	0	1 0 0 0	1 0	0	1	1	0
t_4	1	1 0 0 0	1 1	0	1	1	0
t_5	1	1 1 1 0	1 1	0	0	1	0
t_6	0	1 1 1 0	0 1	1	0	0	1
t_7	0	1 1 0 0	1 1	0	0	0	1
t_8	0	1 1 0 1	1 0	0	1	1	0
t_9	0	1 1 0 0	1 1	0	0	1	0
t_{10}	1	1 0 1 0	1 1	0	0	1	0
t_{11}	0	1 0 1 0	1 0	0	1	1	0
t_{12}	0	0 0 1 0	0 0	1	1	0	0
t_{13}	0	0 0 0 0	1 1	1	1	0	0

Table 2. An aid in interpreting Fig. 5.

t_1: X and Y will always be forced high when the keyer output goes high.
t_2: End of first dit.
t_3: Clear dit memory.
t_4: See note for t_1
t_5: Operator presses dah paddle. B = 1 and Y = 1 will force the dah latch low, but since both latches are low, there will be no change in the enable lines.
t_6: Output goes low; decision circuit enabled. The decision circuits sees A = 1, B = 1, C = 1, and D = 0, resulting in X = 0 and Y = 1. This causes the dit latch to go high and the dah latch to go low. This, in turn, forces the dit enable low and the dah enable high.
t_7: Clear dit memory.
t_8: Analysis similar to that of t_6, except that this time the dit enable goes high and the dah enable goes low.
t_9: Clear dah memory.
t_{10}: Operator releases dah paddle.
t_{11}: Output goes low. Initially, the operator is still on the dit paddle, so the circuit prepares to send another dit. However, the operator has until t_{13} to get off both paddles to stop any further character generation.
t_{12}: Operator gets off the dit paddle in time to stop the keyer. The decision circuit now sees A = 0, B = 0, C = 1, and D = 0, which ends up forcing both enable lines low.
t_{13}: Clear dit memory. The circuit will now be reset to initial standby states.

Table 3. Notes on critical times.

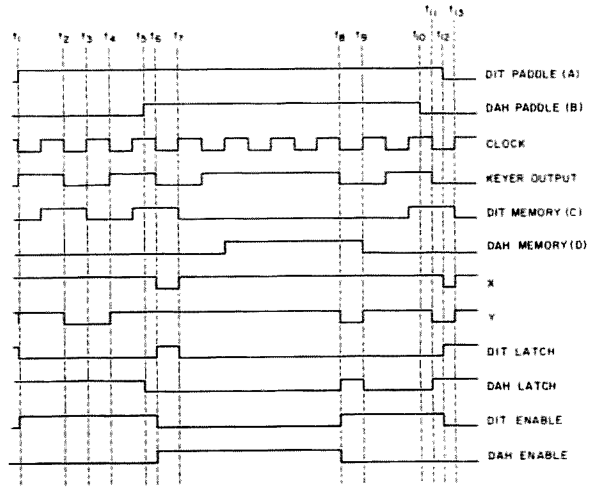

Fig. 5. An example of circuit operation.

ects. The power supply for a TTL circuit must be well-regulated, of course.

This is a good place to mention that the +5-V line in any TTL project should be bypassed to ground with small despiking capacitors distributed uniformly around the circuit board. About five 0.01-uF disc capacitors is about right for this project. Some experts recommend more stringent measures. The *TTL Cookbook* is a good source of information about this aspect of building TTL circuits.

I assembled most of the keyer on a perforated circuit board using wire-wrapping, but I designed a layout for an etched circuit board for the clock circuit.

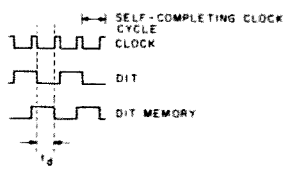

Fig. 6. Decreasing the duty cycle of the clock waveform will increase the decision time. Compare these waveforms to those of Fig. 3.

The best way to build a circuit like this one depends on your personal preference, of course. As of this writing, I have still not decided exactly what type of cabinet the keyer should be housed in. In the meantime, the assembled but exposed circuit has been set up on my operating table and connected to my Bencher paddle. I have used the keyer for many hours of off-the-air practice and am completely satisfied with its operation.

The final test was to connect the keyer to my transmitter to see if it would actually do the job. With the transmitter operating into a dummy load, the keyer worked flawlessly. With the transmitter operating into an antenna, however, the keyer would sometimes act up. Subsequent tests with a dip meter revealed that my rf-in-the-shack problem was worse than I had thought. The dip meter reacted strongly when brought near the coaxial transmission line, the rotator cable, equipment ac line cords, and the cable connecting the keyer to the transmitter.

Part of the solution to this problem was to add a small rf choke in series with the output from the keying transistor, as shown in Fig. 1. I also wrapped the power supply ac line cord around a ferrite rod from an old AM broadcast band receiver. These measures cured the problem as far as the keyer is concerned, and I am now able to use it on the air with no problems. Housing the keyer in a grounded metal cabinet might provide all the necessary shielding. Obviously, I will have to investigate my rf-in-the-shack problem further. The amount of rf-proofing you would need for this keyer circuit—or any other keyer circuit—would of course depend on how much rf is in your shack.

Final Comments

There are two books that you should definitely consider obtaining if you intend to do any experimenting with TTL ICs. The first one is the *TTL Cookbook* by Don Lancaster, which I have referred to in this article. The second one is *The TTL Data Book* by Texas Instruments. It is easy for a mistake to appear in a published circuit despite all efforts to avoid it, so anyone who intends to build such a circuit based on TTL ICs will find it helpful to have a copy of *The TTL Data Book* to check pin numbers and truth tables.

Experimenting with digital circuits such as this keyer can be a lot of fun, in addition to being educational. You ought to give it a try, if you haven't already. If this article encourages someone to get started, it has served its main purpose.

There is one more thing I would like to mention, which could probably come under the heading of second thoughts. A close look at the waveforms in Fig. 3 shows that the decision time could be increased or decreased by adjusting the duty cycle of the clock waveform. For example, Fig. 6 shows how a 25-percent duty cycle would increase t_d from half of a space to three-fourths of a space. The duty cycle can be reduced by increasing the RC time constant of U11, decreasing the RC time constant of U10, or a combination of both. Of course, these changes will also affect the speed range. I have not made any changes in my clock circuit, but since some keyer buffs may feel that a longer decision time is desirable, I thought I should point out how it could be accomplished.■

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The Contest Cookbook

—basic strategy and tactics

A contest QSO differs from a regular QSO in that it is short and in that a particular message must be exchanged. The techniques of getting into a contest QSO are similar to those used to initiate a regular QSO or, especially, a DX QSO, but they are generally performed at a higher rate of speed. Thus it is not all that difficult for any active operator to join in the contest fray *once he has read and understood the contest rules.* However, to do well in a contest (and this can mean anything from surpassing your own previous best score to actually winning the contest) takes some knowledge, experience, and work.

This article will attempt to add to your knowledge by suggesting strategies and techniques which have worked for successful contesters in the past. More important, though, through your own experience you will come to know: (1) yourself (your capabilities and limitations as a contest operator); (2) your station (its capabilities and limitations in any particular contest situation), and (3) propagation (both the basic patterns in your particular geographical location and the recent fluctuations in this pattern). According to W3ZZ and others, this combination of experience and knowledge plus *practice, practice,* and more *practice* will make you the best contester you can be.

The Basic Goal of Contesting

Enough of the philosophy—though it is tried and true and should not be neglected, it makes dull reading! Let's look at the basic goals of a typical contest operator. Besides having fun, he usually tries to make the best possible score in the time available. To do this, he must make as many contacts as he can. Many contests are scored by multiplying total contacts by a "multiplier" factor (multipliers will be discussed elsewhere in this article). For now, let's focus on making contacts, the most basic goal in contesting.

Each contact consists of an exchange of some standardized message, and only a limited amount of time is available in which to make these contacts. Therefore, a basic strategy for achieving a better score is to speed up the rate of message exchange or, in other words, to improve your ability to transmit and receive rapid communications through (typically) heavy QRM. Another basic strategy is to minimize the time between contacts, to maximize the *rate* at which contacts are made.

The Exchange

Very little can be said here about improving the receiving end of the exchange other than to urge practice. Upgrading your station equipment may also help, but don't underestimate your own ability to compensate for less than ideal gear. Believe it or not, the combination of the human ear and brain is the best audio filter available today, and it is extremely sensitive as well. Practice will maximize your own amazing capabilities.

On the topic of sending, more may be said. Let's take a simple example that is known to almost everyone who has dabbled in contesting: the ARRL Field Day exchange. All one needs to get across in a Field Day contact is his call, class, and ARRL section. To do this as rapidly as possible, send each piece of information once:

CW: "W6XYZ/6 1C EB de WB6CEP/6 K."

PH: "W6XYZ portable 6, 1C East Bay from WB6CEP mobile 6, over."

Notice how clear but brief the above message is. Repeat calls or parts of the message on the first exchange only if the station you are working is very weak or if its operator does not sound as though he knows what he is doing. For most contacts, though, send each piece of information just once, and you'll be surprised how often that is all that is needed. If someone does ask for a repeat, be sure to repeat only what he is missing. In other words, if you are asked "What's your section?", just give the section (in the above example: "East Bay"). If that still doesn't get through, then repeat the section several times—plus your callsign to assure the other operator that he is listening to the correct signal. On phone, it really does help to use phonetics. The standard ICAO phonetics, or other commonly used phonetics, are highly recommended. "Whiskey 2 Fuzzy Wuzzy Gorilla" (or whatever) is an attention-getting crack-up only if W2FWG has a good signal; otherwise it's usually a waste of time.

The above method is not always best, and as you become a more experienced contester, you will gain the ability to sense how much of the exchange should be sent and how often, in any given situation. The point is that the shorter you make your messages, the more

contacts you are likely to make.

The other major comment regarding the sending of exchanges is pretty straightforward. Improve your sending ability so that you can send your exchange as fast as the person you are working can copy. Estimating just how fast the other operator can copy is a skill that comes only with experience—but if you cannot send that fast, such an estimate will be less helpful. Practice!

mproving the Contact Rate: CQ vs. Search-and-Pounce

Now let's look at the con- :ept of improving score by ncreasing rate. The easiest vay to "keep the rate up" is o call CQ and get others to nswer you. To accomplish his effectively, a loud sigal is normally required. A owerful transmitter plus ancy, high-gain antennas n big towers will give you loud signal, but this is a rohibitively expensive soition for many. However, ven a so-called "little gun" an be a big signal at cerin times, on certain ands, and into certain geo- aphical areas. When any these conditions holds d people are there to ork, by all means call CQ gardless of what kind of gnal you have at your mmand.

At the beginning of the ical contest, "big guns" ll call CQ and be an- ered by those with weak- signals. An exception is iere some types of stans are rarer than others; example, an operator in rare country may have cess calling CQ with a atively weak signal. For majority of stateside itesters in most contests, wever, the big guns will the initial CQers. As the itest wears on, the weak- signals will have worked big guns and will be king for new stations to contact. At this point, the successful little gun will search the band for a relatively clear frequency that still has some contest activity near it and try a few CQs there. If it works, he should continue to call CQ; if not, he should go back to calling others. Towards the end of the contest, the big guns will have run their pileups dry. If a little gun calls CQ then, he is very likely to attract big guns hungrily searching for that one additional contact.

As the contest progresses, band conditions will fluctuate. If the little gun who is calling others suddenly finds that he is getting answers on the first call to the stations he is working, this indicates good propagation conditions, though often to only a particular part of the US or the world (depending on what type of contest it is). If that particular part is at all heavily populated with contest-oriented amateurs, he should shift to a clear frequency and try some CQs.

Certain bands tend to be better for weak-signal CQs than others. The higher bands—fifteen and ten meters—are very good when they are open. Little guns should keep a close watch on these bands for good openings which will allow them to call CQ—and get answers!

Finally, even a little gun will be quite loud locally in a domestic contest, especially on 40 and 80 meters. An occasional CQ will often produce short "runs" or "strings" of contacts with local operators, especially when the little gun is a fresh signal on the band.

When calling CQ fails, one must answer the CQs of others or suffer a drastic drop in his contact rate. This method of making contacts is commonly referred to as "searching-and-pouncing" (S & P). One searches the band for a station he hasn't worked yet, then pounces on that station and gives a call. Very skilled operators can make QSOs almost as rapidly by searching-and-pouncing as by calling CQ, but it is a more difficult technique to master and requires greater operator effort. Again, practice is important.

Let's first consider the "search" portion of the search-and-pounce method. You want to find a station that you have not yet worked, preferably one that is just finishing a "CQ Contest" or "QRZ Contest" as you tune across it. A loud station will be easier for you to copy—but it may have more search-and-pounce types calling it, so take your choice. A fast, smooth operator will probably work you sooner than a slow and/or unsure one.

While searching, be sure to tune across the entire portion of the band in which there is contest activity. Stations on the fringes may be easier to work because the competition is less. The bug guns tend to congregate near the low end of the band in major CW contests and DX phone contests, while during major domestic phone contests, the action is heaviest near the bottom end of the General class phone band. Once you have worked some of the big guns, search more carefully up towards the higher end of the band (or in the Advanced class phone band during domestic contests) for weaker (and often slower) CQs. Constantly sweep and re-sweep across the band, as new stations will appear (and disappear) at a surprising rate.

When your search unearths a juicy new station to work, several "pounce" considerations must be examined critically. First, how heavy is your competition? If many stations are calling, or if a number of bigger stations are calling, try only 1-3 calls and move on—unless the new station is a multiplier (see the next section for a discussion of multipliers). Under most conditions, your rate will tend to drop drastically if you sit on any one station's frequency for more than a couple of minutes. A superior alternative is to try your luck elsewhere and then come back later to check if the competition has lessened and/or propagation into that area has improved for you.

Second, exactly what is the new station working? If local stations with signal strengths comparable to your own are getting answered, the chances are very good that you can get through, too. If only stations considerably louder than yours are being worked or if the stations being worked are mostly located in other geographical regions, your chances are not so hot. With experience, you will develop a feel for the probability of contacting a given station under a certain set of band and competition conditions.

Third, as was mentioned earlier, the faster, smoother operator will usually work you sooner than a poorer operator if the size of their respective pileups is about the same.

When actually answering a contest CQ, keep it short. The preferred method is to send: "de K6PU." Then send his call as part of your exchange if and when you actually do work him. If this technique causes confusion, send both his call and your call, possibly repeating your call once.

With light competition on CW, or in most instances when operating phone (the exception is split-frequency operation with a DX station), zero-beat the desired station as you would in any regular QSO. With heavy competition, more

finesse is required to break through. Time your call for a lull in average signal strength on the frequency, or try shifting slightly to either side of the desired station's frequency if operating CW.

Finally, there will be times when both calling CQ and high-rate searching-and-pouncing will no longer work. You then have three choices: change bands, take a break, or search-and-pounce at a low rate. Band changes and rest pauses will be covered in succeeding sections. Low-rate search-and-pounce requires much patience and the conviction that each new contact is worthwhile because it improves your score. The "doldrums" are among those challenges of contesting which separate the good contester from the also-ran, so hang in there—and pray for better conditions soon!

Multipliers

Scoring in a few contests is based entirely on total contacts. Field Day is a good example of this type of contest, though it does contain certain bonus factors for portable stations which we will ignore for the moment. However, most contests complicate the scoring procedure—and thereby alter contest strategy significantly—by throwing in a multiplying factor. The "multiplier" is usually the sum of the number of distinct geographical areas contacted (with the definition of what is a "distinct geographical area" varying from contest to contest).

Some examples will probably illustrate the multiplier concept most readily. In the Sweepstakes Contest, the multiplier is the sum of ARRL sections contacted. If you work a station in each of the 74 sections, your score will be:
SS Score = Total Number of QSOs × 2 × 74 sections.

In the CQ Worldwide DX Contest, the multiplier is the sum of the countries and zones worked on every band. For example:
CQ WW Multiplier = 20 countries plus 10 zones on 40 meters and 50 countries and 20 zones on 20 meters = (20 + 10)+(50 + 20)= 100 (if one operated only on 20 and 40 meters in that particular contest).

In the California QSO Party, the multiplier for non-California stations is the number of California counties worked.

So much for what a multiplier is—now let's take a look at what effects a multiplying factor has on contest strategy. In a typical contest, your contact total will be significantly larger than your multiplier factor. Thus, each additional multiplier contact is worth a lot more than each additional non-multiplier contact—often five times as much, sometimes ten times as much, and possibly twenty times as much! However, finding an additional multiplier to work, or breaking through a pileup of twenty other stations who also need him for a multiplier, may take even more time than contacting an additional five or ten "ordinary" stations. Herein lies another major challenge of contesting: to balance contact rate and multiplier total in such a way as to maximize your score.

There is no simple answer to this dilemma. The best compromise depends upon a host of factors: the contest in which you are operating, your signal strength, your operating ability (especially your ability to search-and-pounce rapidly), band conditions, your geographical location, etc. Multipliers are generally easier to come by naturally in the course of making contacts in domestic, as opposed to DX, contests. In Sweepstakes, for example, the first fifty to sixty multipliers are almost automatic for the active participant, while the remainder of the seventy-four possible multipliers become progressively tougher to accumulate.

Experience in any given contest will teach you which multipliers are relatively rare; if you hear one of these, spend a little more time trying to work him than you would on a normal contact. Beware, though, of sitting on a rare multiplier's frequency for long periods of time. Unless contacts are really coming slowly, call a multiplier several times, note his frequency if you miss him, and try again every five to ten minutes. As his pileup (and rare multipliers usually do have pileups!) dies down, and as band conditions improve, your chances of working him become better. On the other hand, if band conditions become poorer, you may never get another chance to work him.

It is difficult, at the basic level, to provide any further solid tips on multipliers which will hold for all or even most contests. This is something one really needs to develop a feel for through experience.

Changing Bands

It is clear by now that there are two major goals in most contests: making a high contact rate and collecting multipliers. Simply stated, you should change bands only when by doing so you will improve your rate and/or add some new multipliers to your total.

In contests where you may work a station once on each different band (CQ Worldwide, ARRL DX, Field Day, etc.), the best general strategy is to operate on the highest band that is open. If the opening is not a particularly good one, your rate will suffer. In that case, it may be best to grab what multipliers you can quickly and then QSY to the next band down (for example, from fifteen to twenty).

Sweepstakes is a good example of a contest in which you may contact each station only once, regardless of band. In such contests you should strive to be on the band which will produce the highest rate, and pay less attention to marginal opernings on the higher bands. However, a good high-band (15 and 10) opening can really boost a score (especially a little gun's, as noted earlier), so it is important to monitor other bands for possible openings. This involves interrupting your operating whenever your rate slows, switching your receiver to any other bands which might be open, and quickly turning across the band.

If a given band appear to be active, listen more carefully to see if the activi ty level there is higher thar that of the band on whicl you have been operating—and/or check for multiplier you still need. Choose th band likely to be the mos productive for you in term of contacts or multipliers and either stay put or QSY The importance of monitoi ing other bands is eve greater when you may wor the same station on eac band, so by all means do and your score will almo surely improve.

A cost of such monito ing is the time lost in a justing your receiver to li ten on each different ban plus the time required t tune around the band. Th technique of tuning aroun the band rapidly has a ready been discussed. R ceiver adjustment—or th even more time-consumir task of tweaking both trar mitter and receiver—something which can I speeded up tremendous through practice and o simple trick.

Place some white stic on labels (masking tape w

also work OK) on your transmitter, receiver, amplifier, etc., panels just above all controls which must be adjusted when a band change is made. Pick out a band—eighty meters, for example—and tune up. Directly opposite the pointer line or dot on each tuning knob, make a mark on the label or tape and write "80" next to it. Do the same thing for every other band you will use in the upcoming contest. Now all you have to do to change bands is turn the bandswitch and rotate each control knob until it lines up with the appropriate marker. Very few controls are so touchy that if you are off by a fraction, performance will degrade sharply; if one or two are particularly touchy, spend an extra second or two to tweak them up after the basic changes have been made. There is seldom anything to be gained by being perfectly tuned in a contest; a few Watts more or less are unlikely to make much difference. The time you save by using this technique often does make a difference, though, as band changing now can be accomplished in ten seconds or less!

A final basic consideration when changing bands is your antenna system. If some of your antennas perform better than others, a sensible strategy is to spend more time using those antennas! For example, with a collection of dipoles and a four-element 20-meter beam, you probably would do better to spend much more time on the beam than you would on the one of the dipoles. However, this may not always be the best strategy. To continue with the beam-plus-dipoles example, it is highly likely that if your station happens to be located in the Northeast and you are operating the Sweepstakes Contest, the 80-meter dipole would be your "best" antenna. Thus it is critical to determine through actual on-the-air tests which of your antennas performs best in which directions and in which types of contests (local, domestic, DX, etc.). In other words, know your station.

Rest Periods

As was the case with changing bands, the basic underlying philosophy in determining when to take a break is quite simple: Rest when your rate will be low and when you will be unlikely to collect many multipliers. Unfortunately, as was also the case with changing bands, deciding more concretely at which specific time periods such conditions will hold is not so easy. The question of when to rest is further complicated by your own physical endurance limitations, which will often supersede rate and multiplier considerations.

Propagation is a key factor is determining when to rest. When one or more bands are open to an area where other contest participants are available to be worked, it is usually best to be on the air—especially if the areas concerned are highly-populated ones. Propagation is such a complex function of type of contest, geographical locations, time of day, year, sunspot cycle, etc., that few generalizations can be made about it which will hold more-or-less true for all US contesters. However, one generalization is that propagation peaks occur at sunrise and sunset, while midday is a low point. This is particularly true in DX contests, so the middle of the day is a time when many top contesters take a several hour nap (if they need it) in a DX contest.

Most DX contests do not have required rest pauses; you may operate the entire forty-eight hours (or whatever) if you have the stamina. If you do not and require more than a nap in the middle of each day, the next best approach is to take a short break when your efficiency drops off and operating is pretty much a waste of time anyway (e.g., in the wee hours of the morning). Since the excitement of a good opening will tend to wake you up, while low levels of activity will usually have the opposite effect, this is not too bad a system for most operators. Of course, if you know from experience (or from conversations with knowledgeable locals) when to expect good openings to various parts of the world, you will do even better if you take your breaks between predicted openings.

The rest-pause strategy for domestic contests is a bit different than for DX contests. Here, everyone's day and night very nearly coincide, and the contests are generally shorter (20-30 hours). The best time to take a nap in a domestic contest is during the wee hours of the morning. A common strategy is to operate on forty and eighty until the rate drops off noticeably, then sack out until dawn. If rest pauses are required—you must, for example, operate no more than twenty-four hours out of thirty in Sweepstakes—the additional breaks are best taken in short bursts of fifteen to twenty minutes any time the rate drops off.

In any contest, if at all possible, it is not wise to take long breaks. As propagation prediction is not an exact science, the successful contester must constantly monitor any band which might be open. Most people have difficulty doing this while they are asleep! ■

See List of Advertisers on page 130

William P. Smith K3LF
R.D. #2
Cold Spring Creamery Road
Doylestown PA 18901

The $50 Sweeper

—build this audio function generator and sweep your troubles away

One of my favorite aspects of ham radio is audio circuitry, and I am constantly constructing amplifiers, filters, and other devices which operate within the audio spectrum. In order to evaluate my projects, I built the swept function generator described here to use in conjunction with my oscilloscope.

The generator features a frequency range of .05 Hz to 300 kHz, digital frequency display, and a sweep range of 1000:1 or better. The unit produces sine, triangle, and square waves as well as left- or right-sloped ramps and pulses with an adjustable duty cycle of 1% to 99%. The outputs may be amplitude- or frequency-modulated by an external signal and adjusted in amplitude from six volts peak-to-peak down to millivolts. The sine, triangle, and square waves may be swept in frequency by a built-in linear sweep circuit or by an external signal. The cost is in the $50.00 range if you have a moderately stocked junk box. The majority of the parts are stocked by Radio Shack. About half of the cost is in the digital frequency display, which may be easily replaced with a frequency counter or an analog scale.

The entire unit consists of the function generator circuits, the sweep circuits, the digital display circuits, and the power supply. The function generator circuits actually contain two function generators, designated the primary and secondary, and labeled F1 and F2 in the picture of the front panel (Photo A). The two generators may be set independently of each other and it is possible to shift between the two merely by changing the logic level at the FSK jack. The amplitude of the

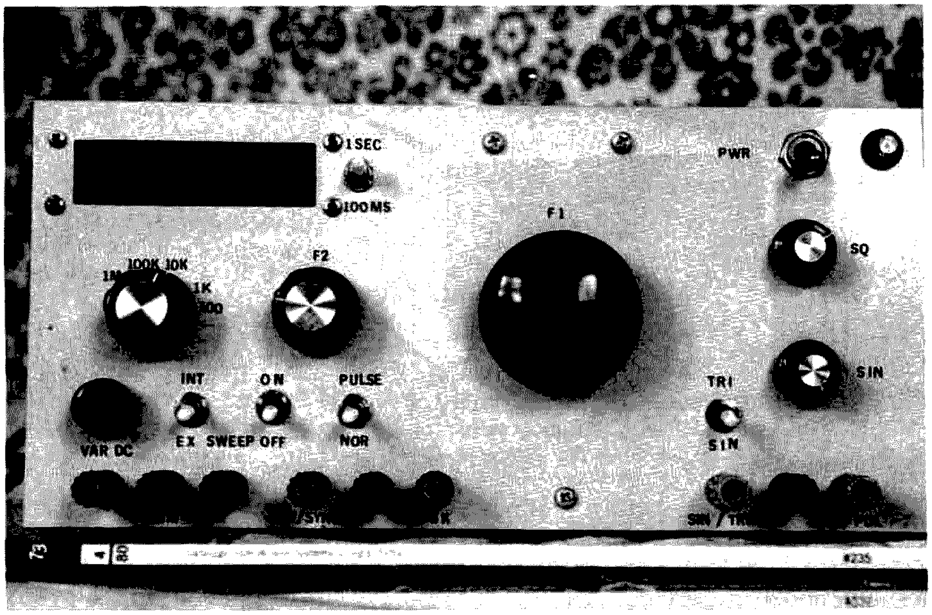


Photo A. The completed swept function generator. The knob labeled F1 is the primary frequency control and is mounted on a 3:1 gear drive. The SIN/TRI output jack also provides a ramp function. All unlabeled jacks are grounds, except the jack, far left, which is the variable dc output.

output is absolutely constant from the lowest frequency up to 300 kHz with a usable signal generated up to about 1 MHz. Distortion of the sine wave is adjustable and quite good at approximately .5% THD.

Construction

The heart of the function generator is an XR 2206 IC. I purchased my chip from Jameco Electronics, 1021 Howard Ave., San Carlos CA 94070. Be sure to ask for the spec sheet; the additional 25 cents is well worth the price. I used the manufacturer's recommendations on wiring the 2206 except for several modifications that are peculiar to my function generator. If you do not want to build the sweep circuit, then just leave those components off of the circuit board; there are no components that are used for both the function generator and the sweep circuits.

I used ¼-Watt, 5% resistors except for R12, which is not critical but should be at least 1 Watt. Capacitors C1 through C5 are frequency-determining components and should be 5% or better, and for best results should be made of some stable material such as polystyrene. Other types of capacitors could be substituted, but the generator will be slightly less stable. Wherever possible, I have tried to provide large pads on the circuit board to accommodate capacitors of different sizes.

Trimmer pots R1, R2, R3, R6, R7, and R8 all are mounted on the PC board. I have provided space on the circuit board so that either the stand-up or the lay-down type of trimmer may be used. It seems that I always have the wrong type when building a project on someone else's circuit board, so I have allowed for both types (prospective authors please take note). Front-panel pots R4 and R5 are the other frequency-determining components. During normal use, R4 is the main frequency control, and I have mounted mine using a 3:1 gear drive so that the frequency can be varied in small increments. Potentiometer R5 is used to set the frequency of the secondary function generator and to adjust the shape of the pulse and ramp functions. I found it sufficient to mount R5 directly on the front panel without a gear drive.

The function generator may be swept in frequency by applying a varying voltage to R5. For maximum frequency sweep, 1000:1 or better, this voltage should vary from 0 V to +3 V, with the highest frequency being generated at 0 V. I have arranged the front-panel

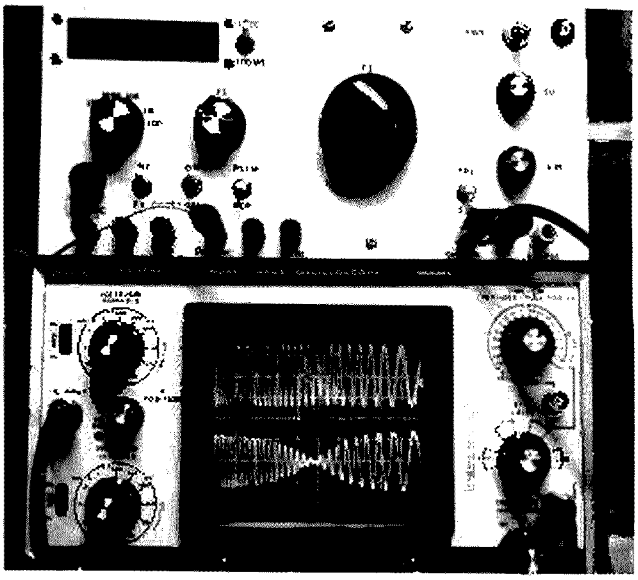


Photo B. The swept function generator in operation. The top trace is the output of the generator in the sweep mode. The bottom trace is the same signal after processing in a home-brew notch filter. The notch filter has a design frequency of 1100 Hz. Note the digital display showing 1,093 Hz which will correspond to the center of the scope face. The actual sweep here is about 20 Hz to 2200 Hz.

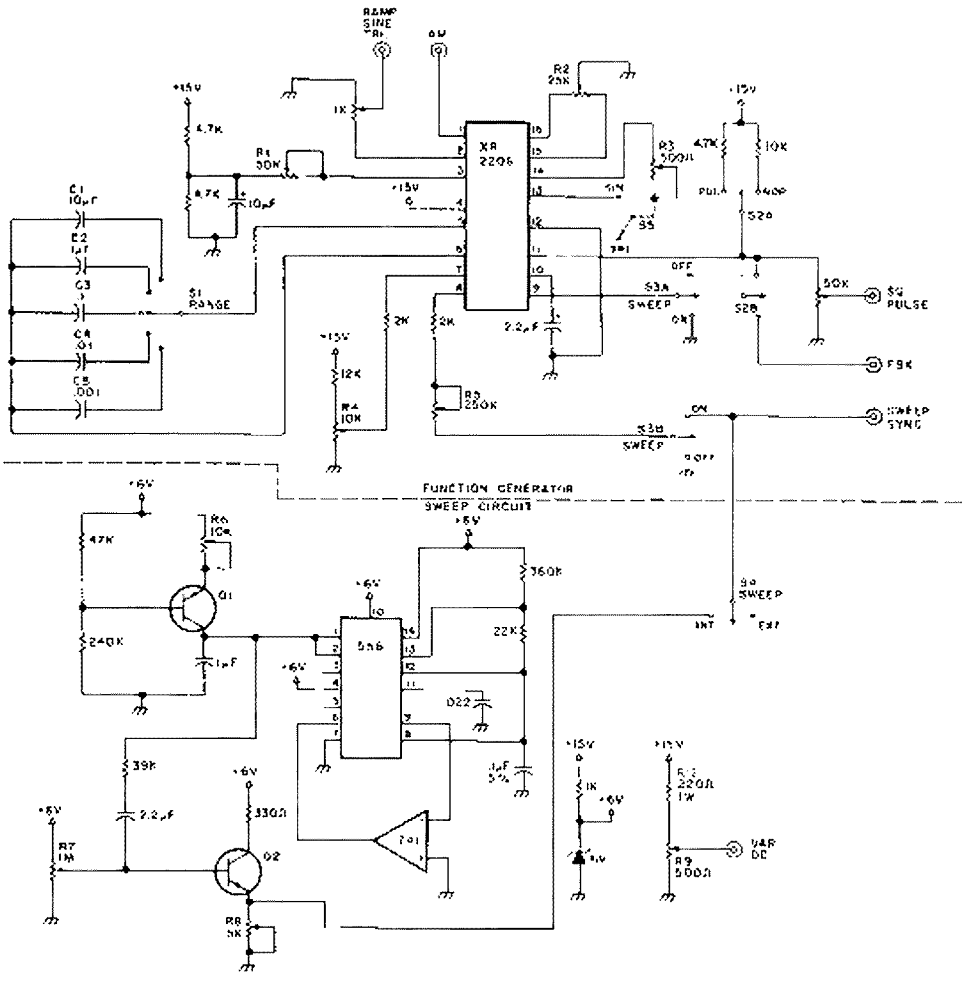


Fig. 1. Schematic of function generator and sweep generator.

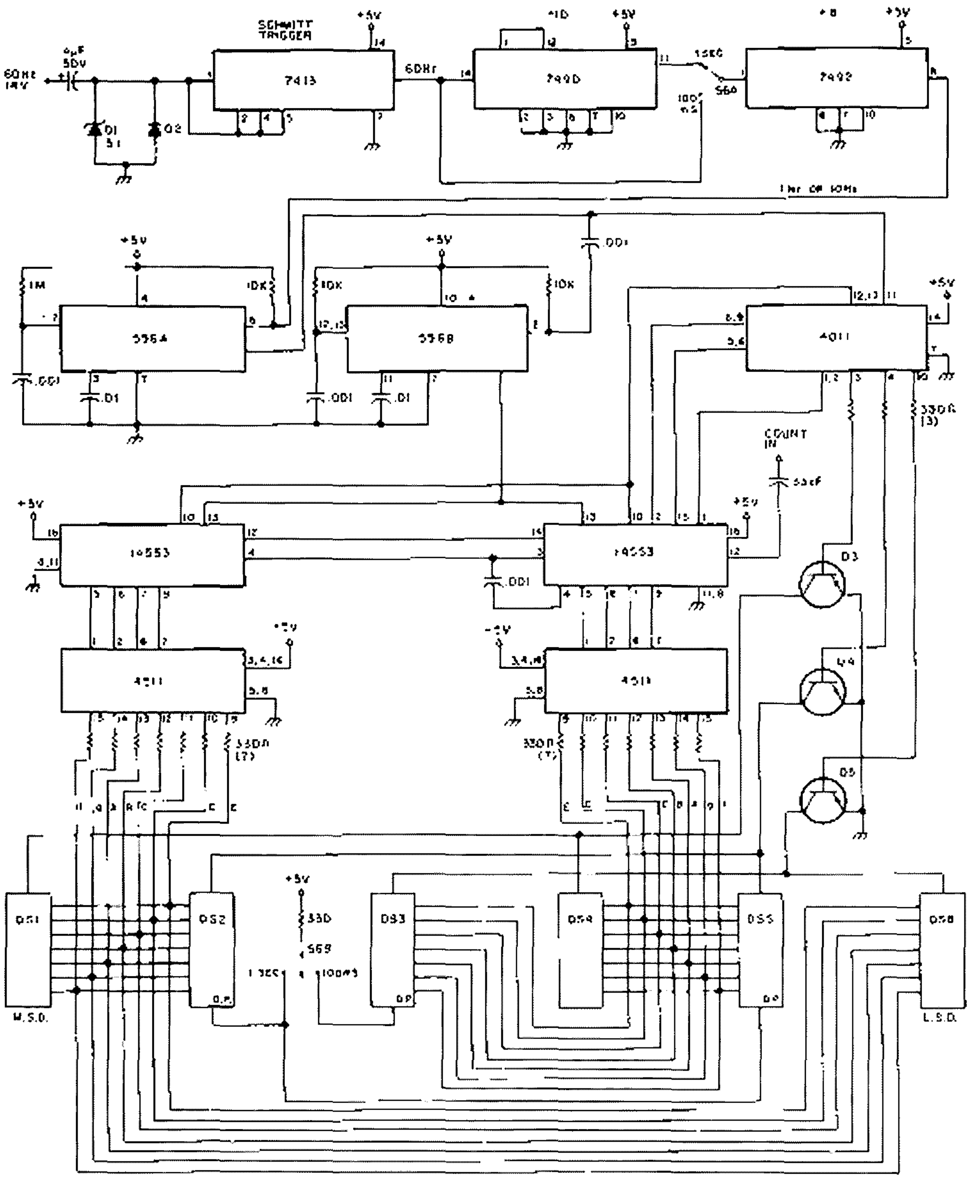


Fig. 2. Schematic of digital frequency display.

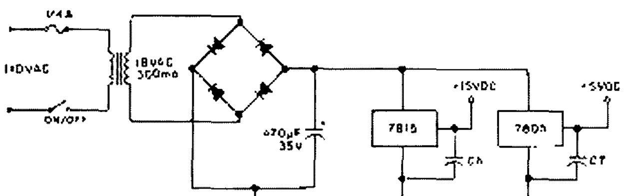


Fig. 3. Power supply. C6 and C7 are 2.2-uF tantalum and are mounted on the circuit board. All other components are mounted on the chassis.

switches so that the function generator may be swept or frequency-modulated by applying a varying voltage to the sweep/sync jack from an external source or from internal circuitry. The internal sweep circuit is a linear ramp generator which provides a 3-V ramp at a frequency which allows one sweep to fill my scope screen when set to 2 ms/cm. When the internal sweep circuit is used, the ramp signal is applied to the sweep/sync jack so that it may be used to trigger your scope.

Operation of the sweep circuit is not overly complex. One half of the 556 dual timer is wired as a monostable multivibrator which is used for a timebase. The 741 op amp inverts the output of the multivibrator to provide a good trigger signal. The actual ramp is generated by the other half of the 556 and the two transistors. Transistor Q1 is a 2N4250 or similar and provides a constant current source to capacitor C6. This constant current allows C6 to charge linearly. The other half of the 556 timer acts as a switch which grounds the positive side of C6, when triggered by the op amp. The voltage across C6 almost instantly goes to zero and then begins to recharge. Transistor Q2 (a 2N2222) is a buffer amplifier. By adjusting the dc bias on this transistor, the amplitude and position of the ramp relative to ground may be precisely set. The output of this emitter-follower type circuit is the final sweep signal.

The digital frequency display is a multiplexed unit and is based on the Radio Shack three-digit BCD counter IC, part 276-2489. The entire display was point-to-point wired on a multipurpose 22-pin edge connector circuit board which will just accommodate the 9 ICs and three 2N2222 transistors. The timebase is derived from the 60-cycle line. I have found the accuracy to be quite good at audio frequencies, often showing the same frequency as my lab grade counter, up through 50 kHz or so. Even at much higher frequencies, the difference is usually under 100 Hz and the error will always be on the low side. The frequency generated by the function generator is sampled at pin 11 of the XR 2206 and is coupled to the digital display through a 33 pF capacitor. This signal is then counted and displayed by the two sets of 14553 counter and 4511 driver ICs.

The wiring of the LED displays is a little unusual and requires an explanation. If the counter is placed in the 100-ms timebase position, it will count and display 1/10 of the actual frequency being generated, so that 4552 Hz would appear as 455. I found this to be distracting, so I added another LED display in the "ones" position and set it to display a

"0". Now the frequency display would appear as 4550. In order to get the newly-added display to have the same brightness as the other digits, I wired it as if it were in the "millionth" position. There is no leading-zero blanking, so the new digit will always show a zero unless a frequency of one MHz or higher is counted. In the one-second timebase mode, this newly-added digit will appear in the "tenths" position and will be zero unless a frequency of 100 kHz or higher is counted. In this timebase, the display would appear as 4,552.0. The decimal points are wired to the timebase switch so they will always correctly separate the hundredths and thousandths digits.

The digital display circuit is set up for common-cathode displays with right-hand decimal points. Maximum current should be limited to about 25 mA per segment. I used Radio Shack 276-1644 displays but would recommend some of the multiple-digit, multiplexed units such as those sold by Digi-Key, Inc.

The timebase and control circuits for the display are fairly straightforward. A 60-cycle signal is taken off the low voltage side of the power transformer. Diode D2 and zener D1 limit the voltage excursions to −0.7 V and ±5.1 V. This 60-cycle signal is applied to a Schmitt trigger to produce an accurate square wave, and then passes through the 7492 IC wired to divide by six. The resulting 10-Hz square wave triggers the two one-shot multivibrators which form the latch and counter reset pulses. In the one-second timebase, the 60-Hz signal is divided by ten in the 7490 IC before going through the 7492, so that a 1-Hz square wave is applied to the one-shots. Again, this is a surprisingly accurate system, and I have been very pleased with the results.

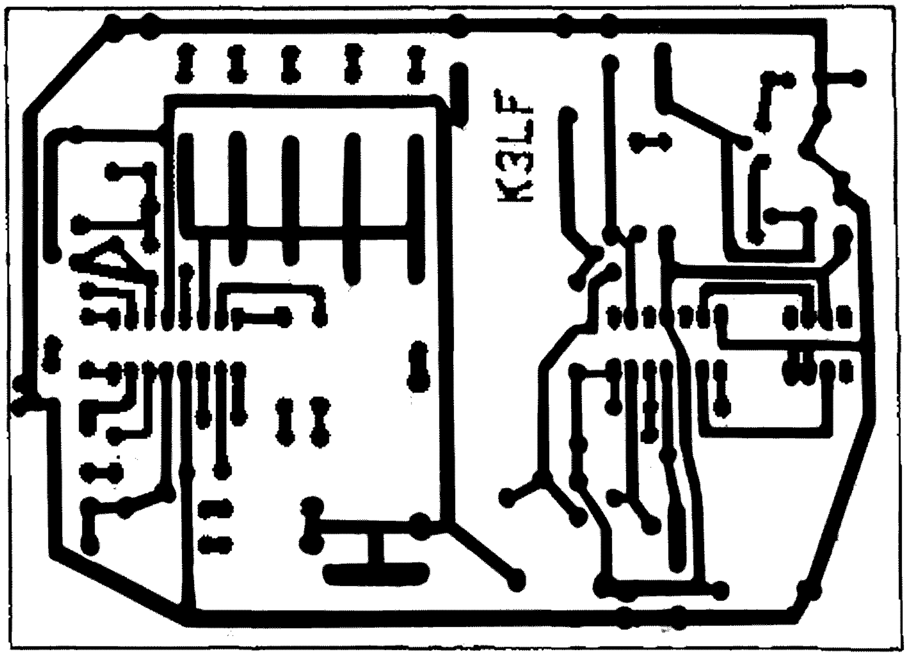


Fig. 4. PC board layout.

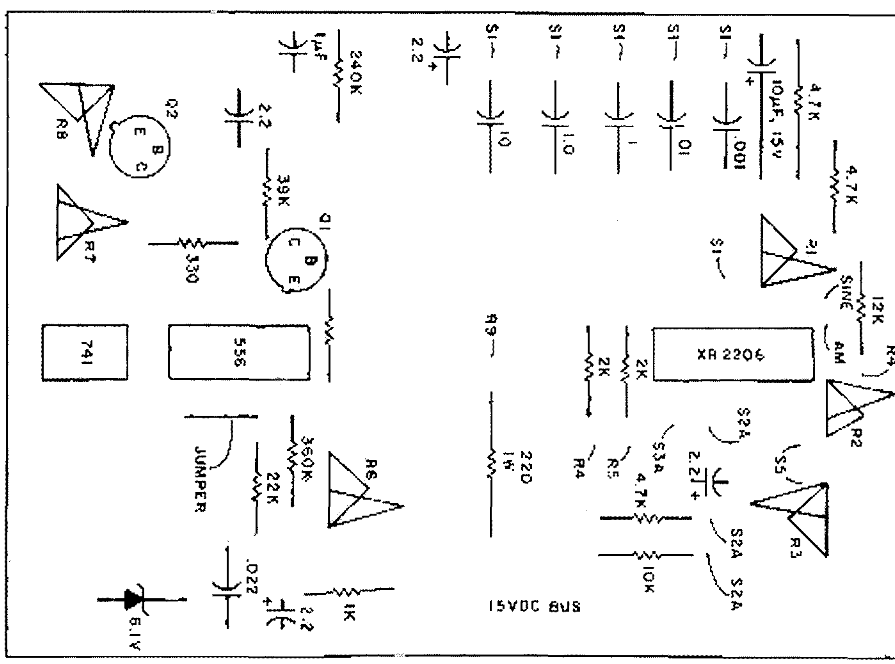


Fig. 5. PC board component location.

The power supply is fairly conventional, using an 18- or 24-V ac transformer, a bridge rectifier, and two regulators, a 15-volt and a 5-volt. If you use a 24-V ac transformer, be sure you do not exceed the maximum voltage which may be applied to the regulators; mine were rated for 35 V dc. All of the power supply components were mounted on the chassis. Note that a 2-wire power cord is used so that the chassis ground is floating and is not connected to the house wiring ground. This allows the function generator ground to be floating and set in relation to other pieces of test gear.

Calibration and Operation

Calibration is not difficult, but does require a dc-coupled oscilloscope. The function generator circuit has three adjustments. Trimmer R1 adjusts the amplitude of the signal with a maximum of six volts for

the triangle waveform. Symmetry is adjusted by R2, and R3 adjusts distortion of the sine wave and may be replaced with a 200-Ohm resistor with fairly good results. The three adjustments will interact to some degree; the object is to maximize amplitude and minimize distortion. The sweep circuit is adjusted using R6, R7, and R8. The collector of Q1 should be monitored while adjusting R6, which should be set to a position giving the longest ramp. Too little resistance here will make the ramp generator operate at twice the trigger frequency. With an oscilloscope connected to the output of the sweep circuit, adjust R7 so that the ramp just touches the 0-volt baseline. The amplitude of the ramp is adjusted by R8 to a value of three volts p-p. There is some interaction between R7 and R8, and these adjustments are somewhat critical—so be patient.

Operation of the swept function generator should be fairly obvious, but here are some helpful hints. When operating in the sweep mode, S3 should be placed in the ON position and S4 placed in INT. This will apply the ramp signal from the sweep circuit to the function generator and to the sweep/sync output jack for synchronizing or triggering your oscilloscope. You will find the signal appears to sweep from right to left as the lower frequencies are to the right. If S4 is placed in the EXT position, then an external device may be used to sweep or frequency-modulate the function generator. Whenever S3 is ON, the average frequency will be controlled by R5 and the range switch.

To determine the range of frequencies actually being swept, place the digital frequency display in the one-second timebase mode. The displayed frequency will be very close to half of the peak frequency and 500 times the lowest frequency. I have found this to be a very handy phenomenon. If I am looking at the response of a notch filter and want to know at what frequency the notch occurs, I can adjust R5 until the notch is at the center of my scope. At that point, the frequency displayed on the digital readout will be the frequency of the notch. If I want to apply a swept signal of 10 Hz to 10,000 Hz to some piece of equipment, then I merely adjust R5 until the display shows 5,000 Hz and I will be right on target.

When operating the generator with the sweep turned off and S2 in the NOR (normal) position, the secondary function generator may be activated by grounding the FSK jack. The frequency of the secondary generator is controlled by R5 (the primary generator is controlled by R4).

One last item: Any amplitude-modulating signal must have the same dc bias as the output. Potentiometer R9 has been included to provide an adjustable dc reference voltage. The 220-Ohm resistor, R12, limits the current if the VAR dc jack is grounded.

I have had my function generator in use for about a year and have been very happy with its performance. In the future, I hope to build an interface device so that the function generator can be controlled by my KIM-1 micro via the sweep and FSK inputs. This would probably open the door to all sorts of neat applications. I hope you enjoy this versatile instrument as much as I have. ■

New Horizons for the HW-8 Transceiver

—a dandy mod to expand frequency coverage

Roger C. Amundsen W1PQ
264 Old Sib Road
Ridgefield CT 06877

Would you like to increase the tuning range of your Heathkit HW-8 to add 3750 to 4000 kHz, 7250 to 7500 kHz, 14250 to 14500 kHz, and 21250 to 21500 kHz? I did and I found it very easy to do. I wanted to listen to some of my friends on 75 and 40 and also be able to receive CHU just above 7300 kHz.

To make this modification, only two parts are required: a capacitor to pad the vfo tuning and a toggle switch to add it or leave it out of the circuit. I used a trimmer, but if you are not too fussy, a fixed capacitor of 12 pF will do.

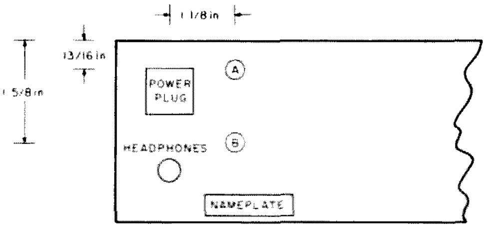


Fig. 1. HW-8 rear panel. A = 3/16" hole for 15-pF trimmer if used. B = 1/4" hole for miniature SPST toggle switch.

I located a miniature toggle switch on the rear panel (as shown in the sketch) so that no injuries were inflicted on the front panel. One side of my trimmer (mounted above the toggle switch) is grounded, so it was simple to run the other lead to one side of the toggle and then tie the other terminal of the switch via a piece of tinned bus wire to the lug on the vfo tuning capacitor, C302B.

One adjustment and you are in business. With the new capacitor switched out of the circuit, open up (reduce) the mica trimmer (C362A) on the vfo tuning capacitor to offset the stray capacity of the added circuitry. Adjust the vfo to 3500 kHz when the dial reads 0 (3.5 MHz band position). If in doubt, adjust it so that W1AW broadcasts are on 3580 kHz. No adjustments are required for the other bands. Throw the toggle switch and adjust the new trimmer for 3750 kHz for 0. The dial will now read 250 kHz higher on all bands or tune from about 3750 kHz to 4000 kHz on 80 meters. *Do not operate the transmitter function outside of authorized bands.*

Results: The HW-8 is no superhet, but for a direct-conversion receiver it is not bad. Also, if you desire to remove the mod, a couple of small hole plugs cover up the surgery. See you on 3540 kHz. ■

John S. Wilcox KS4B/NNNØBKS
4733 Bill Knight Road
Millington TN 38053

New Frequencies for the IC-2

—for MARS members only

MARS members will be happy to know that the no-compromise, synthesized, Icom IC-2 handie-talkie can be modified easily to transceive out of band. And, best of all, the cost of this modification is a total of *zero!*

Tuning this HT is done by setting three miniature thumbwheel switches—one each for MHz, 100 kHz, and 10 kHz. A slide switch beside the thumbwheels adds 5 kHz to the frequency. Although the MHz thumbwheel turns throughout its full 0-9 range, the synthesizer confines the actual frequency to the amateur band, as shown in Table 1.

After inspection of the circuit boards, thumbwheel switches, and schematic, it became apparent that this HT was manufactured for usage throughout the range of 140.000-149.995 MHz. By the placement of jumpers, it can be configured to the different band plans for Europe, England, and the USA.

After making this modification, the IC-2 will tune from 140.000 through 149.995 MHz in 5-kHz steps following the exact thumbwheel setting. All other functions remain the same.

Step 1. Remove the battery pack. Remove the four screws that hold the battery retaining plate on the bottom. (Note the position of the plate to assist in reassembly.)

Step 2. Turn the HT face down. Remove the two case retaining screws.

Warning: A paper-thin, flexible, printed circuit board connects between the touchtone™ pad and chassis on the IC-2AT model. Be extremely careful if you remove the front half of the HT case.

Step 3. Remove the back half of the HT case.

Step 4. Using the picture of the HT on page 20 of the Icom manual and Fig. 1, here, find the programmable divider chip, IC1, and the flexible circuit-board tape soldered to it. Run solder across the nonconductive gap in the line designated C4. Use a small, low-wattage iron so as not to damage the flexible circuit board.

Step 5. Remove the two retaining screws on the side of the chassis and hinge open the two circuit boards.

Step 6. Find the brown-colored jumper wire that connects two solder pads together on the underside of the MHz thumbwheel switch. Snip this jumper and tape the ends.

Step 7. Carefully reassemble the HT. Make changes in the Icom manual and on the schematic.

Navy-Marine Corps MARS in Tennessee is currently using a 600-kHz split in the 148-MHz range. If you require a non-standard split, the MARS modification article for the Tempo S1, written by Dorsey "Diz" Price K5EDS in the April, 1980, issue of *73* should be reviewed. A similar modification could be made to the IC-2. I'll let someone else write that one! ■

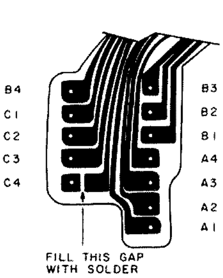


Fig. 1.

MHz Thumbwheel	Actual Frequency
0	144.XXX
1	145
2	146
3	147
4	144
5	145
6	146
7	147
8	144
9	145

Table 1.

Larry T. Wier W7CRY
1068 149 Pl. S.E.
Bellevue WA 98007

The Digital Defender

—computerized ham shack security

Protecting personal property, be it ham shack or home, is big business these days. Even traditional department stores have started to stock systems which blast you with bells, whistles, or horns when activated. None of those systems has the flexibility to cover several possible installation situations and provide complete protection. This system probably won't either, but it comes a lot closer.

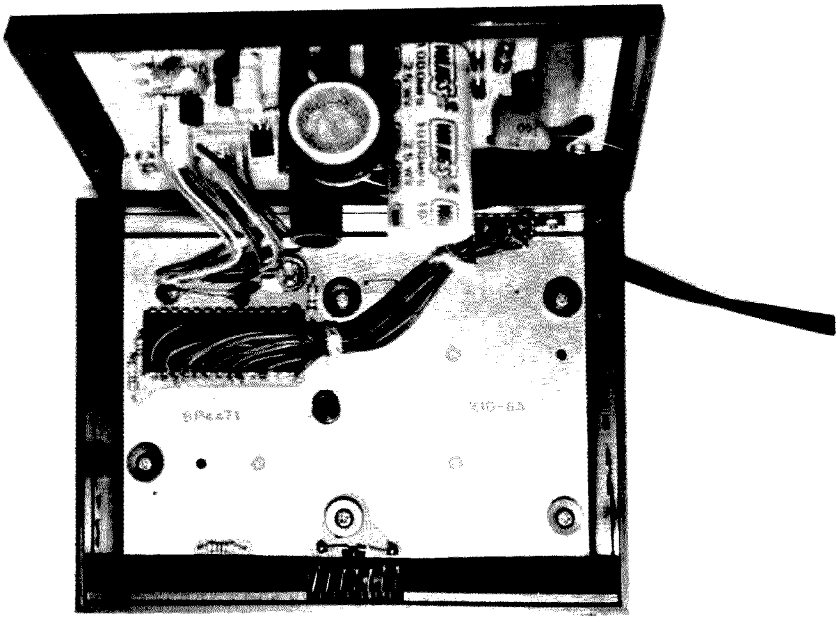
Requirements

Requirements for this system are that it be inexpensive, flexible, easily installed, and as foolproof as possible. The sensors must be easily installed and repairable. They should sense breakage, smoke, fire, and when someone is about to enter a protected area. Warnings should be audible and visual. The system should have built-in self-test features along with power-fail battery backup. And, as a final touch, it should have the capability of controlling lights or appliances.

To fulfill these requirements is no small task and is difficult without the use of some external intelligence. By now probably you have guessed that a microcomputer might be the intelligence. Well, it is, and the total cost of this system is well below that of most of today's allband transceivers. The system described here was developed on a Heath H8 with parallel I/O, but is easily adaptable to any system or single-board micro having an 8-bit parallel I/O port and about 8K of memory.

System Planning

To find out the best way to protect yourself or your property, ask a burglar. The next best way is to ask the police. Since this system is to provide for fire and smoke detection also, a stop by the fire station for a few pointers would be advisable. With these ideas in mind, on to the planning.



This photo shows the internal wiring of the Sears control unit. Be sure to route wiring as close to the circuit board as possible and away from the ac power wires.

One of the best ways to plan and install a detection system is to draw a scale floor plan of the area to be protected. Figs. 1, 2, and 3 assume that it is a house that is to be protected. It is a good idea to show fire-/smoke-detector locations as well as alarm sensors. Divide the total area to be protected into smaller, well-defined zones, keeping in mind how sensor wires can be installed. Once one has a general idea of how the sensor installation might be done, the next step is to define system operating conditions.

The fire-/smoke-alarm section of the system should function even though the micro may have failed or is being used for other purposes. If ac power has failed, the automatic lighting will not function, but the alarm will since the system has battery backup. For safety reasons, the complete system (except for micro power) operates at +18 volts or less. All voltages are derived from the same source so that if the battery fails, no false alarm will sound. This may or may not be an advantage depending on system usage.

No system yet devised is completely foolproof. Several techniques are used in software (see Software Description) to avoid false alarms caused by spurious noise spikes, power outages, lightning strikes, and ham radio transmissions. Murphy's Law is still in effect, however.

One additional feature is a time-of-day clock. It is not listed under requirements because it applies only to the Heath H8 system. It is a software-generated clock and utilizes the H8 front panel for readout. This same function (minus the H8 front panel) is used for timing in the software (lines 200-245) to control the rest of the sequence. This clock function is derived from the internal tick counter of the computer and is described in the software section below. Along with the clock, facilities were built into the software to record when (time of day) an entry was made. An automatic self-test feature also was included.

System Design

For purposes of system description and layout, the Fig. 4 block diagram is included to help avoid confusion. The system is divided into three basic parts. Part (C) is the H8-2 Heath I/O and is shown for clarity. Parts (A) and (B) can be combined into one unit or board even though they are shown as being separate. The reason for separation is that I chose to build two units using .1 × .1 inch, 22-pin, two-sided, plug-in vectorboards. Circuit-Stik copper strip and pads are used to mount components, and wire-wrap sockets are used for the IC sockets. The two boards are connected together by a 16-pin DIP jumper (U10).

Early in the design stage, a decision was made to allow for several types of simple sensors. The simplest of these is the open/closed circuit. A decision also was made to provide all signal conditioning and detector logic outside the computer enclosure. As a result, parts (A) and (B) are external to the computer and all inputs and outputs are external to the detector enclosure.

Power Source

To overcome the power problem, a backup source of power is used. Fig. 5 is a block diagram of one method of doing this. This particular method is not as efficient as a more complex battery and regulator circuit, but it is simpler. Also shown in Fig. 5 is the method of connecting both the charger and inverter to the battery. The inverter will run about ten hours on a fully-charged 12-volt automobile battery. The charger is set for 14 volts so that as soon as line power is restored, the battery is automatically recharged. Additional filtering was added to the charger to reduce the feedthrough ripple. A device called "Mayday," manufactured by Sun Technology, Inc., New Durham NH 03855, is purported to prevent loss of memory when brownouts or blackouts occur. In any case, a 200-Watt power source will be sufficient for a fully-loaded H8.

Sensors

All of the detector logic—part (A)—uses positive true logic, i.e., a 1, or high, level indicates a fault. Reverse logic can be used also and will be explained later. Both the burglar and/or fire alarms are designed to operate with positive or negative logic.

All sensors with the exception of the smoke alarms are made of small-gauge copper- or enamel-covered copper wire and are shown in Fig. 12. These are the least expensive and

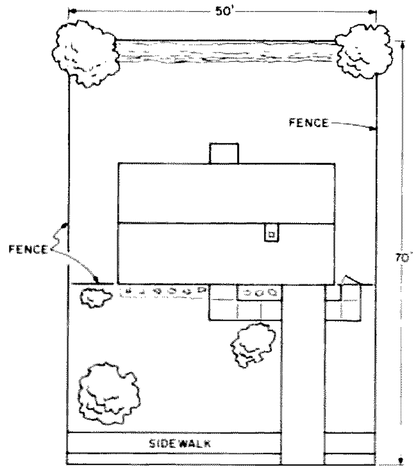


Fig. 1. Plat.

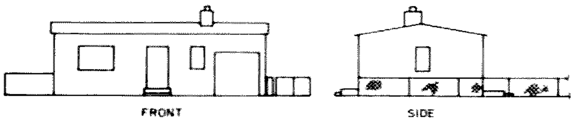


Fig. 2. Wall views.

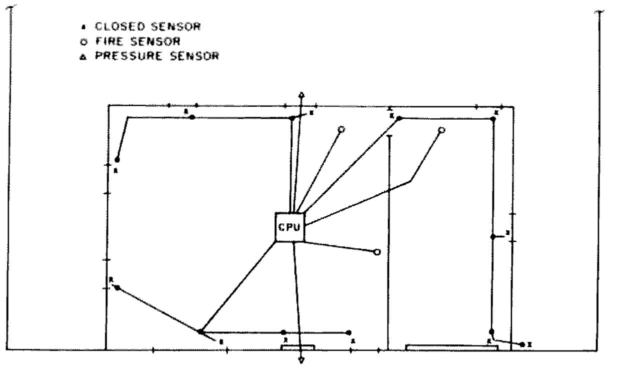
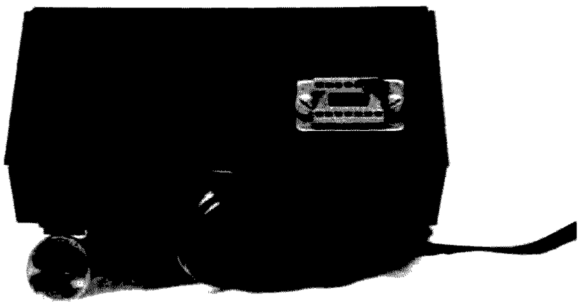


Fig. 3. Floor plan.



This shows the position of the I/O connector on the Sears control unit.

easiest to install. No relays or magnets are used although they are easily substituted.

Fire detectors are manufactured from a short piece of rosin core (Multicore) .028" (.71mm) solder. This solder melts at approximately 450 to 550 degrees F. This is below the flash point of paper and is great around a fireplace or flue. The output from a standard smoke detector is used to trigger the fire-/smoke-alarm input. Most smoke alarms use a transistor to turn on the alarm device, so the sensor lines (input and ground of U8) are connected at the switching-transistor input. Some schematic checking may be required for your particular smoke alarm.

Two additional sensors are provided; these are pressure types. They are manufactured from two galvanized sheet-metal plates separated by a 4- or 6-mil plastic sheet. The plates are approximately 2 × 3 feet and are covered by indoor/outdoor carpet. The carpet is used partly for protection from rain and partly for concealment on an outside step.

Part (A)—Alarm Logic

The schematic diagram of Fig. 6 is the detection board. U1 and U8 along with signal conditioning form the inputs to the system. U1 is the burglar-alarm section and U8 is the fire-alarm section. R15 through R28 (10k) form pull-up levels for each input line. Diodes CR1 through CR12 (10-V zeners) have two functions. The main function is to limit the positive input voltage via R1 through R12 (1k) to 10 volts. In normal operation, the input lines are shorted to ground through the sensor and go high only when the sensor is tripped. The second function of the diodes is to provide a method of checking operation of the system by software. U1 and U8 are CMOS non-inverting buffers. If it is desired to have a closure to ground when a sensor is tripped, U1 and/or U8 can be changed to a 4049B inverter. The diodes must be reversed along with ground and +5 volts on RL.

U2 and U3 form an 8-bit latch which stores whatever input changed. U4 is connected in parallel with U2 and U3 and is an 8-input NOR gate. No matter which input line goes high, the output of U4 (pin 13) goes low. This line is used to tell the computer I/O that valid data is ready to be sent. Pins 5 of U2 and U3 are tied together and to the SEND DATA line of the computer. The software will toggle this line several times to be sure that the data is constant and available for the correct length of time, thus preventing static discharges from triggering the alarm. These two lines form the major handshaking with the computer.

U9 and Q1 form the self-test circuit. U9 is connected via the board interconnect, U10 to U16. The software randomly checks the system to determine if it is still functional. RL forces +5 volts on all inputs simultaneously and the computer reads the results. If the value read is not correct, a notice is printed out and the program continues. S1 is provided to allow a local check of the system. The software monitors this function and will inform the operator if all is well.

U5 and U6a form the code logic. The logic is nothing more than an eight-line-to-binary conversion. This method allows 16 input lines to use only four of the eight data-output lines to the computer. Data-output line D4 is used only to record the fact that a fire/smoke sensor was triggered and to turn on all lights. The alarm is set off without computer intervention.

U7 is used in the same manner as U4 except that its output drives the input of U6b which is used as an inverter. As in the case of U1, if an input to U8 should open, pin 13 of U6b would go high, indicating an alarm condition. Two additional lines into U7 are provided as shown in Fig. 6. They are used to connect to the smoke alarms. If they are not used, they should be grounded.

U13/U11 and U14/U12 form the pressure sensors.

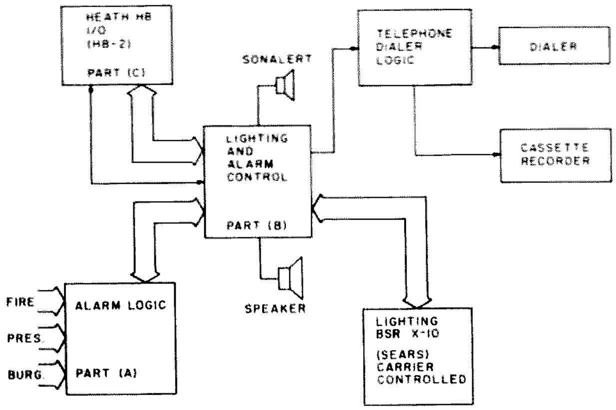


Fig. 4. Block diagram.

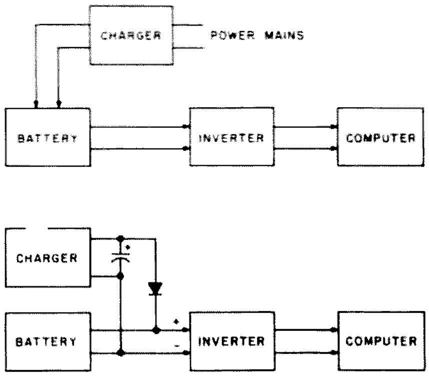


Fig. 5. Power source.

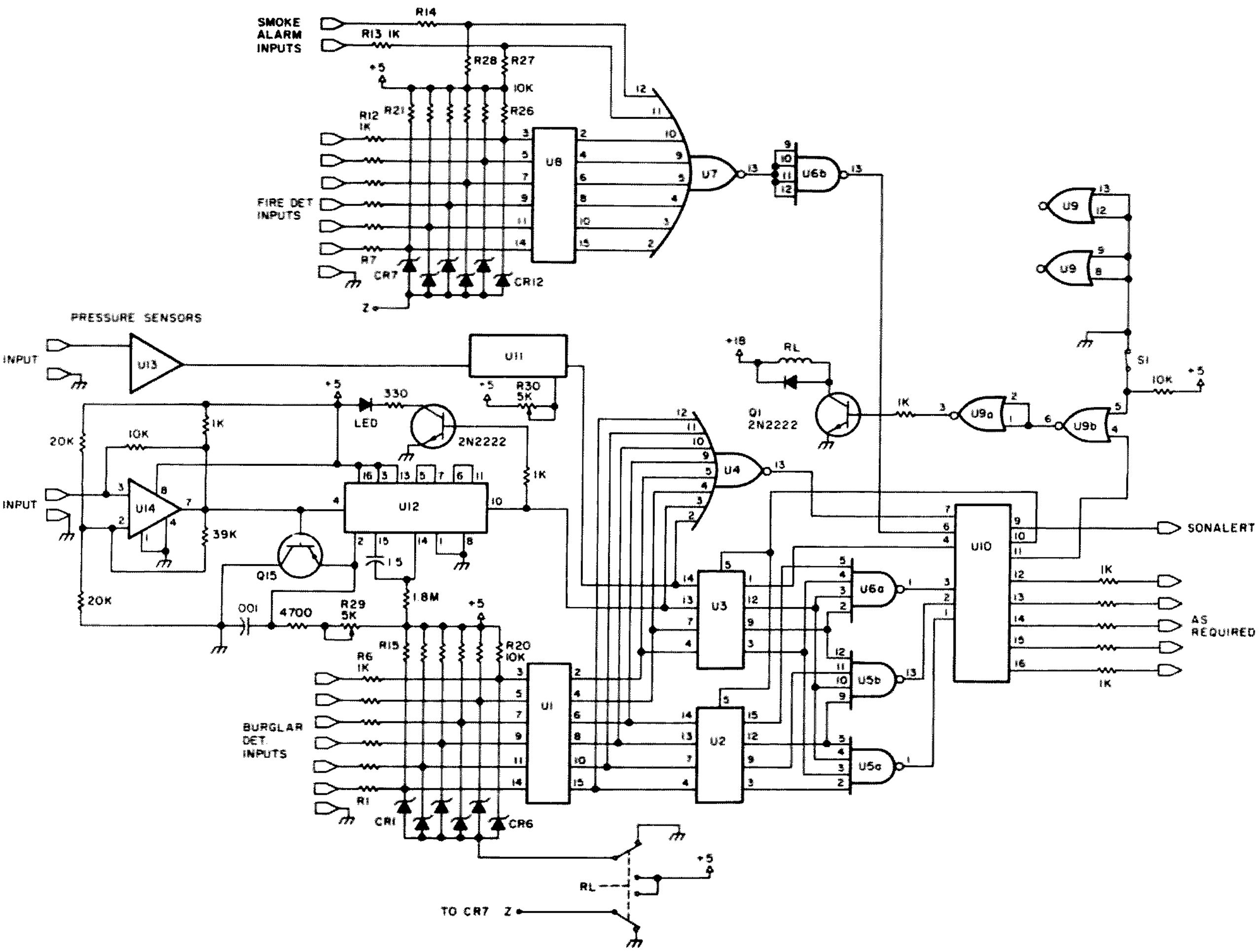


Fig. 6. Part (A), alarm logic.

Since the function of each is the same, only one set will be described. U14 is an LM311 that is connected as a multivibrator which runs at approximately 1 MHz with no input. When a fifty-foot length of Belden 8401 microphone cable and the two galvanized plates are attached, it runs at about 50 kHz. U12 is a CMOS dual one-shot. The first section along with Q15 forms a missing-pulse detector. When pressure (stepping on the plates) is applied to the plates, the frequency goes down and the one-shot times out and triggers the second section of U12. The second one-shot is retriggerable and the output goes high for approximately 3 seconds. The LED is used only for visual aid. R29 and R30 provide adjustment of the missing-pulse detector to allow for various cable lengths and plate sizes. A fixed resistor in series with R29 and R30 provides additional range if required.

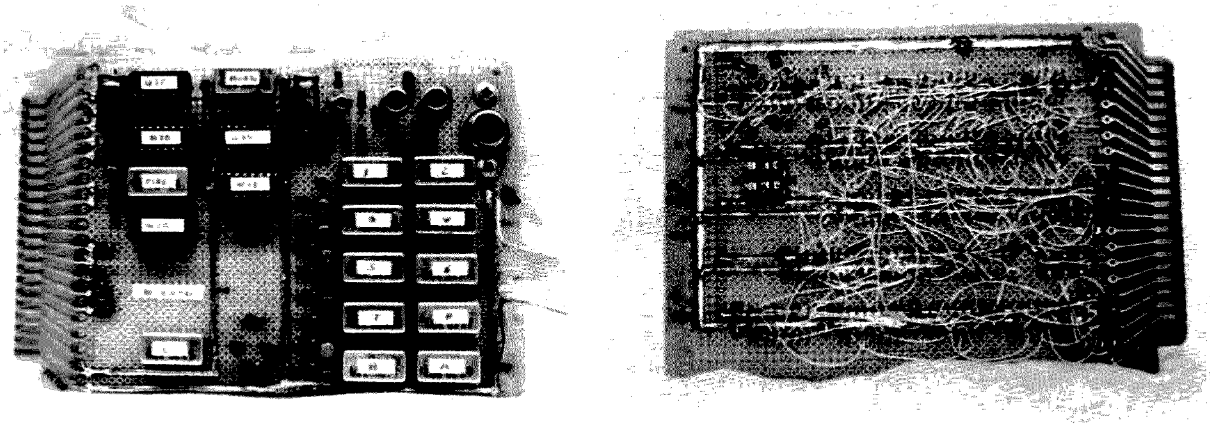
Part (B)—Lighting and Alarm Control

The Fig. 7, part (B), schematic is perhaps the heart of the system. The function of this part is to provide a path for data to and from the computer I/O. Handshaking information is passed through this card and onto the part (A) card. Incoming data from the part (A) card is passed through this card and into the computer I/O.

U15 and U16 form a 4-line-to-16-line decimal decoder. The output lines, 1 through 9, are connected directly to the inputs of nine driver transistors (Q3 through Q13) which, in turn, are connected to relays labeled 1 through 8. Line 9 is connected to the same type of transistor driver/relay (Fig. 8) as well as to the fire-alarm circuit. The line-9 relay controls the external alarm simultaneously with the internal fire-alarm circuit. This combination alerts anyone inside or outside the house. The remaining lines from U16 are returned via the U10 interconnect to the part (A) board.

U18 is a two-bit decoder which is used in combination with U15 and U16. The output of U18 is connected to three driver transistors which, in turn, are connected to relays. These relays are labeled A, B, and C. These relays, along with those labeled 1 through 8, are the control relays for the operation of one of the neatest devices to come along in a long time. This device is a BSR X-10 (Sears) carrier-controlled lighting system. This little gem will control home or office lighting or applicances with just a push of a button. It uses existing power wiring, is inexpensive, and provides an ideal solution to a complex problem. (It is beyond the scope of this article to describe the BSR X-10, but a good description of it can be found in the January, 1980, issue of *Byte*, "Computerize a Home.")

The BSR X-10 is modified slightly to allow the control lines to be brought out to the relays. Relays must be used to control the device because the control unit is



These photos show the front (left) and back (right) views of the "A" board. Note the use of "Circuit-Stik" copper strip for power and ground. The IC sockets are soldered to the copper strip to hold them in place before the wire-wrap is installed.

connected directly to the power line and is powered by −20 volts. Fig. 9 defines the pin numbers to be brought out and their functions. The method used to modify the BSR X-10 will be described later.

Q3 through Q14 are all 2N2222-type transistors, but they could be any NPN device. Power ratings are minimal because they are on for only about 35 ms. Relays are +12-volt SPST DIP types. RL must be a DPDT type as shown. Any small relay can be used.

Alarms

Not counting lighting control, this system has only two alarms. The burglar alarm is a "warble" type and will drive a 30- or 40-Watt speaker. The speaker is mounted in a weatherproof housing. The fire alarm is a Sonalert which is mounted directly on the hot air ducting of the furnace. The ducting makes a good sound pipe and the alarm is easily heard throughout a medium-sized building. Fig. 8 is the schematic of the warble alarm. It is a modified version of the one found in H.W. Sams' *Solid State Electronic Projects*, 1972, page 52.

Telephone Dialer

An output for a telephone dialer (see Fig. 4) is included for special usage. This line is connected to a small amount of logic which controls an autodialer. The dialer is sold by Radio Shack and is connected so that an audio cassette with prerecorded messages is played over the phone.

Care should be used when operating the dialer. Most states do not allow automatic dialers controlled by computers to dial police and fire services. A friend or relative would be a better choice. No circuit description is included here because of regulations that city, county, and telephone companies have instituted.

BSR X-10 Modifications

The BSR X-10 is modified by first removing a single screw in the bottom of the unit. It will come apart in two sections. The LSI chip and push-buttons are in the top section while the transmitter is in the bottom section. The push-buttons will not fall out since they are mounted on the reverse of the PC board. There is room on the top section to cut a hole large enough to install a 14-pin DIP socket. The pins of the socket are wired to the control pins of the LSI chip using small-gauge stranded wire soldered directly to the pin.

Fig. 9 defines the pins and their functions. It is necessary only to tack-solder this connection. The BSR X-10 will function manually as well as from computer control.

Unused Outputs

Several spare outputs are provided for other devices. A word of caution when using these outputs: All are capable of driving one TTL load and it is advisable to include a 1k series resistor when using any of them for additional functions.

Software Design—Overview

The major function of the software is to generate a clock for reference and to help control all other activities of the alarm system. The clock routine is a modified version of an H8 alarm-clock program written by

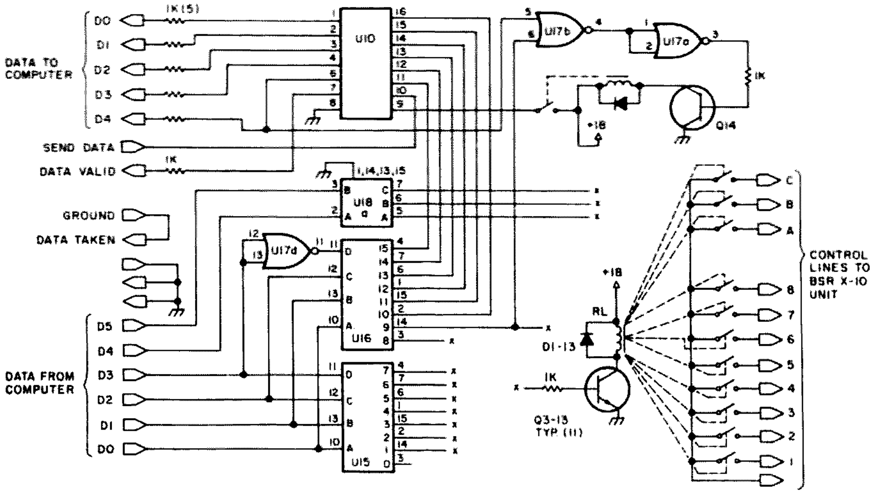


Fig. 7. Part (B), control.

SOFTWARE DESCRIPTION

- Lines 10 through 18 are reminders only. Heath Extended BASIC version 10.05 is used although this software will work on version 10.02 as well as HDOS.
- Lines 20 through 28 allow automatic title centering.
- Lines 30 through 35 are a printed warning for proper port I/O addressing.
- Lines 36 through 46 check to see if the H8-2 will respond. If not, the program stops.
- Line 48 determines the number of days alarm information can be stored. If more time is required, the dimension statement can be changed. The only limit is the amount of memory in the computer.
- Lines 50 through 62 set up and check the time of day that was input from the keyboard.
- Line 64 defines which buttons on the BSR X-10 will be used. The values 33 through 40 equate (see Figs. 9 and 11) to the following buttons: 10, 2, 6, 8, 4, 14, 12, and 16. Any value can be used here.
- Lines 70 through 74 set up the CNTRL-B function and the H8 front-panel readout.
- Lines 80 through 84 check the burglar alarm for operation. If the alarm does not respond, the program stops.
- Line 88 clears the remote-lighting control (BSR X-10) unit.
- Lines 100 through 135 are the alarm check routine.
- Lines 200 through 265 are the clock-counter routine.
- Lines 500 through 595 are the main lighting routine. Note that the lights are not turned on if the time is between the hours of 6 in the morning and 6 in the evening.
- Lines 600 through 695 control when, and the length of time, a randomly-selected light is on.
- Lines 700 through 710 are a subroutine used as a timing routine to allow the relay time to close.
- Lines 800 through 810 are the OFF lighting relay timing routine.
- Lines 1000 through 1060 print the system status when a control-B is used. Any entries are stored in memory and are printed on command.
- Lines 1100 through 1140 are the system error print routines.
- Lines 1200 through 1225 set off the alarm. Before the alarm is actually turned on, the counter (B1) must count eight alarm conditions before the alarm relay is set to ON. This is done to prevent static or power glitches from triggering the alarm. If it is after 6 pm, line 1220 turns all controlled lights on as well as the alarm. Only a control-B or power failure will shut off the alarm. An external switch will silence the speaker but the alarm is still activated.

You will note that the telephone dialer function was not included in the software listing. If it is to be used, it would be added after line 1305 in the case of fire and 1215 in the case of possible burglars. The code would be as follows:

```
1306 OUT 2,x:FOR L = 1 TO 30:NEXT L:OUT 2,0
```

where x will equal the value (decimal) required for the output port selected.

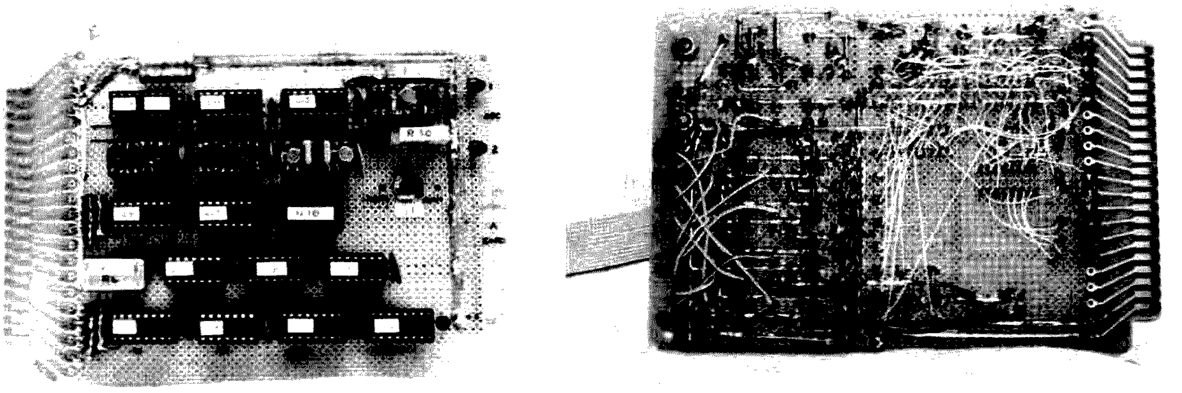
- Lines 1300 through 1310 turn all controlled lights on in case of fire. After the lights are on, the telephone dialer would then be turned on. The program would then return to the timekeeping routine line (200).

\drian Thornton for the December, 1979, issue of *Kilobaud*. The clock time-set outine was modified for 24-hour operation and the alarm routine was modified to control the burglar/fire alarm using the H8 software control-B function. The control-B function also prints out the system status. In my case, the computer is never turned off and the terminal is always on.

Probably the best way to describe the functions of the software program is to go through it line by line

Program listing.

```
10 REM ** BURGLAR/FIRE ALARM SYSTEM WRITTEN FOR THE HEATH H8 MICROCOMPUTER **
12 REM ** REQUIRES APPROXIMATELY 16K OF MEMORY AND H8-2 PARALLEL I/O BOARD **
14 REM ** WRITTEN BY LARRY T. WIER *** BELLEVUE, WA. ** 98007 *** FOR HEATH
16 REM EXT. B.H. BASIC VER. 10.05 **
18 REM  ** VER. 1.0.8    LATEST REVISION  JUNE 1980  **
20 DIM Z(8),A(8):O$="                    ":O$=O$+O$+O$+O$
22 DEF FN K$(X$)=LEFT$(O$,35-INT(LEN(X$)/2))+X$
24 T1$="*****************":T$="* ALARM SYSTEM *"
26 PRINT FN K$(T1$):PRINT FN K$(T$):PRINT FN K$(T1$):PRINT
28 T$="** WARNING **":PRINT FN K$(T$):PRINT
30 PRINT TAB(5)"THIS ALARM SYSTEM REQUIRES ADDITIONAL HARDWARE TO FUNCTION CORR
ECTLY."
32 PRINT "THE SOFTWARE EXPECTS PORT ADDRESSES 2 AND 3 FOR THE PARALLEL I/O.  IF
"
34 PRINT "YOUR H8-2 IS NOT ADDRESSED HERE IT MUST BE CHANGED.  REFER TO THE H8-
2"
35 PRINT "MANUAL FOR PROCEDURE.":PRINT
36 REM ** PORT ADDRESS CHECK **
38 OUT 3,64:OUT 3,78:OUT 3,53:Z=PIN(3):Z1=Z1+1
40 IF Z<>133AND Z1 3THEN 44
42 GOTO 48
44 PRINT TAB(5)"THE CORRECT STATUS WAS NOT READ FROM THE I/O PORT.  PLEASE CHEC
K THE"
46 PRINT "I/O PORT ADDRESS.  A VALUE OF";Z;" WAS READ.":STOP
48 DIM D(24),D1(24),D2(24),D3(24),D4(24)
50 REM * * * * SET-UP CLOCK * * * *
52 T1$="** * 24 HOUR CLOCK SET-UP * **":PRINT FN K$(T1$):PRINT
54 LINE INPUT "ENTER CURRENT TIME OF DAY AS 6 DIGITS: (HHMMSS)  ";T$
56 IF LEN(T$)=6AND VAL(T$)<=240000AND VAL(T$)>1000THEN 60
58 PRINT :PRINT CHR$(7)"INVALID INPUT -- PLEASE TRY AGAIN":GOTO 54
60 T1=VAL(LEFT$(T$,2)):T2=VAL(MID$(T$,3,2)):T3=VAL(RIGHT$(T$,2))
62 A=0:B=250:T4=1:T2$="NO UNUSUAL ":T3$="THE FOLLOWING"
64 A(1)=33:A(2)=34:A(3)=35:A(4)=36:A(5)=37:A(6)=38:A(7)=39:A(8)=40
70 REM ** ** ** SET UP FRONT PANEL AND CNTRL-B FUNCTION ** ** **
72 CNTRL 2,1:CNTRL 0,1000
74 FOR I=0TO 2:POKE 8203+I*3,255:NEXT I
80 REM ** ** ** ALARM POWER STATUS ** ** **
82 OUT 2,0:OUT 2,15:FOR L=1TO 30:NEXT L:C=PIN(2):C=PIN(2):OUT 2,0
84 IF C<>23THEN PRINT TAB(7)CHR$(7)"* ** ALARM IS NOT POWERED OR AUTO TEST HAS
FAILED.  CHECK SYSTEM.  ** *":STOP
86 REM ** ** CLEAR REMOTE DEVICES (BSR-10) ** **
88 OUT 2,54:FOR L=1TO 30:NEXT L:OUT 2,0
100 REM * * * * ALARM CHECK ROUTINE * * * *
105 C=PIN(2):C=PIN(2):IF Z9=1THEN 690
110 IF C=0THEN 200
115 IF C>=1AND C<=7THEN 1200
120 IF C=8THEN 500
125 IF C=16THEN 1300
130 IF C=23THEN PRINT :PRINT TAB(10)"SYSTEM SELF CHECK OK.":GOTO 200
135 GOSUB 1100
200 REM ** ** LOOK AT INTERNAL CLOCK COUNTER ** **
205 X=PEEK(8220)
210 IF X=P THEN 500
215 P=X:A=A+1
220 IF A=B THEN T3=T3+3:A=0
225 IF INT(X/2)<>X/2THEN 100
230 T3=T3+1
235 IF T3>59THEN T3=T3-60:T2=T2+1
240 IF T2>59THEN T2=0:T1=T1+1
245 IF T1=24THEN T4=T4+1:T1=0
250 POKE 8211,SEG(T3-(INT(T3/10)*10)):POKE 8210,SEG(INT(T3/10))
255 POKE 8208,SEG(T2-(INT(T2/10)*10)):POKE 8207,SEG(INT(T2/10))
260 POKE 8205,SEG(T1-(INT(T1/10)*10)):POKE 8204,SEG(INT(T1/10))
265 GOTO 100
500 REM ** ** ** MAIN RANDOM SYSTEM AND LIGHT CHECK ROUTINE ** ** **
505 A9=RND(1)*10:IF A9<=.001THEN 570
510 IF T1<=17AND T1>=6THEN 200
512 I=INT(RND(1)*9):IF Z(I)=1THEN Z(I)=0:C1=A(I):GOSUB 800
515 IF C=8THEN 680
520 A9=RND(1)*10:IF A9>=.0015THEN 200
525 A9=INT(RND(1)*9):GOTO 600
570 REM ** ** SELF CHECK ROUTINE ** **
585 OUT 2,15:FOR L=1TO 30:NEXT L:C=PIN(2):C=PIN(2):OUT 2,0
590 IF C<>23THEN PRINT "SYSTEM AUTO CHECK FAILED.  PLEASE CHECK MANUAL OPERATIO
N.":PRINT :PRINT
595 GOTO 200
600 REM ** ** LIGHT STATUS AND CONTROL ROUTINES ** **
602 I=1
604 IF Z(I)=1THEN 612
606 IF A9=I THEN OUT 2,A(I):Z(I)=1:GOSUB 700
608 I=I+1:IF I=9THEN 200
610 GOTO 604
612 IF INT(RND(1)*10)>=5THEN Z(I)=0:C1=A(I):GOSUB 800
614 I=I+1:IF I=9THEN 200
616 GOTO 604
680 REM ** ** PORCH LITE ROUTINE -- FIXED VALUES -- OUT2,24 CAN BE 2,XX ** **
685 IF Z9=0THEN OUT 2,24:Z9=1:GOSUB 700:GOTO 200
690 IF C=0THEN Z9=0:C1=24:GOSUB 800:GOTO 200
695 GOTO 200
700 REM ** ** ON BUTTON CONTROL ROUTINE ** **
705 FOR L=1TO 30:NEXT L:OUT 2,0:FOR L=1TO 30:NEXT L:OUT 2,53:FOR L=1TO 30:NEXT
L:OUT 2,0
710 RETURN
800 REM ** ** OFF BUTTON CONTROL ROUTINE ** **
805 OUT 2,C1:FOR L=1TO 30:NEXT L:OUT 2,0:FOR L=1TO 30:NEXT L:OUT 2,55:FOR L=1TO
30:NEXT L:OUT 2,0
810 RETURN
1000 REM ** ** ** SYSTEM STATUS ROUTINE (CNTRL-B) ACTIVATED ** ** **
1005 T1$="** ** SYSTEM STATUS ** **":PRINT FN K$(T1$):PRINT
1010 OUT 2,0:V9=0:FOR I=1TO T4
1015 IF D(I)<>0THEN PRINT T3$;:GOTO 1030
1020 NEXT I
1025 PRINT T2$;
1030 PRINT " CONDITIONS WERE MONITORED DURING YOUR ABSENTS:":PRINT
1035 IF I=T4+1THEN RETURN
1040 PRINT "(DAY)","(HOUR)","(MIN.)","(SEC.)","(ZONE)"
1045 FOR I=1TO T4
1050 IF D(I)=0THEN NEXT I:RETURN
1055 PRINT D4(I),D1(I),D2(I),D3(I),D(I):NEXT I
1060 RETURN
1100 REM ** ** ** SYSTEM ERROR ROUTINE ** ** **
1105 T1$="* ** SYSTEM ERROR ** *":PRINT FN K$(T1$):PRINT
1110 IF C=9THEN 1130
1115 PRINT TAB(5)"ERROR";C;"!"
1120 PRINT "THE FIRE ALARM ALONG WITH ONE OR MORE ZONE VIOLATIONS HAVE OCCURED.
 THIS"
1125 PRINT "IS NOT A NORMAL CONDITION.  PLEASE CHECK SYSTEM.":RETURN
1130 PRINT TAB(5)"ERROR";C;"!"
1135 PRINT "THE FRONT DOOR SENSOR ALONG WITH A ZONE VIOLATION HAS OCCURRED.  TH
IS"
1140 PRINT "IS NOT A NORMAL CONDITION.  PLEASE CHECK SYSTEM.":RETURN
1200 REM ** ** ** SET OFF ALARM ROUTINE ** ** **
1205 IF V9=1THEN 200
1210 B1=B1+1:IF B1<8THEN 200
1215 D(T4)=C:D1(T4)=T1:D2(T4)=T2:D3(T4)=T3:D4(T4)=T4
1220 B1=0:V9=1:IF T1>=6AND T1<=17THEN OUT 2,9:GOTO 200
1225 OUT 2,51:FOR L=1TO 30:NEXT L:OUT 2,9:GOTO 200
1300 REM ** * FIRE LIGHTING ROUTINE * **
1305 OUT 2,51:FOR L=1TO 30:NEXT L:OUT 2,0
1310 GOTO 200
1400 END
```



These photos show the IC layout (left) and wire-wrap (right) of board "B". The same techniques are used on this board as were used on the "A" board. The relays are wired using copper strip since they are the PC variety. IC-type relays would use sockets and therefore could be wire-wrapped like the ICs.

(see box). It is written in BASIC, which is an advantage in that there are no speed requirements and modifications are easy to make. The only requirement is that any routine other than the time/tick-counter routine (lines 200 to 260) must be executed in at least 500 ms. If the general format of the program is maintained, the clock accuracy will not be altered.

Several possibilities or methods could be used in the case of fire. It is assumed here that it is night and you are asleep. If a fire starts, the first thing that happens is that the fire alarm goes off. The next is

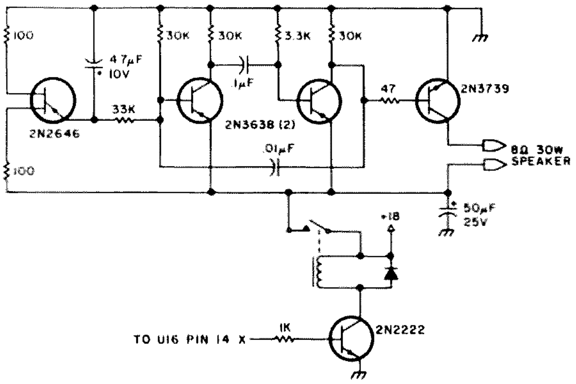


Fig. 8. Warble alarm.

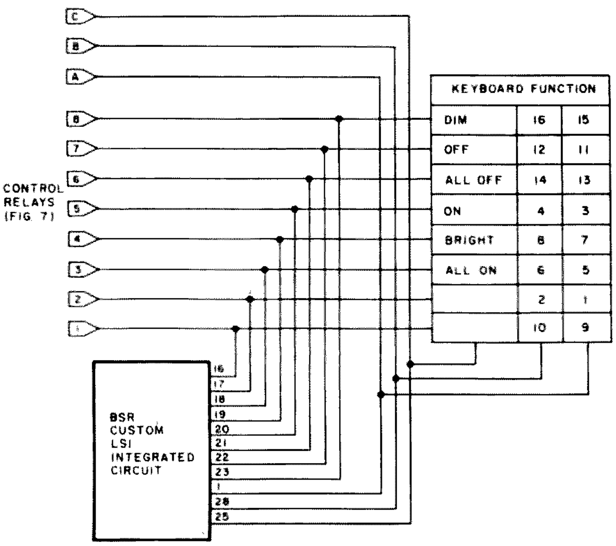


Fig. 9. BSR X-10 control.

SOFTWARE VARIABLES

A	Tick counter
A(1) thru A(8)	Preset light selection
A9	Random number used to determine various selected functions
B	Hi-byte counter
B1	False alarm counter (When count = 8, alarm is set off.)
C	Value read from I/O (alarm system)
C1	Temporary variable used to turn lights off
D	Zone storage element
D1	Hour storage
D2	Minutes storage
D3	Seconds storage
D4	Days storage (24 max.)
L	Relay bounce timing
P	Temporary clock storage
T1	Hours (front panel)
T2	Minutes (front panel)
T3	Seconds (front panel)
T4	Days (internal counter)
X	Temporary clock storage
Y9	Alarm check (1 = on, 0 = off)
Z(1)	Light check (1 = on, 0 = off)
thru	
Z(8)	(All random)
Z(9)	Front porch light status (1 = on, 0 = off)
0$	Set spacing for titles
K$	Same
X$	Same
T$	Variable titles
T1$	Same
T2$	Same
T3$	Same

Decimal Input	C	B	A	8	7	6	5	4	3	2	1	Binary Code	Function
0												000000	Normal state
17			X								X	010001	
18			X							X		010010	
19			X						X			010011	
20			X					X				010100	
21			X				X					010101	
22			X			X						010110	
23			X		X							010111	
24			X	X								011000	
33		X									X	100001	
34		X								X		100010	
35		X							X			100011	
36		X						X				100100	
37		X					X					100101	
38		X				X						100110	
39		X			X							100111	
40		X		X								101000	
49	X										X	110001	Not used
50	X									X		110010	Not used
51	X								X			110011	All on
52	X							X				110100	Bright
53	X						X					110101	On
54	X					X						110110	All off
55	X				X							110111	Off
56	X			X								111000	Dim

Fig. 11. BSR X-10 function chart.

that the lights come on smoke-filled room), then a call (if selected) is made for ou.

In lines 100 through 135, he value of "C" is used to etermine what will happen ext. If the value of "C" quals 8, then the front-orch light is turned on, but nly if it is after six in the evening. If the value of "C" is equal to 16, the fire alarm is set off. If the value is 23, then the self-check message is printed. Any value suitable to your system installation can be used here.

Lines 200 through 265 should not be changed unless you are familar with the operation of the internal tick counter. A complete description of the clock routine can be found in the riginal article referred to earlier.

Random Timing

Line 520 plays an irnportant part in determining hen and if a light will be urned on. The object of his and the following lines to make the house look ived in. A value for A9 of ss than .001 will occur about 6 times in a 24-hour period. If a value less than 01 is generated, line 525 sets A9 to a random integer and then lines 600 rough 616 provide the acal control. These values can be changed to suit individual living patterns.

Line 505 is the line that etermines when the system will self-check. As now et, the system will check tself about 6 to 10 times a ay. Line 585 does the acual checking via OUT 2,15.

Control-B

The function of the control-B is twofold. The first thing that happens is that the alarm is shut off. The next thing is that memory is searched for data. If no data is found, then line 1025 is printed. If some data is found, it is then read out via lines 1030 through 1045. It should be noted that some time will be lost when a control-B is used and there are several different items to list. This is a small problem because the services of the burglar alarm are usually over when this function is required.

Figs. 10 and 11 are the required input codes for the various output functions. Fig. 10 shows the values which control the functions of part (A), and Fig. 11 gives the values required to control the relays attached to the BSR X-10 control system.

Sensor Installation

Sensor installation will depend on several factors, including the types of materials used in the building. Fig. 12 gives examples of the major types of sensors used in this system. Installing the door sensor is about the easiest. Sensor contact is made by attaching small wires to nails or screws which are mounted in the hinge side of the door jamb. A small metal plate attached by nails or two-sided tape is mounted on the door. When the door is closed, the plate shorts across the nail (screw) heads, closing the circuit. Wires from the nails (screws) are run along the floor, rug, or, if necessary, through a small hole drilled in the doorstop. Caulking and paint will easily cover this small wire on the outside of the building.

ecimal Input	U10 Interconnect Pin 16	15	14	13	12	11	Binary Code	Remarks
0							000000	Normal state
9							001001	Sounds alarm
10	HI						001010	
11		HI					001011	Phone dialer
12			HI				001100	
13				HI			001101	
14					HI		001110	
15						HI	001111	System test

Fig. 10. Control functions.

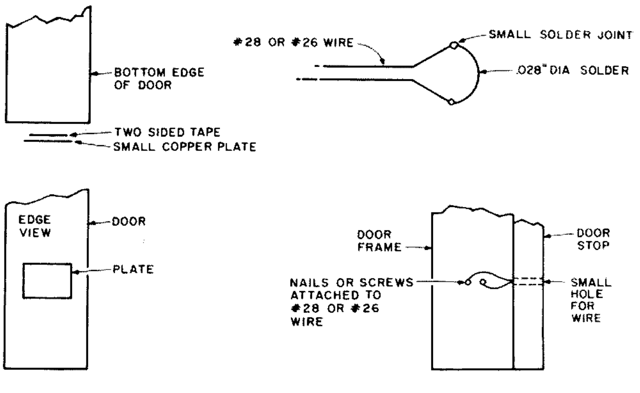


Fig. 12. Fire sensor design (upper right) and sensor-mounting tricks.

Aluminum frame windows and doors are the hardest to wire. If the window or door has an aluminum frame but a wood casing, the same method as used above can be used except that in this case the aluminum frame takes the place of the small plate. If both the frame and casing are aluminum, the best method seems to be mounting the screws on a small insulated block. Careful attention should be given to mounting so that an occasional open or always short circuit will not develop. Conductive tape can be used on windows if necessary. This tape is available from Radio Shack. In any case, use care to conceal the wire. A single wire can be used to loop around one side (zone) of the building with the return being brought directly back to the source (detector enclosure).

The galvanized plates are laid on a plastic mat to prevent current leakage through concrete or wet wood. The entire plate assembly is then covered with indoor/outdoor carpet. The carpet is glued down to prevent slippage.

Summary

This alarm system has been in operation for about one year. Various forms and layouts have been used and as yet only two false alarms were sounded. Both of these were caused by poor solder joints. Power for this alarm is taken directly from the H8 +18- and +8-volt bus. Any source which will provide approximately 500 mA (alarm on) will work. The system is built with CMOS devices and requires less than 1 mA for normal operation.

I hope you enjoy the same peace of mind that I do, should you try this system.■

Parts List

Qty.	Type	Used For	Remarks
ICs			
2	4050B	U1 and U8	
2	4042B	U2 and U3	Pin 6 and 8 to Vss
2	4078B	U4 and U7	
2	4068B	U5 and U6	
2	4001B	U9 and U17	Unused inputs to Vss
2	4028B	U15 and U16	1 4514B substitute
1	4555B	U18	Unused inputs to Vss
2	4098B	U11 and U12	
Transistors			
2	PNP	Q15 and Q16	Any PNP type for Q16; not shown in Fig. 6
13	NPN	Q1 through Q14	2N2222 or equivalent
Opamps			
2	LM311	U13 and U14	Voltage comparator
Diodes			
11	1N914	Voltage suppressors	across relays
12	10 V	CR1 through CR12	100-mW zeners
Relays			
10	SPST	+12-volt DIP	
1	DPDT	+12-volt DIP	

Miscellaneous

All resistors are ¼ Watt. Capacitors are in uF and electrolytics are marked with a +. Circuit-Stik products are available in most parts houses or directly from Circuit-Stik, PO Box 3396, Torrance CA 90510. All components can be purchased from Godbout or James or from other advertisers in this magazine.

Diode Doctor

—the P-N diagnoses

Paul M. Danzer N1II
2 Dawn Road
Norwalk CT 06851

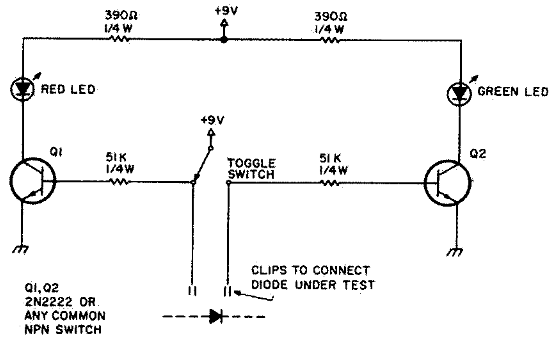


Fig. 1. Diode-tester schematic.

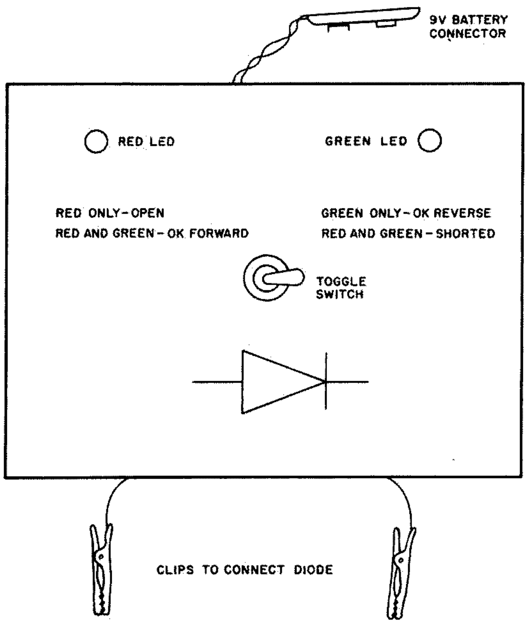


Fig. 2. Front-panel layout.

For many years I have used my ohmmeter to test diodes. The usual technique was to set the meter on R × 10, fumble with the test leads to get a "low" reading (OK in the forward direction), reset the meter to R × 100 or R × 1000, refumble to reverse the diode, and check for a "high" reading (OK in the reverse direction). Usually, around the second fumble I would lose track as to whether I actually reversed the diode and would have to fumble a few more times to recheck.

Recently, I purchased a bag of 100 untested switching diodes, and anticipating a long evening of lead switching, testing, and retesting, I decided to build a simple diode tester. Construction time was about 15 minutes, a good investment if you occasionally or more than occasionally test diodes.

The circuit shown (Fig. 1) was built in a 3" × 4" × 1" plastic box. Three holes are drilled: one for each LED and one for the toggle switch. The "instruction plate" was written on a self-stick label and mounted just above the switch. Two test leads with clips are brought out to connect with the diode as shown by the symbol drawn just below the switch. Fig. 2 shows the physical arrangement of the front panel.

A standard 9-volt battery connector is brought out the back to power the circuit. I recently have standardized all of my small test instruments on 9 volts and bring out the connectors. When I want to use an instrument, I simply connect a 9-volt battery, thus saving on power supplies and multiple batteries for instruments I only occasionally use.

Operation of the tester follows the "instruction plate." Connect the diode, throw the toggle switch to the left, and check that both the red and green LEDs are on. If only the red LED fires, the diode is open. Now throw the toggle to the right; only the green LED should be on. If both the red and green LEDs fire, the diode is shorted. Note: If the diode fails both tests, you probably have connected it backwards. Thus, the tester also can be used to find the polarity of unmarked diodes.

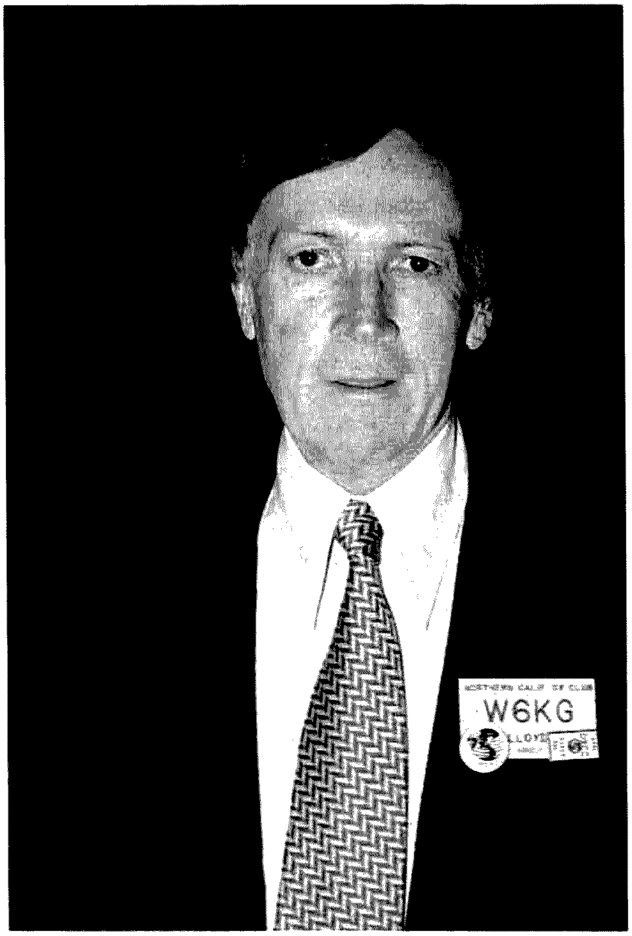
Caution: Many toggle switches connect the center terminal to the end terminal opposite the direction of the toggle handle. When the toggle handle is to the left, the center and right rear contact (as viewed from the front) are connected. Check yours out with an ohmmeter before wiring it in accordance with the schematic.■

Chris Brown KA1D
73 Magazine Staff

In Profile: Lloyd and Iris Colvin, The DXpeditioners

Lloyd and Iris Colvin are living a dream that all DX-oriented amateurs have envisioned at least once. It's a dream of unlimited travel toward receding horizons, of financial security and international celebrity status. It's a dream of going to the sun, setting up a shack, and, for once, operating as the hunted rather than the hunter. It's a dream of being DX.

For the past 16 years, the Colvins have been on the move. The statistics listed on their Yasme Foundation QSL card tell the story: traveled to 142 countries, worked over half the active amateurs in the world, achieved DXCC 56 times under various callsigns, received over 350,000 QSL cards, worked 354 countries, won 400 awards including the first *CQ Magazine* WPX Certificate.



Lloyd Colvin.

Tanned and healthy, the Colvins approach retirement age with energy and enthusiasm instead of dread. Part of the reason is their lifestyle. Financially secure and unfettered by family or business constraints, they are free to roam the world together in an ongoing DX odyssey.

Under the auspices of a tax-exempt foundation called Yasme, they have made a career of amateur radio DXpeditioning. With an affinity for travel gained during a 23-year military career and a love of radio communications spawned in the early days of amateur radio, the Colvins are uniquely equipped to meet the demands of their gypsy lifestyle. Operating from seldom-heard coral atolls, newly-established African countries, or lavish Caribbean island playgrounds, the Colvins have long fascinated those less-fortunate souls on the opposite end of the circuit.

But what does it take to globe-trot constantly, to be without home and family much of the year? How is it possible to be so dedicated to amateur radio that, no matter how unusual or exotic the locale, rarely a day goes by without time spent at mike or key?

And what of Yasme? Where does the family stop and the Foundation begin? How does this tax-exempt corporation function? Is it a building or a box in the Castro Valley, California, post office? How are the donations used and what degree of financial support does Yasme sponsorship entail?

These questions are just a few of many asked during an afternoon spent with Lloyd and Iris Colvin—the DXpeditioners.

73: Lloyd, what is Yasme all about?

Lloyd: Actually, it all started in 1954. A young fellow named Danny Weil built a 19-foot boat with his own two hands. Danny was an Englishman, and he hoped to sail around the world in the little boat that he had built.

When he got to the US Virgin Islands, he met Dick Spenceley KV4AA. Dick said to Danny, "Why don't you become a radio ham? Then, as you go around the world, people who enjoy speaking with exotic countries would have the chance to do so. They might even help you financially in pursuing your trip around the world."

73: So Danny Weil wasn't licensed when he began the trip?

Lloyd: No. He was not a radio ham and he didn't know the code. But Danny accomplished something about only one man in 100,000 could. He learned the code, got his license, and was on the air working pileups at 20 words per minute within one month after starting from scratch. He then proceeded to go out to many exotic places with a rig and give many people new countries.

Well, Danny never quite made it around the world, but he did sail over 25,000 miles. His boat was called *Yasme*—that's a Japanese word meaning "good luck."

In 1961, the Yasme Foundation was formed. Its main goal was the collection of money to keep Danny going. This worked out well until 1964, when Danny met a young lady on one of his stops and they got married. They went out on a few more voyages together and almost lost their lives in mishaps at sea.

There were five *Yasme* boats from the beginning of Danny's odyssey to the end. All now rest on the ocean floor.

73: Is Danny Weil still alive?

Lloyd: Yes, he's still alive. He is living in Texas now and he's about fifty years of age. He gets on CW frequently, but he does not hold a call of his own in the US.

73: So, in 1964 the Yasme DXpedition torch was passed to you?

Iris: Yes. We had always thought about going out on a DXpedition, and in 1964 I said to Lloyd, "Why don't we go?" We contacted Yasme because we knew it was still active, although no one was out at the time. We asked if they'd sponsor us, and they said yes.

73: What did Yasme sponsorship entail?

Iris: They had no money in the Foundation at that time, but we paid our own way, anyhow, so it didn't matter. They provide a big service for us in the way of QSLs. The donations they receive help with that. They also helped with licensing in countries where we had trouble.

73: So you're operating as independent hams under the umbrella of the Yasme organization?

Iris: Yes, that would describe it well.

73: Are there other people in the same situation in Yasme or are you two the only active DXpeditioners?

Lloyd: There have been others in the past. One of the most noteworthy is George McKercher WØMLY. He is now a director of Yasme. He made a Yasme-sponsored trip to many of the countries of Africa in the 60s. There have been a couple of other people who have gone out under the sponsorship of Yasme, also.

We are finally approaching the activity of Danny Weil. He was out continuously for nine years, you know. We have been out actively from 1965 . . 16 years in all. We frequently take a few months off and go back to California for a rest. We still have a business there that we're connected with.

73: I see. Is Yasme headquartered in California?

Lloyd: It is, but it is incorporated as a nonprofit corporation in Florida.

73: Does Yasme have an office and phone, or is it just a mail drop?

Lloyd: Well, for nearly 16 years now we have had the same PO Box—2025, Castro Valley, California—that's been a help because people always know that they can get a card from us at that address.

73: So, no full-time, paid office staff?

Lloyd: No.

Iris Colvin.

73: You must receive thousands of QSLs each month. How and by whom are they handled?

Lloyd: We have had a number of Yasme people who have helped with the QSLs.

Today, Iris and I have the largest QSL collection in the world. I don't think there is anyone else who has more cards than we do. All of them are arranged in alphabetical order and stored in a huge metal cabinet. Our files number in excess of a third of a million cards at present.

73: That's amazing!

Lloyd: There are some other amazing statistics about our QSL collection. For one, the weight. We're a little worried about the structure of our home which, incidentally, we built. It was designed to carry a good load, but the QSLs we have amassed weigh over a ton!

Also, putting this collection in the state it's in now has taken lots of work. For example, if it takes a minute and a half to answer a card, file it, etc., when we receive one, it would take one person working forty hours a week three years just to file the cards we have received to date.

73: How do you confirm a contact for a new country? Do you check back against the log?

Lloyd: Yes, we do. We use a log system that Yasme has used ever since we've been connected with it. We can thank the infamous Mr. Don Miller W9WNV for designing it. In fact, he gave us the first copy of the log we use. It's a good system and we have used it for as long as we've been operating.

It consists of a small form with attached carbon, about five by seven inches in size. Each sheet holds 100 entries and when a sheet is full, we send the carbon to Yasme for filing and verification.

73: And the folks at Yasme verify the contact and then QSL?

Lloyd: Yes, and Yasme has had over 100 people help with this over the years.

73: Are all these people volunteers, or are they paid?

Lloyd: They are all volunteers. Nobody gets a cent. Nobody has ever received any money in the headquarters of Yasme, either. Right now, we have one lady who is single-handedly answering all of our cards. She is Carolyn Brand WA6AKK.

SOME OF THE COLVIN CALLS

W6KG (Lloyd)—W6QL (Iris)—FA8JD—J2AIH—J2USA—DL4ZC—KG6SV—KC6SZ—VR1Z—GD5ACH—ZB2AX—GC5ACI—CT3AU—CT2YA—6W8CD—5T5KG—ZD3I—9L1KG—5L2KG—9G1KG—TU2CA—5V1KG—TY2KG—VR8B—3D2KG—C21NI—FKØKG—YJ8KG—ZF2CI—W6KG/-AJ3/TI5/6Y5/VP2A

We've just returned from four months of operating during which time we made over 55,000 contacts. This poor lady is receiving over 25,000 QSLs from that trip alone.

Iris: Lloyd, we should also give credit to W6RGC—Bob Vallio. He was our first secretary and he did all of our cards in years gone by.

73: How did you folks acquire the DXpedition lifestyle, the constant going?

Lloyd: We started our world travels while I was in the service. I've had one career in the military and a second afterwards. I was in the Army Signal Corps before World War II. I was a radio ham when I was 12 years old and have been one for 52 years now. Iris became a ham as soon as we got married, so she's been a ham for 37 years.

Actually, I got into the Signal Corps through ham radio. In fact, almost everything we've done in our lives has been directly connected with ham radio. I guess I found my military life interesting because much of it was similar to running ham stations.

73: And I imagine you did a fair amount of traveling during your military years?

Lloyd: That got us started traveling, yes. We've now been to 142 countries, and about half of those were visited while I was in the military service. I spent 23 years in the military and retired in 1961 with the rank of Lieutenant Colonel.

73: How did you get into DXpeditioning?

Iris: When we decided to go on our first DXpedition, in 1965, we sold our house, closed out the five construction contracts we had going, advertised for and found a good home for our dog, and then left. Our intention was to go out indefinitely.

Well, after three an a half years we got tired and went back to California for a rest. Now we have a different house; it's a place we can go back to as a home base and it even has a permanent amateur radio station.

73: You said that you had a business in California. What type of business is it that allows you to be away so much?

Lloyd: Well, when I left the military, we went immediately into the construction business. We started out building homes and then went on to larger projects like apartment houses, hospitals, and office buildings. Today, I'm the president of Drake Builders of California and Iris is the vice president.

> "Almost everything we've done in our lives has been directly connected with ham radio."

73: I see. Since you're away so much, I imagine you must have a reliable manager working for you.

Iris: We're no longer in the construction business. Today we own several apartment buildings which require occasional looking after but not daily attention. My daughter and her husband look after the day-to-day cares of the business. In fact, she's a ham, or was. Her call was W4ZEW, but it has expired. It hasn't been reissued though, so maybe she could get it back.

73: Ham radio seems like the ideal way for her to keep in touch with you when you are in hard-to-reach places, places, say... like China. I assume you folks are interested in China?

Iris: Yes. We've been working on it, but we don't know how to break the permission barrier.

73: Have you personally made any overtures to the Chinese government?

Lloyd: Yes. In fact, we had a rather interesting experience while making an effort to gain permission to go.

Back in the last days of the Nixon administration, I read that Secretary of State Kissinger was going to China. I sat down and wrote a letter, giving him the full story on ham radio. I told him that Iris and I would dearly like to go to China and asked him to please do something to help us get into Red China with an amateur station.

We never knew for sure whether he read our letter, but eventually we got a letter from a fellow in the State Department saying that Secretary Kissinger had directed him to respond to us. He provided us with the names and addresses of the four Chinese that they thought were most likely to be in a position to help us.

We wrote to these four people and after many months received an answer from one of them. It was a very short letter, written in Chinese, about a third of a page long.

Not being able to read Chinese, we assumed that it said no, simply because of its length. We took it to an interpreter and, after it was translated, the third of a page became two full pages. One Chinese character can have the same meaning as a full English sentence.

It was a rather interesting answer, and it went something like this: It said that our letter had been received, and they wished to tell us that when our country saw fit to fulfill all the promises made by President Nixon on his recent trip to China, it was possible that favorable action would be taken on our request to operate.

73: We know what happened to Mr. Nixon after that. How do you assess the political situation there today? Do you sense an easing of tensions?

Lloyd: Right now, the Chinese are operating low-powered transmitters in the 80-meter band, so they know what ham radio is. Though they are not permitted to contact the outside world yet, it is my opinion that the day is coming.

73: Do we need some ping-pong diplomacy in ham radio?

Lloyd: Yes. I think a group of hams going over there the way the ping-pong people did could make great strides in furthering the amateur cause.

Iris: The Chinese don't seem to want their people to contact the outside world. That's the stumbling block. If there were some way we could overcome that... we might get somewhere. Right now, they are just afraid to have their people have any contact with the rest of the world.

73: In all such matters I imagine you've got to be part politician to make any progress. You both must be quite adept at working your way through bureaucracies after all your dealings with foreign governments.

Iris: That's one thing that you've got to do. I remember an instance in Africa back in 1971 when many of the countries were being formed. In one place we visited, we felt that they were willing to let us operate but we sensed that there was another problem.

They simply didn't know how to go about granting an amateur license. They had never had to do it before, having had no amateur service of their own. They didn't even know what a ham license should look like.

We told them that we had licenses from many

other countries that we'd be happy to let them inspect. We did so, and the next day were granted a license that looked much like some of the ones we had left with them.

Lloyd: We sensed that they didn't know how to issue a ham license but we couldn't just say, "Hey, don't you guys even know how to issue an amateur license?" Instead, we said, "Why don't we leave these other licenses with you overnight?" When we finally got our license we saw that they had copied almost word for word from our other licenses. Diplomatically speaking, we came in the back door.

73: It's hard to envision a country without an amateur service, but I suppose they exist, don't they?

Iris: They do, and it's a problem for them to issue licenses to people like us.

73: I'm curious about the scenario of a Colvin DXpedition. What happens when you arrive at a new place? Do you have a tech crew that gets everything up and running for you?

Iris: Sometimes yes, sometimes no. One of the things that we do differently than some smaller operations is that we take a full kilowatt station and a directional antenna along wherever we go. We take a three-element beam, a rotator, a linear, and a transceiver. The whole package weighs about 400 pounds.

It's been a lot of trouble to carry around, and a big expense, too. But, as a result, wherever we have gone we have put out a very good signal and given anybody who wants to work us the opportunity. That's our criterion of operation and that's what we've been doing.

73: Do you ship all this gear ahead or do you travel with it?

Lloyd: We have tried many different ways of doing it. When we can, we ship it ahead, but that isn't always possible. When we put the new country of Tuvalu Island on the air under the call of VR8B, we shipped the gear ahead and, fortunately, it was there when we arrived.

Iris: We prefer to take the gear with us instead of shipping it; that's the ideal way. On the other hand, if you don't have a license when you go in, you may have a problem getting it through customs.

Lloyd: In that connection, we have changed some of our ways of carrying gear. During the first ten years of our operation, we always carried it in the manufacturer's packing material—bulky boxes, Styrofoam® packing, etc.

About two years ago, we found a better way to move the main part of our station. Now, I take the transceiver aboard the plane as carry-on baggage. I don't wrap it up at all, so everyone can see what it is. Iris does the same with the linear.

There are some real advantages to this. First, nobody can ever accuse us of sneaking anything into a country because the gear is right out where everyone can see it. Second, all the large, bulky packing material is eliminated. And most important of all, the gear doesn't get lost. Our personal bags and clothes may, but even if they do, we still have the ham station and, to me, that's most important. You can operate in your underwear, but you can't operate without the rig!

Iris: The hippies have helped us out in this regard.

73: The hippies?

Iris: Yes. It's the "in thing" today to carry one of those great big radios around with music blaring. In the streets of San Francisco these days, there are so many that they interfere with each other. As a result, we have had very little trouble carrying our transceiver around. Everyone assumes it's a radio.

73: Speaking of equipment, what type of gear are you using?

Lloyd: We use an old Heath SB-230 linear that weighs 30 pounds. With all the advanced technology we have today, we still can't find anything that will run a kilowatt and weighs 30 pounds.

When we started, years ago, we were using a Collins. Later we switched to Kenwood, and today we are using a Yaesu. All these rigs worked very well for us, especially when you consider that we have had something in the neighborhood of 400,000 QSOs, all with very little technical trouble. We really take our hats off to the manufacturers.

"We've been forced into being the good guys by Don Miller."

73: Lately, many DXpeditioners seem to be having a large number of power-line-related problems. On your trips, do you take any precautions to limit power-line variations?

Lloyd: No. In fact, we're astounded at how well the equipment we've used has held up under considerable variations of input power.

On our very first trip, we took a Variac with us. Soon thereafter, we eliminated it because we found that the commercial equipment we were using worked well with a variation of input voltages in excess of 15 percent. We don't carry a Variac with us now or take any special measures to protect the rigs.

Everywhere we go we are looking for new, lightweight equipment—anything to improve our ability to carry a station with us. Some of the advances have not been as great as we'd have liked.

For example, we are still using the same antenna that we carried with us 15 years ago because we can't find one that is smaller or better. When an antenna comes along that is lighter and better than the Hy-Gain TH-3, we'll buy it immediately!

73: I've always been mystified by the DXpedition that goes to an exotic place, whose members then lock themselves in a room with a rig for a week. They see very little, if anything, of the country. When you are on a DXpedition, do you get around the country and meet the people?

Iris: We sure do. That's the reason that we usually try to stay at least a month in a place. It gives us an opportunity to rent a house or apartment and get out and around. We more or less live with the people wherever we go.

We do like to contact as many people as possible and, in a month's time, most of those who wish to, contact us. We still have time for sightseeing, though, even when we operate 12 hours a day.

Lloyd: And, when we've left a country, our memories are of the people we've met there, not of the actual on-the-air operation. When we look back on it afterwards, it's the people we've met that seem to be the outstanding thing about the visit.

73: You two have been referred to as the premier ambassadors of amateur radio. How do you feel about that?

Lloyd: Well, we have been forced into being the good guys by Don Miller. When he was out he frequently ran into trouble with both the local authorities and his fellow hams. He was occasionally not licensed for, or even located in, some of

the places he claimed to operate from.

We once spent two and a half months in a rare country, with our gear, and couldn't get a license. In spite of that, we never fell for the temptation of getting on the air illegally. We've always had legitimate licenses on all our trips. We also have made it a special point not to commit any type of minor crime in any country we visit, such as operating without proper permission or not paying all our bills.

73: I imagine it's hard to keep up with all the different rules of these countries with regard to frequencies available.

Lloyd: It's not so much keeping up but rather dealing with the annoyance of being in a country where you can't operate on a frequency that you did the previous month in another country. For instance, there are some countries now that allow their amateurs only a 100-kHz segment of 80 meters. During our operations, it is a great temptation to try to go where the Americans are operating on 80 meters, but often we are unable to do this—and we don't.

73: Strictly by the rules then?

Lloyd: Only where the local government says you're supposed to operate, yes.

73: I'd like to hear your views on the bogus DX QSL card incident. Dave Gardner's claim that the scam was merely an effort to demonstrate to the ARRL the shortcomings of its own DXCC program met with little sympathy in most circles.

Lloyd: I have no sympathy for him, I'll tell you that.

73: Were you at the 1980 Fresno DX Convention where the plot was supposedly hatched in a secret meeting?

Lloyd: I was at the Fresno convention, but I heard nothing about a secret meeting, much less bogus QSL operation. If I had, I'd have probably gone to the League myself. What Dr. Dave Gardner did was just plain cheating, and you can quote me on that.

73: In a statement to HR Report, *Gardner implied that a large number of DXers and DXpeditioners were involved. Do you think this is the case?*

Lloyd: I doubt it. I think this was his idea and his operation. The sad thing is that as a result of all of this, people are going to lose faith in DXing and also in amateur radio. The impact of this will be terrible for amateur radio.

73: How do you feel about the no-code license?

Lloyd: We are not in favor of it. It seems to me that we must not lower the standards of amateur radio to those of CB. We have a little something special with the code requirement. Though many say CW is a thing of the past and we don't need it, it never seems to disappear completely.

73: Do you feel that in this era of liberalization it is difficult to maintain standards in amateur radio?

Lloyd: To a degree. However, I don't go along with those who say that the conditions on the bands today are worse than in years gone by. As I look back at my early days in the hobby, and I started in 1929, I'd have to say that it was just as bad or worse back then. People have just forgotten.

In 1929, when two people in the same city got on the air they QRMed each other so badly that neither could hear anything, even if they were on opposite ends of the band. It's simply not true to say that things are worse today than in the old days.

As far as politeness goes, we are in no worse shape today than we were in 1929. When I first became a radio amateur, we had 35,000 hams in this country—that's all. We have ten times that number today, and while there are more troublemakers around, the ratio is just about the same as it was in 1929. I don't really think that conditions today are any worse than when I started.

73: Iris, I read an interesting statistic recently in QST. *They conducted a survey of amateurs and found that the number of women becoming involved in ham radio is on the increase. Any comment on that?*

Iris: Oh, I think that is definitely true. I also think that women are becoming better operators, too. I usually try to contact the YLs, and I've noticed recently that the YLs are much more self-confident in pileups. They talk slowly, seem more poised, and in general are capable of making contacts in good style.

73: How about plans for the future? Other than China, are the Colvins planning anything exciting?

Lloyd: We laughingly tell everyone we meet that we hope to operate from every country in the world. We know this is an impossibility, but it is a goal that we can keep in front of us—something to make life and ham radio more exciting.

"We must not lower the standards of amateur radio."

73: So, as you look down the road, you see more of the same: the travel, the DX operations, the going?

Lloyd: That's right, yes. ■

Antonio G. O. Gelineau W1HHF
142 Home Avenue
Burlington VT 05401

Ringo Ranger Redux

—add those radials for better performance

After reading the very excellent article by Robert Glorioso W1IS in the May issue of *73*, and having a Ringo Ranger, my interest was stimulated to experiment with adding ground-plane radials.

I cut six pieces of aluminum wire to lengths of 20 inches (50.8 cm). As an aid to spacing them around the base mounting of the antenna equally, I placed a strip of 1" masking tape around the base, brought the ends together, and marked them as shown in Fig. 1(a).

Using a marking pencil, I made a line to indicate where one radial was to be placed. Removing the tape, I then made lines equally subdividing the distance between the two original marks—see Fig. 1(b). The marked tape was then placed on the base mount of the antenna as shown in Photo A.

Next, I placed a 2" hose clamp above the marked tape, but did not tighten it. I slid the aluminum rods under it one by one at the marks, holding each in place with a piece of masking tape. When all six rods were in place and aligned, I secured them by tightening the hose clamp, as shown in Photo B.

Using the handle of an adjustable square which had a designed angle of 45°, I bent each rod to a 45° angle as shown in Photo C.

My findings on adding radials to the Ringo Ranger were the same as those of W1IS. There is an improvement in received signals from repeaters and considerable improvement when working simplex.■

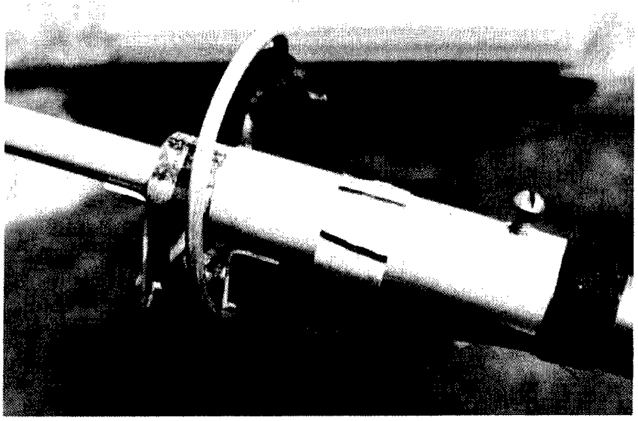


Photo A.

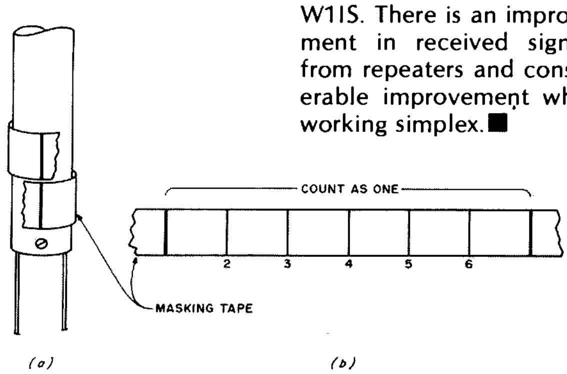


Fig. 1.

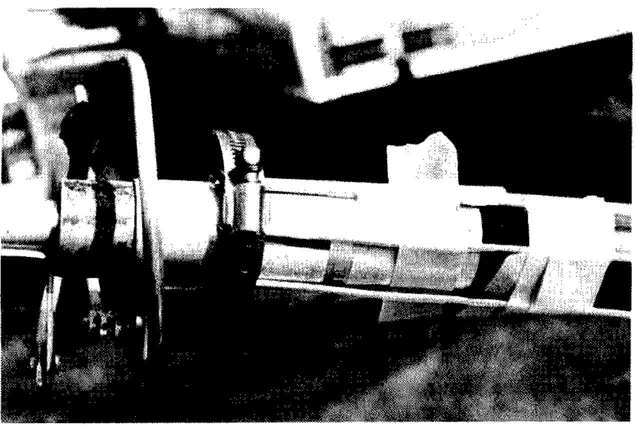


Photo B.

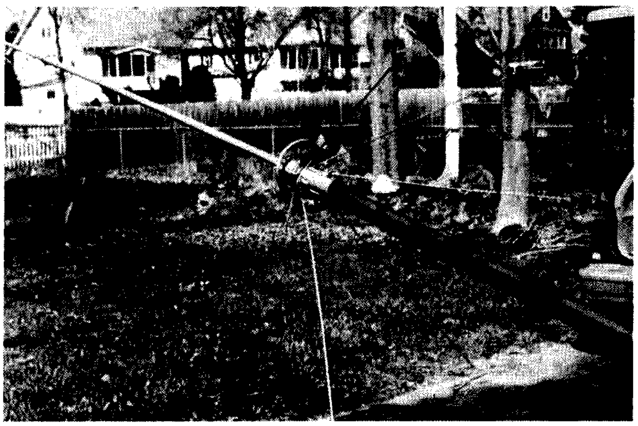


Photo C.

FUN!

John Edwards KI2U
78-56 86th Street
Glendale NY 11385

CONTESTING

Ahhh, the weekend. Two solid days to ignore work and tune the airwaves. What? The XYL has chores? Too bad. Today's the day to have some long anticipated rag-chews. Anyway, it looks like rain.

But one flick of the power switch finishes all those pleasant thoughts. No rag-chews today—*it's another contest weekend!* A spectrum full of anxious amateurs, eager to give anything that talks a 59 signal report.

Not since the incentive licensing debacle have feelings run so high. Contesting is one of those searing issues that immediately crystalizes amateur radio into two opposing camps. The only middle ground is here, in FUN!, where both lovers and haters can prove their contesting knowledge.

ELEMENT 1—CROSSWORD PUZZLE (Illustration 1)

Across

1) Contest bonuses
7) Unhardy contester
10) 1970s U.S. prefix
11) Popular contest starting day
12) Pacific prefix
14) Popular antenna
17) Night (abbr.)
18) Civil defense (abbr.)
20) Call-oriented test (2 words)
21) Preliminary result: ____ score
23) Guatemala prefix
24) Twice-worked stations
26) Soviet satellite (abbr.)
28) Between nations
30) Home power type
31) HF wavelength (abbr.)
32) November contest

Down

2) The non-initiated
3) Infinitesimal
4) Identification (abbr.)
5) Electromagnetic communication
6) System of communication
7) Informal contests (2 words)
8) A Soviet prefix
9) Summer contest
13) CW chuckle
15) Gone to ruin
16) Mr. Last Place
18) Bolivia prefix
19) ARRL contest
20) *CQ* contest (abbr.)
22) Repeat (abbr.)
24) To fall in standing
25) Contesters can't wait to hit this at end
27) ______ up first place
29) Two winners
31) 32 across (abbr.)

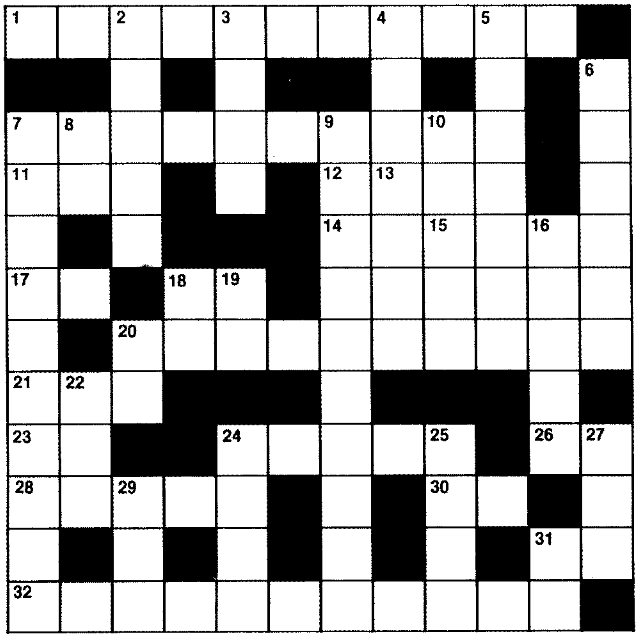


Illustration 1.

ELEMENT 2—TRUE-FALSE

True False

1) It's quite legal for contest organizers to offer prizes. ______ ______
2) A Novice won the 1954 ARRL CW Sweepstakes. ______ ______
3) Most contest organizations disqualify entrants submitting logs with errors totaling more than 2%. ______ ______
4) The North American Sprint is sponsored by the *National Contest Journal.* ______ ______
5) It's possible to enter many contests without even transmitting. ______ ______
6) The March, 1921, *QST* suggested a CQ party. On April 1, according to a specific schedule, all amateurs in a given call district would send CQ. ______ ______
7) The first ARRL Sweepstakes was held in January, 1930. ______ ______
8) The winning operator in the first Sweepstakes worked 153 stations in 43 sections. ______ ______
9) The first Field Day took place in January, 1933. ______ ______
10) The first winning Field Day station had six operators and accumulated a grand total of 60 contacts. ______ ______
11) The Radio Society of Great Britain and the ARRL once cosponsored a contest. ______ ______
12) The 1952 Novice Roundup had 100% greater participation than the previous year. ______ ______
13) In November, 1931, the ARRL sponsored a "Crossband Get-Acquainted Party" to "promote fraternalism and versatility" between 40- and 80-meter operators. ______ ______
14) From 1942 through 1945, U.S. hams were forbidden to have contest QSOs with German and Japanese stations. ______ ______
15) The 1977 Novice Roundup was the first to include Technicians. ______ ______
16) The ARRL, *CQ Magazine*, and *73 Magazine* have all sponsored 160-meter contests. ______ ______
17) The ARRL "Copying Bee" was a receiving contest that specialized in tricky text and code combinations. ______ ______
18) The VHF Marathon was a 1946 contest that lasted eight months. ______ ______
19) The Southpaw Fist Contest is devoted entirely to left-handed brasspounders. ______ ______
20) The NBVM Sweepstakes is a contest for narrow-band voice modulation devotees. ______ ______

ELEMENT 3—SCRAMBLED WORDS

Unscramble these words associated with contest operating.

foceef	olg	mutrecop
coclk	phrocmenoi	eyerk
linpce	peadenohsh	tations
	neatnan	

ELEMENT 4—MATCHING

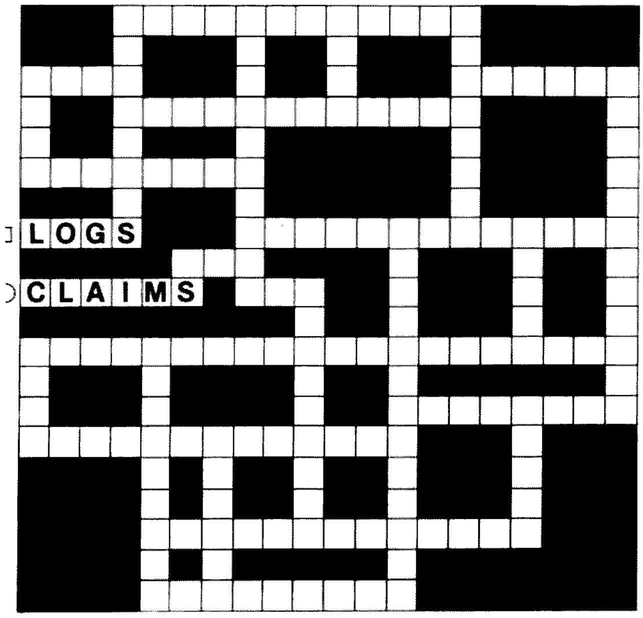
Match the contests listed below with the month in which they take place.

Column A	Column B
1) Field Day	A) January
2) IARU Radiosport	B) February
3) *CQ* WPX (Phone)	C) March
4) ARRL Novice Roundup	D) April
5) *CQ* Worldwide (CW)	E) May
6) CAN-AM Contest (CW)	F) June
7) ARRL VHF Sweepstakes	G) July
8) Straight Key Night	H) September
9) *CQ* Worldwide (Phone)	I) October
10) County Hunters SSB Contest	J) November
	K) December

ELEMENT 5—HAMAZE

Here's a new type of maze geared specifically to hams. The object is to start at the circle and trace your way to the square by filling in the answers to the clues given below. To help you on the way, we've already given you the first and last clue answers. All words read either vertically downward or from left to right. Each new word is on a *perpendicular* angle to the previous word. Words join on a common letter. Good luck.

1) Contest records (given)
2) Sometime domestic multipliers
3) Specialized mode
4) West coast contesters (abbr.)
5) Station timepiece
6) Automatic key
7) Station's heart
8) To make advances
9) Novice contester's speed
10) European award (abbr.)
11) Contest QSO
12) Top ticket
13) Topside metal
14) Beam reckoning
15) Total
16) Ham letter words
17) DX encounter
18) Contest sleep
19) What you're reading
20) Output (abbr.)
21) QSOs ____ minute
22) Postscript (abbr.)
23) Sources of assertion (abbr.) (given)



SCORING

Element 1:
Twenty points for the completed puzzle, or 1/2 point for each question correctly answered.

Element 2:
One point for each correct answer.

Element 3:
Two points for each word unscrambled.

Element 4:
Two points for each contest matched to its correct month.

Element 5:
Twenty points for the completed puzzle, or one point for each word.

How did you do in this contest?

1-20	points—"Why is the League wasting my dues on these contests?"
21-40	points—"Contests? I can take 'em or leave 'em."
41-60	points—Third place—Manitoba QSO Party.
61-80	points—"Mr. Clean Sweep."
81-100+	points—They won't let you enter any more contests—you're too good.

FUN! MAILBOX

I think Dave Mann's shot at you in the July "Leaky Lines" was uncalled for. To me, your column will always have taste.

Jonathan Bird KA0BYW
Hopkins MN

As my nephew, Paul David Mann (no kidding) always says: "With a little MSG, it'll even taste better."—J.E.

THE ANSWERS

Element 1:
See illustration 1A.

Element 2:
1—False Not in the United States. Actually, small prizes such as plaques and cups are okay, but the FCC tends to frown on anything more substantial.

M	U	L	T	I	P	L	I	E	R	S	■
■	■	A	■	O	■	■	D	■	A	■	C
Q	U	I	T	T	E	R	■	W	D	■	O
S	A	T	■	A	■	A	H	■	I	■	D
O	■	Y	■	■	■	D	I	P	O	L	E
P	M	■	C	D	■	I	■	O	■	O	■
A	■	W	P	X	C	O	N	T	E	S	T
R	A	W	■	■	■	S	■	■	■	E	■
T	G	■	■	D	U	P	E	S	■	R	S
I	N	T	E	R	■	O	■	A	C	■	E
E	■	I	■	O	■	R	■	C	■	S	W
S	W	E	E	P	S	T	A	K	E	S	■

Illustration 1A.

2—False But it would have been something.
3—True Be careful.
4—True Great contest and a great group.
5—True Sure. Haven't you ever heard of SWLs?
6—True We think it was meant as a joke.
7—True It was designed as an exercise in traffic handling.
8—True Today, even I do better than that.
9—False No, June, 1933. January's too nippy.
10—True Portable work was tough in those days.
11—True In 1934, a 10-meter contest.
12—True Since 1952 was the Roundup's first year...
13—True Could we make that up?
14—True And because of World War II, anyone else, too.
15—True Techs got their low-band privileges the summer before.
16—True And W1BB has worked them all.
17—True Fifty years ago—sounds like fun.
18—True I wonder when they slept?
19—False Gee, I could enter that one.
20—False It would have to be an ARRL contest.

Element 3:
(Reading from left to right) coffee, log, computer; clock, microphone, keyer; pencil, headphones, station; antenna.

Element 4:
1—F, 2—G, 3—C, 4—B, 5—J, 6—H, 7—A, 8—K, 9—I, 10—E.

Element 5:
See Illustration 2A.

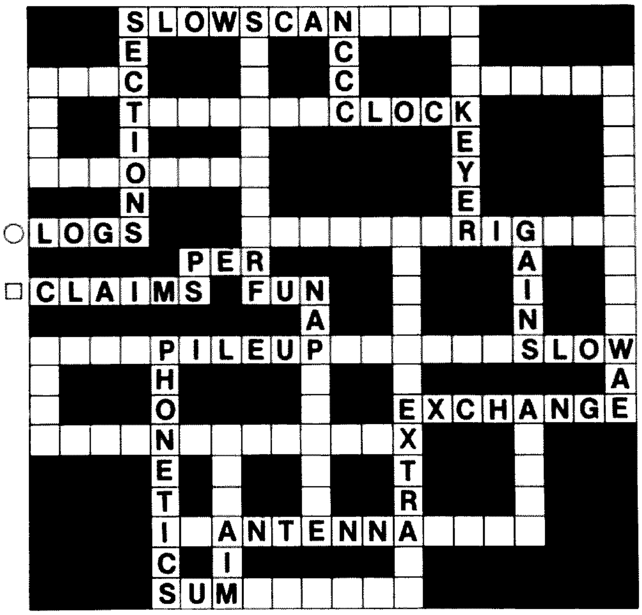


Illustration 2A.

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

WORLDWIDE AWARDS DIRECTORY

Award hunting may have become the most favorite pastime of radio amateurs, and the need for a consolidated source of information is apparent. To date, I know of three major sources In which such information is available.

The Worldwide Awards Directory, Volume 1, is now available. It lists over 100 awards, and more will be featured in consecutive volumes to be published at later dates. Its cost, $9.95, should be sent to its publisher, KB0ZP, at 736—39th Street, West Des Moines IA 50265.

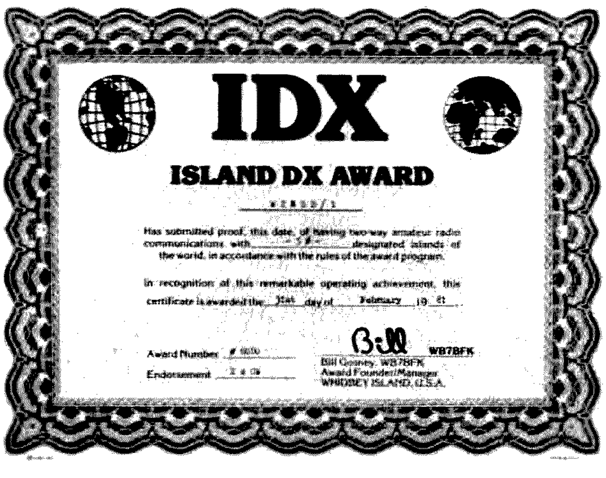
INTERNATIONAL DIRECTORY OF AWARDS

This manual features various award programs throughout the world, and segments its contents by continents of the world. Updates to the manual will be issued in the form of a newsletter and may be inserted within the manual. The basic directory is $8.00 or 32 IRCs while the newsletters (published twice annually) will be $4.00 per year. For additional information, contact the directory's publisher, Vance LePierre W5IJU, 2618 McGregor Blvd., Fernandina Beach FL 32034.

THE DX AWARDS GUIDE

The third and probably the most complete source of information is a series of volumes made available by Chuck Ellis of Ames, Iowa. This directory not only details each award program in detail but also provides a very fine facsimile of the award applications. I've utilized its contents numerous times while filing for various parchments and believe me, the work that Chuck put in his publication has cut processing time dramatically. I am positive that the various award sponsors, as well, are appreciative of the effort of providing a uniform application. There is nothing more cumbersome than trying to sort through various application formats all submitted for the same award.

The DX Awards Guide is featured in great detail on page 128 of the July, 1981, edition of this



magazine.

ISLAND DX AWARD

Of all the DX awards being offered these days, one of the newest and fastest-growing awards programs is that of the Island DX Award: Sponsored by the Whidbey Island DX Club, available to licensed amateurs and shortwave listening stations worldwide, awards are issued for 2 × SSB, 2 × CW, 2 × RTTY, and 2 × SSTV, as well as mixed and single-band accomplishments.

Fifty (50) IDX islands as they appear in the IDX Island listing are required for the basic award. Recognition is given for contacts made in increments of 50 Islands, up to and including the maximum number of islands possible. All DXCC countries which are bona-fide "islands" are the only qualifying contacts. See the IDX listing in this column.

To apply for the IDX Award, prepare a list of contacts in *prefix order*. Include the call of the station worked, IDX island name, band, mode, date, and GMT. Please *number your contacts* 1 through 50, etc. *Do not send QSL cards!* Have your list of islands verified by at least two amateurs or a local radio club official. Confirmation of each contact must be in the applicant's possession and confirmed by verifying signatures.

Send your verified list of contacts with $4.00 (US funds only) and a large self-addressed, stamped envelope (3½" × 9") to the following address. (Foreign stations may substitute the fee by enclosing twelve IRCs.) Whidbey Island DX Club, 2665 North Busby Road, Oak Harbor WA 98277. Rules governing this awards program are reviewed annually in September. Please enclose an SASE with any inquiries regarding the IDX Awards program.

A3	HKØ (Bajo)	S9,CR5	VS6
A9X	HKØ (Malp)	SV (Crete)	VS9 (See 8Q)
BV	HKØ (San An)	SV (Dodecanese)	VS9K
C2	IS	T2,VR8	VU7 (Andaman)
C6	J3,VP2G	TF	VU7 (Laccadive)
CEØA	JA-JR-KA	TI9	XF4
CEØX	JD,KA1 (Mina)	UA1,UK1 (Franz Jo)	XP
CEØZ	JD,KA1 (Ogasa)	VE1 (Sable)	YB,YC,YD
CO,CM,KG4	JD,7J1 (Okino)	VE1 (St. Paul)	YJ
CT2	JW	VK (Lord Howe)	YVØ
CT3	JX	VK9 (Willis)	ZD7
D4	KG4 (See CO)	VK9 (Christmas)	ZD8
D6	KH1,KB (Baker)	VK9 (Cocos)	ZD9
DU	KH2,KG6 (Guam)	VK9 (Mellish)	ZF
EA6	KH3,KJ	VK9 (Norfolk)	ZK1 (North)
EA8	KH4,KM	VK9 (Heard)	ZK1 (South)
EI, GI	KH5K,KP6 (King)	VK9 (Macquarie)	ZK2
FB8W	KH5,KP6 (Palmy)	VP2A	ZL
FB8X	KH6,WH6,AH6,NH6	VP2D	ZL (Auck-Camp)
FB8Z	KH6,KH7 (Kure)	VP2E	ZL (Chatham)
FC	KH8,KS6	VP2G (See J3)	ZL (Kermadec)
FG (Gaud)	KH9,KW	VP2K	ZM7
FG,FS	KH6,KH2,KG6 (Mari)	VP2L	ZS2 (Marion)
FH8	KC6 (West)	VP2M	1S
FK	KC6 (East)	VP2S	3B6,3B7
FM	KP (Desoth)	VP2V	3B8
FO (Clip)	KP1 (Navassa)	VP5	3B9
FO	KP2,KV	VP8 (Falkland)	3CØ
FP	KP3,KS4,HKØ (Ran-Ser)	VP8,LU (Ork)	3D2
FR (Glor)	KP4,NP4	VP8,LU (Geo)	3Y
FR (Juan)	KX	VP8,LU (Shet)	4S
FR (Reun)	OHØ	VP8,LU (Sand)	5B,ZC
FR (Trom)	OJØ	VP9	5R
FW	OX,XP	VQ9	5W
G,GM,GW	OY	VR1 (Br. Phoenix)	6Y
GC,GU	P29	VR1 (Gilbert)	8P
GC,GJ	PJ (Neth Ant)	VR3	8Q,VS9
GD	PJ (St. Martin)	VR4 (See H4)	9H
GI,EI	PYØ (Fernando)	VR6	9M6,9M8 (See VS5)
H4,VR4	PYØ (Peter & Paul)	VR7	9V
HC8	PYØ (Trinidade)	VR8 (See T2)	9Y
HH,HI	S7	VS5,9M6,9M8	

Island DX Listing. The IDX Award program depicts DXCC countries which are bona-fide "islands" as recognized by the National Geographic Society. First criterion, however: They must be a DXCC country as stated on the ARRL DX Countries List. Any qualifying DXCC countries either omitted from this list by error or those which have been recognized for DXCC after the release of this listing will be added to the IDX List when it is printed next.

THE CERTIFICATE HUNTERS CLUB

Thanks to Scott Douglas KB7SB, who is the Western States County Award Manager for CHC, we are able to bring to you an extravagant series of operating awards which will obviously win the approval of every county hunter in the world!

Washington State Award

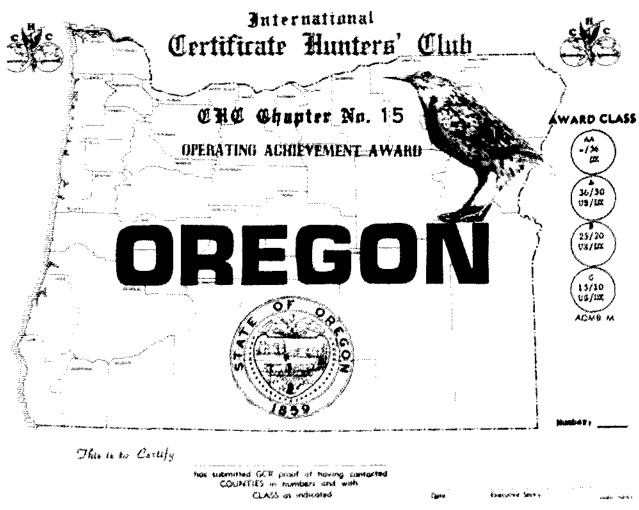
Class D requires 10 to 15 counties; Class C requires 15 to 20 counties; Class B requires 20 to 30 counties; Class A requires 30 to 43 counties; Class AA requires all 44 counties to be worked.

Oregon State Award

Class C requires 10 to 15 counties; Class **B** requires 20 to 25 counties; Class A requires 30 to 35 counties; Class AA requires all 36 counties to be worked.

California State Award

Class D requires 20 to 28 counties; Class C requires 30 to 38 counties; Class B requires 40



IDX AWARD RECIPIENTS

Over the months, many letters have been received requesting a published list of those stations that have qualified for the IDX Award. In callsign order, here are the IDX recipients. Is your call on this honor roll?

US Stations

W1AGA
N1AHN
WB1BVQ
WB1DQC
WA1GTQ
W1HR
WA1SMI
W1TEE
K1TH
W1WKP
N2AWM
N2BQL
KA2EAO
WB2FFY
N2GG
W2KI
AF2L
KE2M
KF2O
WB2QLO
WA2SRM
KB2TY
WA2VJL
KJ2W
W2XQ
WA2YEX
W2-6893 (SWL)
N3AKX
K3FN
W3HRD
K3LUE
WA3PMI/7
AC3Q
K3VY
N4AKO
WD4DVZ
KE4E
KS4G
WD4IHV
KB4JA
K4JYD
K4LQ
KA4LXZ
WA4QZX
WB4UBD
N4XC
KB5AC
KA5ACC
WD5CDR
N5CID
KA5CTZ
KO5D
K5HT
KB5OU
WB5TZO
KB5WQ
AD5X
N6AFN
WD6AQJ
WD6BNH
WB6CDM/7
WA6CUP
WD6FDN
WA6FDX
W6JGT
W6ORD
WA6PJR
WA6QDR
WA6SLO
WA6VJP
WB7AEX
N7AKQ
WB7BFK
K7CU
WDX7DER (SWL)
K7EFB
WA7GVM
NL7J
KL7JC
WA7JUJ
W7KTI
W7KVV
WB7QEP
WB7RFB
WB7ROE
WB7RUV
W7ULC
WB7VHA
WA7YBN
K7YY
K7ZR
KB8CU
K8EJN
K8IQB
WD8IXV
KD8M
WD8MOV
W8NK
WD8QEO
WD8QOM
N9AII
N9BA
N9BAF
K9BIL
W9BM
K9BQL
WD9HWY
WB9JBH
KB9JJ
WB9NOV
KB9QZ
WB9RNF
K9TI
KB9TO
WB9UIA
WB9UKS
K9UR
WB9VGJ
WB9WFZ
WA9WGJ
AE9X
NØAMI
NØBKY
KØDEQ
KBØOE
WBØOMY/6
KØSI
KBØSY
KØUKO
WØYBV

DX Stations

DA1MP
DA1MV
DF7QD
DF9ZP
DJ2UU
DJØSL
EA6DE
F6DUK
GU5CIA
HC2RG
IC8OGS
I2GXS
I8INW
I8KDB
I8KNT
I8YRK
I8XTX
IØMWI
JA1SXH
JH1XUP
JI1NOY
JR1EBL
JA4ESR
KH6JWK
KP4AE
LU1BAR/W3
OE1WPA
S83T
VE1BWP
VE3BXY
VE3JGT
VE3-9094 (SWL)
VE5ADA
VK2NHV
VK4FS
VK6YL
VP2MO
6Y5DA
9V1UK

to 48 counties; Class A requires 48 to 57 counties; Class AA requires all 58 counties to be worked.

Arizona State Award

Class C requires 5 counties; Class B requires 8 counties; Class A requires 10 counties; Class AA requires 13 counties to be worked.

Nevada State Award

Class C requires 8 to 10 counties; Class B requires 10 to 15 counties; Class A requires 15 to 17 counties to be worked.

Utah State

Class C requires 7 to 10 counties; Class B requires 18 to 24 counties; Class A requires 22 to 29 counties to be worked.

Wyoming State

Class C requires 7 to 10 counties; Class B requires 15 to 20 counties; Class A requires 20 to 23 counties to be worked.

Idaho State

Class C requires 15 to 20 counties; Class B requires 20 to 30 counties; Class A requires 30 to 43 counties; Class AA requires 44 counties to be worked.

Montana State

Class D requires 15 to 20 counties; Class C requires 20 to 30 counties; Class B requires 30 to 40 counties; Class A requires 40 to 55 counties; Class AA requires 56 counties to be worked.

Alaska State

Issued by actual counties contacted, this award may be obtained for two or more counties confirmed.

Hawaii State

Issued by actual counties contacted, this award may be obtained for two or more counties confirmed.

Rules:

1) Awards are available to licensed amateurs and SWLs (on a heard basis).
2) Do not send QSL cards. A list showing full details of the contacts, signed by your local club official or two licensed amateurs, should be submitted.
3) Certificates will be endorsed for various bands and modes as requested, providing such request accompanies application and necessary listings are made.
4) Award Fee is $3.00 worldwide.
5) Endorsements after original application are $1.00.
6) Send application to Awards Manager, Scott R. Douglas, Jr. KB7SB, PO Box 46032, Los Angeles CA 90046, USA.

CHC AWARD SERIES

Worked USA Award

Districts: Issued for contact with all US call districts 1 through Ø.

States: Issued for the total states worked.

Capitals: Issued for the total of capitals of states worked.

Prefixes: Issued for the total number of US prefixes worked.

There is no fee for these awards and they are available to licensed amateurs and SWLs worldwide. A USA SASE is required; worldwide, 3 IRCs are required along with an SAE.

Presidents Award

Issued for the total number of cities worked bearing the last names of past presidents. There is no fee. Same rules as Worked USA Award.

State Cities

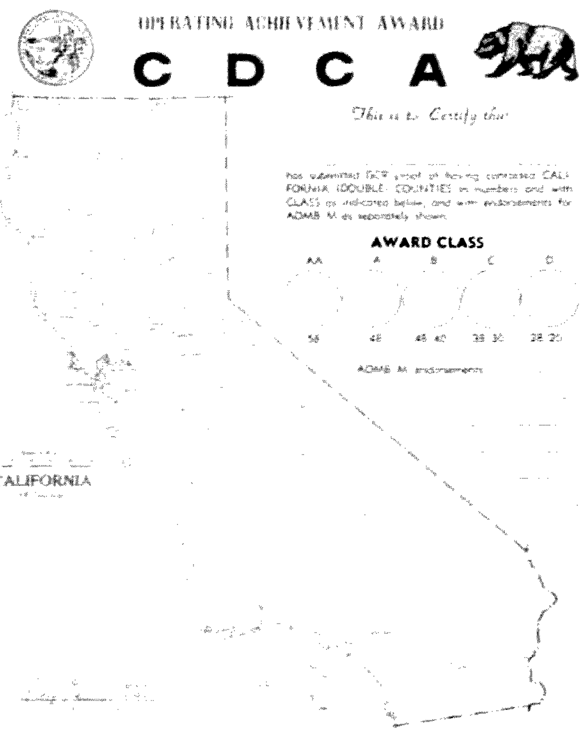
Issued for the total number of cities worked. Awards are issued by state (all 6th & 7th district callsigns). There is no fee for this award but same rules as USA Award.

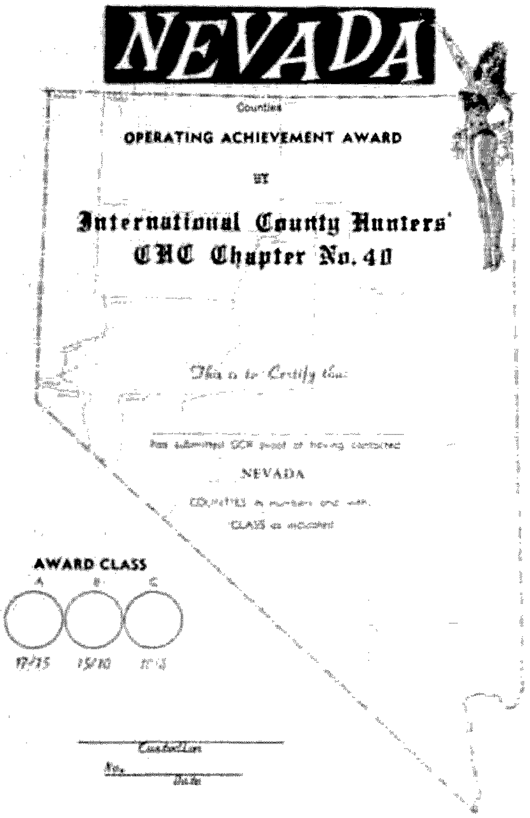
These awards are being issued for a limited time only. Should further information be desired, please contact Awards Manager, Scott R. Douglas, Jr. KB7SB, PO Box 46032, Los Angeles CA 90046, USA.

WORK THE CARIBBEAN AWARD

This basic award is issued for confirmed contact with 20 of the island countries listed below. Endorsement seals are issued

Directory of Certificate and Awards





in increments of 5 countries each. A Gold Seal plaque can be issued for 30 or more confirmations at a cost of $18.95 in US funds or 95 IRCs. SWLs may apply on a heard basis.

Send your verified application and $3.50 or 18 IRCs to the Awards Manager. Do not forward QSL cards because you may have your QSL cards and claimed contacts verified by two amateurs or a local radio club official.

Endorsements will be issued for any mode, band, or power level requested as long as the request is made at the time of initial application. Future endorsements will cost $1.00 US funds plus an SASE.

Forward your application to Scott Douglas KB7SB, PO Box 46032, Los Angeles CA 90046.

Caribbean Country Prefixes

C6, CO/CM, CO4, FG, FS, FM, HH, HI, HKØ (Bajo Nuevo), HKØ (San Andreas), HKØ (Serrana Bank), HRØ, J3/VP2G, J6/VP2L, J7/VP2L, KC4/KP1, KG4, KP4/NP4/WP4, KP4 (Desecheo Island), KP3, KP2/KV4, PJ (Netherland Antilles), PJ (St. Maarten, Saba, St. Eustatius), VP2A, VP2K, VP2E, VP2M, VP2S, VP2V, VP5, VP9, YV (Margarita Island), YVØ (Aves Island), ZF, 6Y, 8P, and 9Y.

WORK THE PACIFIC AWARD

This award should not be mistaken for the famous WAP award which has been offered for years out of New Zealand. This particular award featured this month is sponsored by the Certificate Hunters Club (CHC) and its Manager, Scott Douglas KB7SB.

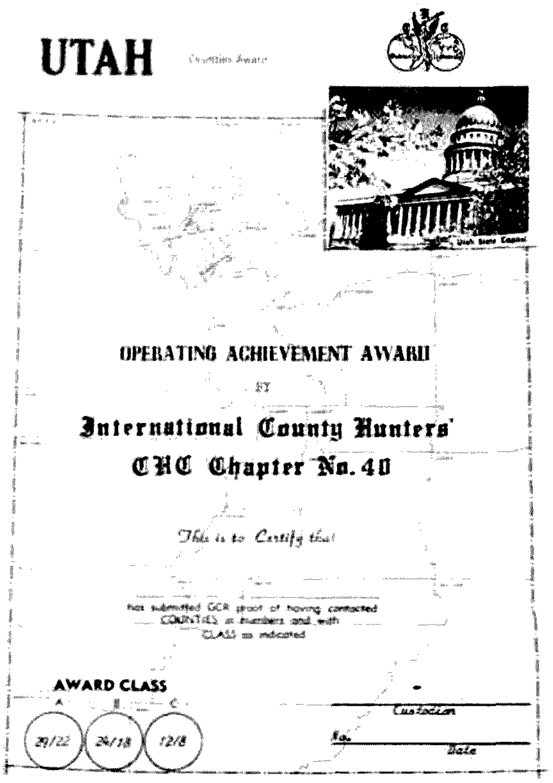
The basic Worked All Pacific Award is issued for 30 confirmed country contacts and is available to any licensed amateur operator or shortwave listener. Endorsement seals are offered in increments of 5 countries. A Gold Seal Plaque can be issued for 50 or more countries worked in the Pacific region if desired. Cost of the plaque will be $16 US dollars or 95 IRCs.

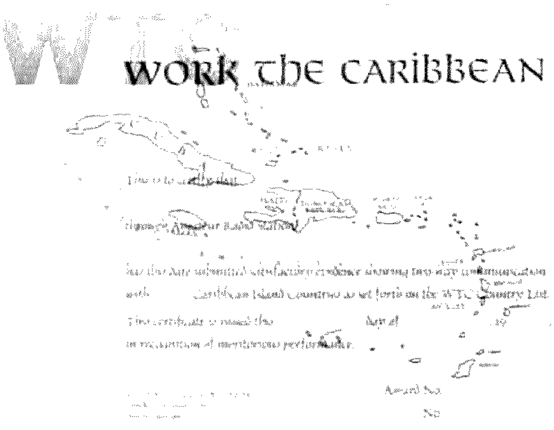
Endorsements for any band, mode, or power will be recognized if such recognition is requested at the time of application.

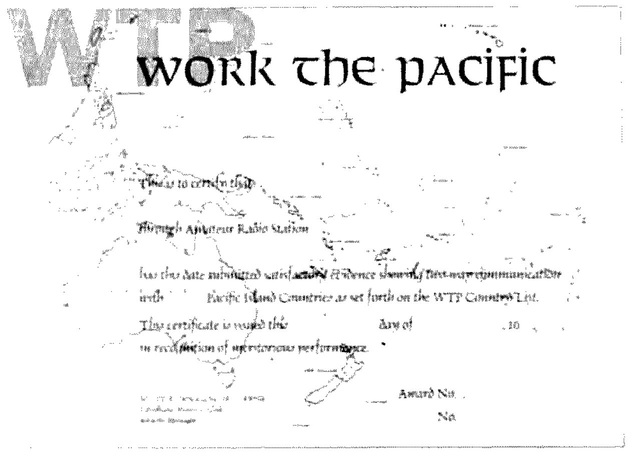
To apply, have your list of confirmed contacts verified by at least two amateurs and have it sent with $3.50 in US funds or 18 IRCs to the Awards Manager, Scott Doulgas KB7SB, PO Box 46032, Los Angeles CA 90046.

Pacific Country Prefixes

A3, BV, C2, CEØA, CEØX, CEØZ, DU, FK, FO (Clipperton), FO (French Polynesia), FW, H44/VR4, HC8, HKØ (Malpelo Island), JD1/KA1 (Minami Tori-







shima), JD1/KA1 (Ogasawara), KB1/KH1, KC6 (Eastern Caroline Islands), KC6 (Western Caroline Islands), KC6 (Valu), KH2, KH0, KH6, KH7, KH3, KH4, KH5K, KH5, KH8, P2, T2/VR8, T3/VR1 (Central, West, and East Kiribati separately), TI9, VK7, VK, VK2, VK9 (Willis), VK9 (Christmas), VK9 (Cocos Keeling), VK9 (Mellish), VK9 (Norfolk), VK0 (Heard), VK0 (Macquarie), VR6, VS5, XF4, BY/YC, YJ, ZK1 (North Cook), ZK1 (South Cook), ZK2, ZL, ZL (Auckland Island), ZL (Campbell), ZL (Chatham), ZL (Kermadec), ZM7, 3D2 and 5W, 9M2, and 9M6.

SPRUCE KNOB

The Parkersburg Amateur Radio Klub of West Virginia will be holding an in-state DXpedition from the top of Spruce Knob, West Virginia. Spruce Knob is the highest mountain point in West Virginia. Elevation is 4862' and it is located in Randolph county, for you county hunters.

The expedition will be on October 3 and 4, starting at 1500 universal time. Station call will be N8CDD. Planned frequencies are: ±3.935, 7.235, 14.335, 21.360, and 28.535; on 2 meters: 144.200, 144.190, SSB, 144.110, CW; on 6 meters: frequencies are 52.150, SSB, 52.525, FM; for CW on HF bands, 10 kHz up on all Novice bands. For special QSL, send an SASE to N8CDD, 902 23rd Street, Vienna W VA 26105.

POPULATION CENTER

The population center of the US as determined by the 1980 census will be commemorated by special event station KA0IAR from 1700 GMT October 10 until 1700 GMT October 11, by the Jefferson County ARC in DeSoto, Missouri. Approximate frequencies used will be 25 kHz up from bottom edge of the General portions of 10, 15, 20, and 40, as well as the center of the Novice portions. For a certificate, send QSL and a large SASE to KA0IAR, 3009 High Ridge Blvd., High Ridge MO 63049.

SUNBELT EXPOSITION

The Colquitt County Ham Radio Society will be operating club station WD4KOW from the site of the fourth annual Sunbelt Agricultural Exposition on October 13-15, 1981. The hours of operation will be 0900 to 1600 EDST each day.

This annual Sunbelt Expo is held each year at Spence Field Air Base, located near Moultrie, Georgia, and is the largest agricultural show in the South. This event draws over 200,000 visitors from all over the United States and foreign countries.

Operations will be mostly on 40 and 20 meters around 7.250 and 14.300 MHz, with some operations in the other HF bands. The members also will be listening for visiting hams on the local repeater, 146.19/.79. Visiting hams are invited to visit the amateur booth at the Expo and operate the station.

A special QSL card is available for those making contact during this event. Contact Joel Goings AA4P, Secretary, Colquitt County Ham Radio Society, PO Box 813, Moultrie GA 31768, for more information.

73 MAGAZINE AWARDS PROGRAM

Work The World Award

76 VP2MO	83 W6JQT	90 WB5TZO
77 HK0EHM	84 WB2TKD	91 WB7VHA
78 WA2SRM	85 W0BM	92 VK2DEJ
79 KA5CTZ	86 WD6EEQ	93 WB1BVQ
80 DF7QD	87 KB7SC	94 KF2X
81 WA2YEX	88 KA2EAO	95 OE1-109976
82 N5BBO	89 K8IQB	96 OE8MOK

North American Award

114 WD4BLU	128 WD6EEQ	142 WB2YMW
115 WB0OMY/6	129 N7AHQ	143 AK1H
116 VK4FS	130 W0OLL	144 WB1BVQ
117 DJ0SL	131 KA9HRI	145 VK2DEJ
118 VE3DIJ	132 WB7VHA	146 DA1PN
119 HK0EHM	133 WB5LBR	147 KF2X
120 VP2MO	134 KA9ERX	148 OE1-109976
121 DF7QD	135 KB7SC	149 W1SIX
122 KA3DBN	136 WA2MCE	150 KA3GGP
123 W6JQT	137 K7DBV	151 KJ0WQ
124 WB0BWY	138 K8IQB	152 OE8MOK
125 N5BBO	139 8P6OV	153 VE1BWP
126 WB2TKD	140 KA1CLV	
127 W9BM	141 WB5TZO	

South American Award

103 DF7QD	115 WB7VHA	127 KC4YY
104 VP2MO	116 WB5LBR	128 WB1BVQ
105 HK0EHM	117 KA9ERX	129 VK2DEJ
106 DJ0SL	118 N7AHQ	130 DK5WJ
107 KA3DBN	119 KB7SC	131 DA1PN
108 N5BBO	120 KB8WJ	132 KF2X
109 WB0BWY	121 VE3DIJ	133 OE1-109976
110 W6JQT	122 8P6OV	134 DJ0WQ
111 ZE2KA	123 K8IQB	135 OE8MOK
112 WB2TKD	124 AK1H	136 VE1BWP
113 W9BM	125 WB2YMW	
114 W0OLL	126 WB5TZO	

European Award

131 SV1GJ	146 KA7COI	161 WB5TZO
132 DJ0SL	147 WB5LBR	162 WB7VHA
133 VE3DIJ	148 KA8RD	163 WB6SZZ
134 HK0EHM	149 W0CJG	164 K7DBV
135 VP2MO	150 WA2SHW	165 N0ASV
136 DF7QD	151 8P6OV	166 WB1BVQ
137 KA1CFQ	152 KB7SC	167 VK2DEJ
138 XE2KA	153 WA2MCE	168 DA1PN
139 N5BBO	154 K8IQB	169 DU1EFZ
140 WB0BWY	155 KA2EAO	170 KF2X
141 W6JQT	156 W1SIX	171 OE1-109976
142 W9BM	157 KA1CLV	172 DJ0WQ
143 WB2TKD	158 KB8WJ	173 KA7GFI
144 WD6EEQ	159 AK1H	174 OE8MOK
145 WB9JBH	160 WB2YMW	175 VE1BWF

Oceanic Award

85 WA2SRM	93 WB2TKD	101 WB5TZO
86 DF7QD	94 ZL2BAO	102 WB1BVQ
87 VP2MO	95 W9BM	103 VK2DEJ
88 HK0EHM	96 WB7VHA	104 DU1EFZ
89 VK4FS	97 WA2LYF	105 KF2X
90 WA2YEX	98 KB7SC	106 OE1-109976
91 N5BBO	99 KA2EAO	107 OE8MOK
92 W6JQT	100 K8IQB	

African Award

89 DJ0SL	100 WB5LBR	111 VK2DEJ
90 HK0EHM	101 WA2LYF	112 WB1BVQ
91 VP2MO	102 W9BM	113 DA1PN
92 DF7QD	103 KB7SC	114 DU1EFZ
93 KA3DBN	104 DK5WJ	115 KF2X
94 W6JQT	105 K8IQB	116 DJ0WQ
95 N5BBO	106 KA2EAO	117 OE1-109976
96 WB0BWY	107 AK1H	118 OE8MOK
97 WB2TKD	108 WB2YMW	119 VE1BWP
98 WD6EEQ	109 WB5TZO	
99 KA9ERX	110 WBVHA	

Asian Award

84 DF7QD	93 W9BM	102 DU1EFZ
85 VP2MO	94 KB7SC	103 KF2X
86 HK0EHM	95 KA2EAO	104 OE1-109976
87 DJ0SL	96 K8IQB	105 DJ0WQ
88 KA5CTZ	97 WB5TZO	106 OE8MOK
89 W6JQT	98 WB7VHA	107 VE1BWP
90 N5BBO	99 DA1PN	108 SV1GJ
91 WB2TKD	100 WB1BVQ	
92 WD6EEQ	101 VK2DEJ	

Worked All USA

6 Meters

1 WB0ZKG	4 KA5DDE	6 K3HFV
2 K6PHE	5 WB5SND	7 N4QH
3 N4BJJ		

10 Meters

1 KL7IEN	4 JH8DSC	6 VE1BWP
2 W5ZKJ	5 VK7NBT	7 N4QH
3 VE1BVD		

15 Meters

1 WD5DRB	4 WB6CDM	6 WB9UKS
2 WA0CEL	5 KA4IFF	7 N4QH
3 KA6ACO		

20 Meters

1 WA9BBX	5 WD0EPE	9 N4QH
2 WA9WGJ	6 WB9UKS	10 KA0INF
3 K1TH	7 VK6YL	
4 KB8JF	8 N8BDI	

40 Meters

1 WA2SRM	3 WD4DBJ	5 N5AHZ
2 N8AZD	4 WD0BOS	6 N4QH

80 Meters

1 KA0AZQ	4 KS4B	7 WA0RVK
2 WD0BOS	5 WB9UKS	8 N4QH
3 KA5AOP	6 KB5FN	

160 Meters

1 KC8P

Worked All USA

All Band

42 N4CXK	46 W9BM	50 N5ACU
43 KA8GXN	47 KA7HPP	51 NL7J
44 N6BXT	48 WD6EEQ	52 KA4ITQ
45 WA4ZLZ	49 W0CJG	53 WB9UIA

73 DX Country Club

2 × *SSB*

54 W5SGT	61 KF2X	68 AK1H
55 W9BM	62 VK4FS	69 WD4DVZ
56 DF7QD	63 K9PSN	70 DA1PN
57 WB7RUV	64 K3KJZ	71 VK2DEJ
58 N7AKQ	65 K3LUE	72 VK2BQN
59 WB5LBR	66 WB1BVQ	73 VE1BWP
60 VK6YL	67 WB2YMW	74 OE8MOK

Mixed Mode

22 WB5LBR	23 WD6EEQ	24 NL7J

2 × CW

9 WB9UIA	10 WB9UIA	11 VE1BWP
12 KA2EAO		

Century Cities Award

19 W9BM	20 K7DBV	21 VK6YL
22 WB9UIA		

Q5 Award of Excellence

44 KA2GTT	50 W9BM	56 N5AUB
45 KA4JVN	51 ZL2LQ	57 WB6SZZ
46 KA4KST	52 KA2GMT	58 KA0KCM
47 VK3VEU	53 KA0FVG	59 KB9PN
48 KA1CFQ	54 KA0INE	60 KA6AHL
49 KA9CWW	55 KA0INF	

More award winners will be listed next month. Full details of the *73* Awards Program can be found in the September, 1981, issue of this magazine. Why not become part of the fastest-growing awards program around!

SOCIAL EVENTS

HOUSTON TX
OCT 2-4

The Houston ComVention 81 will be held on October 2-4, 1981, at the Astrodomain, Houston TX. Features will include an indoor flea market, a Friday night equipment auction, computer exhibits and forums, technical sessions, and DX/Contest meetings with Father Moran 9N1MM. Family activites are planned and the ladies will have a full schedule. Registration is $7.00, the banquet is $18.00, the Johnson Space Center tour is $6.00, and flea market spaces are $6.00 each. For full details, contact HHC, Inc., Box 79252, Houston TX 77024, or phone (713)-481-4586.

CLEARWATER FL
OCT 3-4

The Florida Gulf Coast Amateur Radio Council will holds its annual convention in conjunction with the ARRL South Florida Section Convention on October 3-4, 1981, at the Sheraton Sand Key, Clearwater FL. Registration is $4.00 and children under 12 years old will be admitted free. There will be a QCWA-sponsored luncheon at noon on Saturday, a poolside luau Saturday night, and a fashion show and luncheon on Sunday. Swap tables are $10.00 for the weekend, luncheon tickets are $6.00, and luau tickets are $12.00. Features will include forums, demonstrations, meetings, exhibits for the amateur as well as for XYLs, and a limited swap area. Talk-in on 146.37/.97. For further information or reservations, write FGCARC, PO Box 157, Clearwater FL 33517, or phone Jan KA4ELA at (813)-544-6734.

ROCK HILL SC
OCT 4

The York County Amateur Radio Society will hold its 30th annual hamfest on Sunday, October 4, 1981, at Joslin Park in Rock Hill SC. For additional information and pre-registration, write YCARS, PO Box 4141 CRS, Rock Hill SC 29730.

REVERE MA
OCT 4

The 19-79 Repeater Association of Chelsea MA will hold its annual flea market on Sunday, October 4, 1981, from 11:00 am to 4:00 pm (sellers will be admitted at 10:00 am) at the Beachmont VFW Post, 150 Bennington Street, Revere MA. Admission is $1.00. Sellers' tables are $6.00 in advance and $8.00 at the door, if still available. Talk-in on .19/.79 and .52. For table reservations, send a check to 19-79 Repeater Association, PO Box 171, Chelsea MA 02150.

YONKERS NY
OCT 4

The Yonkers Amateur Radio Club will hold its electronics flea market on Sunday, October 4, 9:00 am to 4:00 pm, at the parking lots of Loral Electronics on Fullerton Avenue in Yonkers, NY. Activities include prizes, an auction, and live demonstrations of computers, satellite TV, hi-fi equipment, and more. Admission is $2.00; sellers' space is $5.00 (bring your own tables). Talk-in on 146.865, 146.910, and CB channel 4. For advanced registration, contact Otto Supliski WB2SLQ, 52 Hayward Street, Yonkers NY 10704. For more info, call (914)-969-1053.

ROME GA
OCT 4

The Coosa Valley Amateur Radio Club will host the annual Rome, Georgia, Hamfest on Sunday, October 4, 1981, at the Rome Fairgrounds. Gates open at 7:00 am, with the main prize drawing at 3:00 pm. Admission is $1.00 and additional prize tickets will be available. Activities include dealer displays, boneyard and flea market, ladies' bingo, and hot, homemade barbeque and Brunswick stew. Top prizes are an Icom IC-260A 2-meter SSB/FM/CW mobile transceiver, an IC-2A 2-meter handie-talkie, and a Trionix full-range frequency counter. You do not have to be present to win the first prize. There will be hourly door-prize drawings plus prizes for the ladies and children. Talk-in on 147.30/.90. For more information, call Cathy Strickland WA4YSV at (404)-235-2311.

SCOTTSDALE AZ
OCT 9-11

The Scottsdale Amateur Radio Club will hold the 1981 Southwestern Division ARRL Regional Convention on October 9-11, 1981, in Scottsdale AZ. There will be major exhibitors and thousands of dollars in prizes. On Saturday, October 10th, a western-style steak dinner will be served and Senator Barry M. Goldwater K7UGA will be the special dinner speaker. Tours of the Senator's "shack" will be conducted also on Saturday. For more information, contact SARC Convention Committee, PO Box 3073, Scottsdale AZ 85257.

MEMPHIS TN
OCT 10-11

The Mid-South Amateur Radio Association, the Memphis VHF Club, the Raleigh ARA, and the Delta ARC will hold the Memphis Hamfest on October 10-11, 1981, in the Youth Building at the Memphis Fairgrounds, Memphis TN. Admission is $3.00 and children under 14 will be admitted free. The hours will be from 8:00 am to 4:00 pm on Saturday and 8:00 am to 2:30 pm on Sunday. Features will include a large indoor and outdoor flea market, on-site trailer hookups, ladies' activities, many forums, and (on Saturday night) a party/dance with snacks. Deadline for Friday night setups for dealers and the flea market is 9:00 pm. Talk-in on .34/.94 and .52. For advance reservations and further details, write Memphis Hamfest, 28 North Cooper, Memphis TN 38104, or phone Clayton Elam K4FZJ at (901)-274-4418 (days) or (901)-743-6714 (nights), or Howard Smith WD5DVB at (901)-372-9618.

ASHEVILLE NC
OCT 10

The Western Carolina Amateur Radio Society, Inc., will hold its 6th annual Asheville Autumnfest on Saturday, October 10,

1981, at the Asheville Civic Center, Asheville NC. Admission is $3.00 in advance and $3.50 at the door. Featured will be dealers, an ARRL booth, and a McElroy memorial CW competition. Prizes include an HF transceiver, a 2-meter transceiver, and many other prizes and door prizes. Talk-in on .31/.91, .16/.76, and .52. For more information, contact WCARS, Box 1488, Asheville NC 28802.

WAUKESHA WI
OCT 11

The KMRA Hamfest '81 will be held on Sunday, October 11, at the Waukesha Exposition Center, Hwy. FT, Waukesha WI. Tickets are $2.00 in advance; $3.00 at the gate. Talk-in on .52. For more info, or advance tickets, write KMRA Hamfest '81, 315 Morey Street, Waukesha WI 53186.

BEDFORD IN
OCT 11

The Hoosier Hills Ham Club W9QYQ will hold its annual hamfest on Sunday, October 11, 1981, at the Lawrence County 4-H fairgrounds, located just south of Bedford IN. Admission is $3.00. There will be refreshments, a free flea market, vendor displays/sales, free camping, and prizes (including a grand prize of an Azden PCS-3000 and a raffle prize of a TRS-80 Model III 4K L1 computer). Talk-in on 146.13/.73. For advance registrations and further information, contact HHHC, PO Box 891, Bedford IN 47421.

PARAMUS NJ
OCT 11

The Bergen ARA will hold a ham Swap 'n Sell on October 11, 1981, at Bergen Community College, Paramus NJ. Seller's admission is $3.00. There will be tailgating only; bring your own table. There will be thousands of spaces available. Buyers will be admitted free. For more information, contact Jim Greer KK2U, 444 Berkshire Road, Ridgewood NJ 07450, or phone (201)-445-2855.

BALTIMORE MD
OCT 11

The Columbia Amateur Radio Association will hold its 5th annual hamfest at the Howard County Fairgrounds (15 miles west of Baltimore, just off I-70 on Rt. 144, 1 mile west of Rt. 144, 1 mile west of Rt. 32) on Sunday, October 11, 1981, at 8:00 am. Admission is $3.00 and tailgating and tables are $6.00. Food and prizes will be available. Talk-in on 147.735/.135 and 146.52/.52. For table reservations and information, write Dennis Parra, 6955 Spinning Seed, Columbia MD 21045.

BIG RAPIDS MI
OCT 17

The Big Rapids Area Amateur Radio Club will hold a fox hunt on Saturday, October 17, 1981, starting at Hemlock Park in Big Rapids MI. Registration is from 8:00 am to 10:00 am. Hunt starts at 10:00 am sharp, rain or shine, on on 146.64. Families, picnics, trunk-sale horsetraders, welcome. $3.50 registration per carload. Information packets sent to advance registrants. Prizes will be awarded and food will be available. Talk-in on .52. For further information, contact Bruce L. Werner WB8TVD, Box 1073, Big Rapids MI 49307.

KALAMAZOO MI
OCT 17

The 27th annual VHF Conference will be held on Saturday, October 17, 1981, at Kohrman Hall, at Western Michigan University, Kalamazoo MI, from 8:30 am through the awards dinner at 6:30 pm. VHF topics will include Design of Low Noise GaAs FET Preamps, An Overview of Packet Networking, and five others. For more information, write Dr. Glade Wilcox W9UHF, VHF Conference Chairman, Western Michigan University, Kalamazoo MI 49008.

IRWIN PA
OCT 17

The Irwin Area Amateur Radio Association will hold its swap and shop on Saturday, October 17, 1981, at the Circleville VFD, Robbin's Station Road, in Irwin PA, just off US 30, 3 miles west of the Pennsylvania Turnpike (exit 7). There will be plenty of indoor and outdoor space available. Features include a flea market, prizes, vendors, and food. Talk-in on 146.925/.325 and .52. For more information, write

Bill Stash WA3AOQ, 421 Dailey Drive, N. Huntingdon PA 15642.

KENNER LA
OCT 17-18

The Jefferson Amateur Radio Club will hold Amacon '81 on October 17-18, 1981, at the Airport Hilton Inn, 901 Airline Highway, Kenner LA. The FCC will conduct tests for all but the Novice level at Our Lady of Perpetual Help School, 530 Minor Street, Kenner LA starting at noon on Saturday, October 17, 1981. Applicants should bring copies of their licenses to the test. Other features will include an indoor flea market, a full schedule of women's events, and FCC, ARRL, and Army and Navy MARS meetings. Talk-in on 147.69/.09. For more details, call W. D. "Bill" Bushnell, chairman, at (504)-887-5022.

GROTON CT
OCT 24

The SCRAMS and the Tri-City Amateur Radio Clubs of Groton CT will hold an auction on Saturday, October 24, 1981, from 10:00 am to 4:00 pm at St. Mary's Parish Hall, at the intersection of Rtes. 1 and 215, Groton CT. Admission is free. Talk-in on .07/.67 or .34/.94. For further information, write Anne Hibbert WB1GVL, 64 Giant's Neck Road, Niantic CT 06357, or phone (203)-739-4970.

CHATTANOOGA TN
OCT 24-25

Hamfest Chattanooga will be held on October 24-25, 1981, at Chattanooga State Technical Community College, Chattanooga TN. Admission is free. Flea market spaces are $2.00 for one day or $3.00 for both days; prize ticket donations are $1.00 each. Events will include dealer exhibits, a flea market, forums, contests, and ladies' programs. Talk-in on .19/.79 and 3980. For dealer information, write Hamfest Chattanooga, PO Box 3377, Chattanooga TN 37404, or call (404)-398-3358.

NEWARK NJ
OCT 24-25

The second annual NJ Microcomputer Show and Flea Market will be held on Saturday and Sunday, October 24-25, 1981, at the Holiday Inn North, Newark Airport, Exit 14 of the NJ Turnpike. Admission to the flea market is $5.00 for sellers and $3.00 for buyers. Admission to both the flea market and the show is $5.00. Saturday hours are 10:00 am to 5:30 pm and Sunday hours are 10:00 am to 3:00 pm. User groups will meet each day and there will be many microcomputer exhibits indoors. For additional information, contact Ken Gordon W2TGH, 3001 Route 27, Franklin Park NJ 08823, or phone (201)-297-2526.

FRAMINGHAM MA
OCT 25

The Framingham Amateur Radio Association will hold its 6th annual fall flea market on Sunday, October 25, at the Framingham police station drill shed. This is the largest indoor ham flea market in New England! Doors open at 10:00 am (sellers may begin setup at 8:00 am). Admission is $1.00; sellers' cost is $8/table (prior to October 15, $10/table after October 15). Talk-in on .75/.15 and .52 direct. There will be a consignment table (for small items), food, and bargains. For more info, contact Ron Egalka K1YHM, 3 Driscoll Drive, Framingham MA 01701; (617)-877-4520.

MARION OH
OCT 25

The Marion Amateur Radio Club will hold its 7th annual Heart of Ohio Ham Fiesta on Sunday, October 25, 1981, from 0800 to 1600 hours at the Marion County Fairgrounds Coliseum, Marion OH. Featured will be many prizes. Food and a large parking lot will be available. Tickets are $2.00 in advance or $3.00 at the door. Tables are $4.00. Talk-in on 146.52, 147.90/.30, or 223.34/224.94. For additional information, tickets, or tables, contact Paul Kilzer W8GAX, 393 Pole Lane Road, Marion OH 43302.

WHITESTONE NY
OCT 25

The Tu Boro ARC will hold a mini flea market and auction on Sunday, October 25, 1981, from 9:00 am to 4:00 pm at the Odd Fellows Hall, 149-14 14th Avenue, Whitestone NY. Admission is a $1.00 donation. Talk-in on 145.62. For table space and other information, contact either Marty WA2APT at (212)-359-6923, or Ed WB2IBQ at (212)-746-4082 after 7:00 pm.

DORCHESTER ONT CAN
OCT 25

The London Amateur Radio Club will hold its 4th annual Swap 'n Shop flea market on Sunday, October 25, 1981, from 9:00 am to 4:00 pm at Lord Dorchester Secondary School, Dorchester, Ontario. Admission is $2.00 per person with children under 12 admitted free. Tables are $1.00 per table (plus admission) and must be reserved and paid for in advance. Talk-in on 147.78/.18 or 146.52. For additional information, write to Dick Reiber VE3IBV, 417 Regal Drive, London, Ontario N5Y 1J8, Canada.

LEAKY LINES

Dave Mann K2AGZ
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I have frequently been savaged as a result of my implacable refusal to go along with the fashionable new attitude of detente that has developed between hams and CB operators. Largely inspired by persons who hold both tickets, and aided and abetted by certain business interests in both electronics manufacturing and in the magazine publishing field, this phony and hypocritical fraternalism poses naught but disadvantage for us. We have little to gain, but a great deal to lose.

Why the unnatural alliance? Who needs it?

Don't get me wrong. Our ranks have been strengthened by many who were first exposed to communications as CBers. They worked hard to achieve their qualifications and deserve all the credit in the world, for they had much to overcome. In point of fact, many of these converts to amateur radio came in as a result of their disgust with CB and their realization that nothing could ever change it and make it a viable service; it had been allowed to retrogress for such a long period that it was too far gone. Despite all the best efforts of the few constructive elements within CB ranks, they have *never* been able to "clean up their act." CB remains, almost 25 years after its inception, an undisciplined, rowdy service, incapable of self-policing. And the licensing authority, the FCC, is apparently unwilling and unable to do anything about the mess.

Typical of what's been going on is an incident reported in the press on the 23rd of June. Three fishermen whose boat capsized in rough seas off Fire Island, N.Y., may have lost their lives because chit-chatting CBers weekending there refused to relinquish an emergency channel. A Coast Guard search for the missing men was abandoned after 21 hours. The proprietor of the marina where the ill-fated *Water Rat* had been berthed said, "It was outrageous! They begged the people to get off the channel, but the idiots went right on talking." A Coast Guard officer said that the problem of people chatting on reserved channels occurs all the time on Citizens Band.

This points up the obvious: If it weren't for the long-term failure of the FCC to insist not only upon mere possession of the applicable regulations, but also upon familiarity with their provisions, there would be greater compliance. How can users be expected to follow rules that they are not required to be conversant with? And how can there be any assurance that they know the rules unless they are required to take an examination which tests their knowledge?

At the very least, the license grant should have been contingent upon a grasp of the radio regulations applicable to the particular service.

But since the FCC has not seen fit to impose such obligations as a prerequisite to licensing, then we, as a conscientious group faced with the necessity of preserving the traditional character of amateur radio as a self-policing service, must oppose all measures which would water down "entrance requirements" and make the acquisition of a ham radio license easy.

I happen to believe that those who are in the forefront of all movements toward detente between the two services have but one purpose in mind: to establish easy ways for unqualified persons to acquire the ham license—code-free licenses, etc. And among the more insidious methods of accomplishing such a sinister goal is the constant effort to legitimize CB in the public mind so that the vast majority of the people will no longer regard the two services as distinct and apart. And I do not believe that there is any doubt that this tactic has succeeded, at least partially.

We had a cookout here recently, and one of our friends brought a lady along. During the course of the afternoon, she glanced at my antenna installation and said to me, "My, you must be a ham operator. My son is also a ham . . . his numbers are . . ." And she rattled off one of those Citizens Band callsigns. When I explained that there is a marked difference, her reaction made it abundantly clear that she hadn't any idea that her youngster was not an amateur operator; this was the first she'd heard of it.

I've just learned that Kayla Hale W1EMV/TI5 passed on recently. A former editor of this magazine, Kayla was a very dear friend of long standing and was directly responsible for my association with *73*. A constant member of the 3999 gang, she was highly respected and will be greatly missed by all who knew her.

Mentioning Kayla reminds me that just a few months ago she wrote a letter that was published in the correspondence section in which she complained about deliberate interference during her attempt to resolve a medical emergency. Her husband suddenly took ill, and her efforts to get a phone patch were marred by intentional QRM. I cite this in order to acknowledge that in ham radio we also have our problems and are not free from our own incorrigibles. But I think it is fair to say that such idiots are in the negligible minority and are roundly condemned by the vast majority.

The DX fraternity is divided into two distinct groupings—those who have succeeded in working XZ5A, and those who haven't made contact. Of course there is that little coterie of fortunate persons who are already credited with Burma, and among them there are those who worked Don Miller W9WNV some sixteen years or so ago.

There is great discussion going on concerning the legitimacy of the present operation. Documentation was not issued by the Rangoon government, apparently, but by the State of Kawthoolei. Speculation is running rife and there is great uncertainty about whether the DXCC office in Newington will accept the operation as valid. Those who are holding the QSL are advancing all sorts of arguments in favor of okaying the operation, while those who haven't worked the station tend to express doubts about it. Since I happen to be one of the former, I hope that Newington will accept it as valid.

The problem is that Rangoon seems immovable in its unwillingness to permit amateur activity now and for the foreseeable future. Because of this intransigence, it is impossible to anticipate that there will ever be any operation which might have official sanction of the Burmese central government. Apparently an insurgent group is in control of the State of Kawthoolei, where the present operation is based, and if documents issued by such a provincial government are not going to be deemed valid by the League, there is no chance that anyone who still needs Burma will be able to make it.

But what of the last operation from Burma? Did Don Miller submit documentation? And was such documentation scrutinized carefully in oder to establish validity beyond any question? These are questions that are being asked and deserve answers. Because of repeated irregularities in his various DXpeditions, Miller's operations, though accepted at the time, are now widely suspect. My point is simply that unless Don Miller's Burma operation was properly documented, it is grossly hypocritical for the League to void the legitimacy of the present XZ5A/XZ9A operation. How can DXCC refuse to accept Kawthoolei licensing while it accepts the validity of an operation in which the documentation is widely regarded as spurious?

I think that at the very least, the League should examine the records in order to establish beyond question that the documentation offered by Miller was in order and not fraudulent. I think that the League owes this to the thousands of amateurs all over the world who have exerted their efforts to work the present operation in good faith. Cavalier dismissal on a technical point is acceptable only if the technicality is applied across the board

and with equal weight. Any other course is inequitable and fosters some of us an unfair advantage at the expense of the rest. An advantage, I might add, that can never be overcome as long as the present Rangoon government maintains its adamant opposition toward any and all amateur radio activity. That, I submit, is the intention of the Burmese authorities, and for this reason an examination of the continued inclusion of Burma on the DXCC countries list now becomes appropriate, in my view.

I would also express the view that if it is found that the Rangoon government is not now in a position of administrative control of the State of Kawthoolei, and if it can be shown that all civil, military, political, and economic administrative rule is in the hands of a provincial government, then the ARRL should accept radio licensing documentation issued by Kawthoolei as valid and legitimate.

After all, at the time of the writing of our own Declaration of Independence, our colonies had not yet won their freedom from Britain, yet that document's legitimacy and validity has never been regarded questionable; indeed, it represents a milestone in the fight for human freedom and dignity. We have recognized and continue currently to recognize the validity of insurgent governments which succeed in overthrowing despotic, tyrannical regimes throughout the world. Why should Kawthoolei be an exception? Or, more important still, is it the function of DXCC to grant or withhold recognition when there is a *de facto* government in actual power and control? These are not questions which should be decided arbitrarily by a single individual or group acting on the basis of private initiative.

The major problem is that it is the central government in Rangoon which is the main culprit. It is in Rangoon that the small oligarchy wields the oppressive power which denies our Burmese colleagues the right to operate their stations. In the very act of recognizing the validity of the Kawthoolei documentation, we can demonstrate a strong endorsement of our national commitment to human rights, and at the same time we can reinforce our solidarity with our ham colleagues all over the globe. If we deny the validity of the Kawthoolei operation, we serve notice to restrictive governments that they can limit or outlaw amateur radio without running the risk of the slightest objection.

DX

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DX CONTESTS

In the months of October and November we have the major contest, what we can call the Olympics of amateur radio: the CQ WW DX Contest. It is unquestionably the biggest and best attended contest of them all. The contesters know what to do; they are trying to get the most contacts with the maximum possible number of countries and zones as possible. The DXers usually show up and tune the bands to find the juicy ones or those that they are still missing on their "most-wanted" lists, because there is an opportunity to work something like 150 countries on the weekend.

A number of Contestpeditions show up from the rare spots. For them, this is a clear advantage, because they have a chance to operate from a good geographical location with good propagation, usually around the equator, and possibly from a country that is relatively rare. The more rare the country, the better the chance to get more people to call them and make more contacts.

To illustrate some of the rates achieved in the contest, the VP2KC operator had runs of about 340 QSOs an hour working JAs. Some stations work around 150 countries on the higher bands. So, wouldn't it be easier to work that BY or ZA under circumstances like that?

Where do the lists stand? Down in the mud. So, all in all, it is a great opportunity to improve your operating skills and also watch those big guns to see how they operate. Also, when you have a big gun locally, you can compare what he is hearing and what you are. Maybe you will discover that that antenna can be better (and bigger) than it is.

It is becoming more common to have some "spectators," that is, operators tuning around the contest turmoil and observing the propagation, signals, techniques, etc. One thing that they also do is give a call to a contester or DXer and help him with a point or two. It is a nice gesture, especially to those who are sitting in the not-so-rare countries such as W or VE. Maybe he was the one who gave you that Spratley or Market Reef contact. So, say thank you.

The multi-multi stations are like beacons on the band. They even call when the bands are seemingly dead, because they are stuck on that band anyway. Some interesting things can be observed.

So, all in all, it is a great opportunity to get that rare one, especially for those who are starting up and need to get there quickly. Watch out for the QSL routes—most of the operations have a QSL manager.

QSLING

What is a QSL card? It is a confirmation of an established contact and it is proof and a record of that event (or, better to say, it is supposed to be). There are always the good and bad, and we have that in our hobby, too. Some DXers figured why bother working the guy if they can maybe get that card anyway, or they would do anything to get the card so they can add it to their total and eventually show up on the Honor Roll. Makes one wonder what honor is if the only desire and drive behind all of this is to get a card, even if the game must be played dirty.

There is a bit of that going on. This was the reason why some DXers were disgusted and tried to get something done about it. Apparently, the ARRL wouldn't do much about it so *they* decided to do something. What they did? QSL scam! Remember Abscam? Similar thing. They went ahead and printed copies of many rare QSL cards and made them available to those who wanted them. You would think that those who wanted to get on the Honor Roll would not go for it? Well, some did. It is best described in the letter by Dave Gardner K6LPL, well-known DXer and DXpeditioner. This letter was sent to *The DX Bulletin*, which broke the news on the whole affair. Here it is:

Approximately one year ago, a group of fourteen amateur radio operators both in the western United States and in Europe involving six countries got together and were discussing the sorry state into which DXing has fallen. It seemed to the group that the original purpose of DXing, the spreading of international goodwill and fellowship, etc., had degenerated into a new form of the hobby which we called "QSLing." At that time, our group, which includes ten members of the Honor Roll, attempted to figure out a way to make an impact on amateur radio, the ARRL, and DXing in general.

Our group has never been anti-League or anti-DXCC. What we are against is QSLing at any price, lack of concern for others, and the virtual disintegration of the generally good-natured camaraderie and willingness to help others that had characterized DXing in the past. The characteristics of DXing have become greed, avarice, and unconcern for others in search of the almighty QSL. Witness the plight of the poor, rare DX operator who gets on the air, and is totally smothered by stations in quest of the almighty QSL. This forces stations to resort to lists so that the poor guy can make a contact. This phenomenon has spread

throughout the world and is not just an American problem, as witnessed by the problems that the most polite of amateurs, the Japanese, had in the demonstration two years ago in China.

It was unbelievable to us how many "straight" amateurs accepted blank QSL cards and submitted them to the League. This is only the tip of the iceberg, as it is a well-known fact that working stations for friends while they are out of town or unable to work rare DX, and even phone-patching those stations through has become a commonplace, everyday habit.

No QSLs were sent out by our group for contacts during this sunspot cycle. Many members of our group have gone on numerous DXpeditions and it was decided that all of our respective QSL managers would be kept completely in the dark about this so as not to endanger their fine reputations. As far as we are concerned, this "operation" is over as we feel we have made our point. No further distribution of cards will be coming from our group. We estimate that between twenty and twenty-five thousand *[emphasis added] QSL cards have been sent and accepted by amateurs throughout the world in every continent except Antarctica.*

We must stop this insane QSL chasing and go back to DXing for the sake of DXing and not just for the sake of a QSL card.
David G. Gardner, M.D. K6LPL

As a result of this, a number of DXers were already disqualified. I think it would be only fair in order to preserve the credibility of the DXCC and the Honor Roll to ask those who are on it or fall in the time frame of the QSL scam to submit their cards for verification. It may be a lot of work, but perhaps there might be some volunteers that can help.

Another questionable way of obtaining QSLs is the operation list. Quite often, the two stations do not hear each other and the report and callsigns get passed by a "third party," the net control. This is definitely not the way to do it and you should stay away from it as much as you can. Don't forget: The whole world is listening and they hear you. What would they think about you? Stay clean! Back in the old country, they used to say that honor is worth more than anything else.

HOW TO QSL?

Generally, I would say QSL to those that you really need. There are some types that QSL anything that moves. For example, you work him in the contest three times on the same band, and you get three QSL cards. You probably already have about ten of them in your collection. This is just an unnecessary burden for the post office, your QSL bureau, your friend, and your pocket, too.

The best thing to do is to keep some kind of records. This is usually done when you are brand new and eager to get a QSL card for each contact you made. I used to have a very nice tracking system, with a book, divided by countries. I used different colors for different bands and modes and then an overall table showing which country was worked, confirmed, and on what band and mode. So, you always know where you stand. Then I gave up after over 40,000 contacts were made; it is just impossible to do that and have the time to operate. The contest logs are nuisance enough.

It is also advisable to keep a record of cards sent out directly and to which QSL manager, so you can try again if for some reason you don't get a reply. As they say: The QSL is the final courtesy of the QSO. It is polite to answer all the requests for your cards. There is no legal right to obtain a card; you can't sue anyone because he did not send you one. You can feel miserable about him, and perhaps "won't hear" him when you fire up from China, but that is about it.

I have experienced a number of threatening letters with exclamation marks just because a guy did not get his card within 24 hours. Well, sometimes there might be reasons for a delay: Cards are not printed, logs are not in the hands of the QSL manager, the boat is going there only once a year, etc.

The contesters are sometimes in a special situation. Usually, the typical multi-multi station can easily make 10,000 contacts on a weekend and this happens about 4 to 6 times a year. It is difficult to QSL everyone contacted. Gentlemen will at least answer all requests. It might take a little longer, but they usually do. This is where those younger and eager hams can perhaps offer to help a contester by volunteering his QSL services. It will give them a chance to get involved in a super-station, learn something, and be of help to many others.

Generally we can divide the QSL types into three groups: regular, rare, and special.

Regulars would be the ones that are around a lot and if you did not get this one to reply, there is always another one. Those we usually QSL via the bureau. Don't waste your money on postage. Put them in a bundle, nicely sorted in alphabetical order by countries and prefixes, and send them to your QSL bureau. Then wait (and wait), especially if it is Box 88, Moscow. Things are slow there. Find out what your local bureau situation is. The ARRL now is running the QSL bureau for outgoing cards. See *QST* for details. Incoming cards are going through the ARRL and local call area volunteers.

It is necessary to have a sufficient number of SASEs with them. Otherwise, cards will be destroyed after a certain period of time. Most of the other countries have their QSL bureaus run by their national amateur radio organizations and they handle all incoming and outgoing cards. Caution: Some hams are not members of the organizations and the bureau is not handling cards for them—cards usually get returned.

It is safe to say that for all the eastern European countries, the bureau is the safe and sure way of getting the cards. When there is a big bundle of cards to be sent out to, let's say, Japan, you will probably be better off to send directly to Japan rather than through your bureau. The cost difference will be small and they can go via slow boat rather than airmail.

Rare ones are those who are rare: There is maybe only one ham in the country, the activity is very sporadic, or the mail service occurs only once a year (like ZD7 or VE with all the postal strikes, hi). Then it is worth it to find out what the best QSL route is. Many times the rare ones have a QSL manager, and if it is a good one, it is easy to get the card. You send the card directly to him. Just remember, he is probably handling over 50,000 cards a year (W3HNK), so make the job easy for him. Make sure that you include an SASE, with the correct postage affixed.

Remember, Canada is not a part of the US and, therefore, it has its own stamps; don't put US stamps on the envelope. If you are desperate, maybe include unglued stamps. They can be used by the manager for his SASEs. But the best thing to do is always to use the stamps of the country that the manager is in, and the correct amount. If you don't have them or cannot obtain them (some philatelic stores have unused stamps of almost all countries in the world), then use IRC coupons. Those are the coupons that you can obtain at your local post office. So, it is a good idea to drop a note to him and ask how many and how much.

One IRC is usually worth the postage of one unit of postal weight in the country at regular, surface mail. Air mail is more and the *Callbook* lists some of the rates to various countries. Usually, three IRCs are sufficient for airmail from most of the countries.

Some countries (most of east Europeans) have 100% censorship at their post offices, so be careful what you are writing so you do not put a ham in jail. Remember, not all countries have the freedom that we in the West enjoy. Some of them prohibit foreign currency and it simply gets removed and put in the State fund. Box 88 apparently even removes the IRCs. Some countries are looking for callsigns on the envelopes and that tells them that there is meat in the envelope—they take it. Or, sometimes there is an unscrupulous postmaster who does that. So, generally, even if you are proud of your callsign, it is better not to put it on envelopes, especially those going to the East or to Africa. This is why the QSL managers are doing their thankless job and serving DXers.

Always make sure that all the information on the QSL card is correct and spend some time doing that. A manager might have lots of work to do with your sloppy card if you did not put your time, date, or band correctly on the card. Remember, he might have 340 QSOs for *one hour* in his log and he has,

perhaps, *5000 QSOs on one band* from that contest station. Double-check your info, and don't make him search through 10,000 QSOs for that *one* you made. Make sure that your date and time are always in GMT (or UTC, as they call it now). Your QSL card is like your picture, so try to look nice.

Special ones would be all those who are either extremely rare or very difficult to get cards from; it is advisable to find out the QSL info right away. This happens when an amateur is assigned to work there or is passing by the country and is active for a very short period of time. A number of DXpeditions fall here, too. You must QSL as soon as possible, before the logs get lost, the QSL manager gives up, etc. Excellent help is provided in the various bulletins and QSL manager lists. To mention two, there is the very sizable W6GO/K6HHD list (Box 700, Rio Linda CA 95673) and the *QSL Report* by QSL Management Association, c/o JH1HWN. Those have the latest, up-to-date information in them, usually taken from the DX bulletins and nicely sorted out and summarized. There is, of course, the *Callbook*, which lists all the hams in the world, and it is almost a must for those who are just starting their QSLing.

I hope that this will shed some light on the art of QSLing. It is always advisable to consult your local big gun if you are not sure. Good luck and may your returns be 100%.

DX NEWS

XZ Burma is getting better and better. Apparently, the station was improved by the installation of a beam and amplifier and operators are starting to work on their own, without the lists. QSL via JA8BMK for XZ5A and XZ9A.

HH0N Navassa operation by a number of operators from Haiti. Operators are trying to do their best and, apparently, Haiti is claiming the island. If Navassa is part of Haiti, then most likely it will lose its separate country status. QSL via WD4JNS.

YO0WUG and other calls with the YO0 prefix are being used to commemorate the world University Games, or Universiade as it is also known.

9Q5VT Zaire is quite active by Len and also shortly by W5VR. QSL via W5VR.

KH6IJ is recovering nicely from his stroke. Worked him recently on CW and he still has a problem with coordination, but it is great to hear that famous call on the air again. One of world's best operators ever. Speedy recovery, Katashi.

Africa. A number of expeditions are wandering around; watch out for the announcements. Most of them are very sporadic, waiting for the licenses.

A7XE operating around 21025, QSL via DF4NW.

AX Australia. Special prefix was used for Prince Charles' wedding commemoration. AX9NL was quite active. QSL cards to their respective VK callsigns.

HAM HELP

I need any info on a Packard Bell oscilloscope, model 5mc CP— schematic, manual, etc. I will pay copying and postage or will copy and return original. Thanks.

Harl Goodsell W7LTH
70 S. 2nd East
Hyrum UT 84319

I need a March, 1975, issue of *73 Magazine*. I also need help in obtaining a Hewlett-Packard HP-46 with the optional LED display and a Fisher HC-10 stereo reverberator.

Ham Help is my last resort in attempting to find these items.

Please send information you may have toward my obtaining these items.

George E. Weinbender
PO Box 747
Lake Havasu City AZ 86403

I would like to correspond with anyone who has converted the ARC-21 or ARC-65 surplus rigs. I have the ARC-65 tech manual and an extra control head.

Mark Meltzer
335 Prentiss St.
San Francisco CA 94110

See List of Advertisers on page 130

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

CALIFORNIA QSO PARTY

Starts: 1800 GMT October 3
Ends: 2359 GMT October 4

This event is sponsored by the Northern California Contest Club, with strong efforts being made to have all 58 counties in California on for the contest duration.

Single-operator stations may operate only 24 hours of the contest period; off-times must be clearly marked in the log. Multi-operator stations may operate the full 30 hours. Stations may be worked only once per mode per band. All contacts must be simplex. All CW contacts must be made in the CW subband. California stations that change counties are considered to be new stations and may be contacted again for points credit.

EXCHANGE:

California stations send QSO number and county. Others send QSO number and state, province, or ARRL country.

FREQUENCIES:

Novice—3725, 7125, 21125, 28125.
CW—1805, 3560, 7060, 14060, 21060, 28060.
SSB—1815, 3895, 7230, 14280, 21355, 28560.
Try CW on the half hour and 16 meters at 0500.

SCORING:

Each completed phone contact is worth 2 QSO points. Each completed CW contact is worth 3 QSO points. For multiplier, California stations use the number of states, VO/VE 1-7, and VY1/VE8, for a possible of 58. Others use the number of California counties worked for a possible total of 58. The final score is the number of QSO points multiplied by the total number of multipliers.

AWARDS:

Certificates for highest-scoring station in each California county, each state/province, and each country. Trophies to the highest-scoring out-of-state single-op, highest-scoring California single-op, and highest-scoring DXpedition to a California county.

ENTRIES:

All logs and summary sheets must be sent by November 1st to: NCCC, c/o Dennis Egan N6QW, 811 Byerley Avenue, San Jose CA 95125. Please include an SASE with your entry.

NINE-LAND QSO PARTY

Starts: 1800 GMT October 10
Ends: 2359 GMT October 11

A maximum of 24 hours of the 30-hour period may be worked. The same station may be worked once per band and mode. If any stations change counties, they may be worked again.

EXCHANGE:

Nine-land stations send RS(T), county, and state. Others send RS(T) and state, province, or ARRL country.

FREQUENCIES:

Novice—3725, 7125, 21125, 28125.
SSB—1815, 3895, 7230, 14280, 21355, 28600, plus VHF.
CW—1805, 3560, 7060, 14060, 21060, 28060, plus VHF.

SCORING:

Each QSO is worth 2 points. Nine-land stations compute final score as: total QSO points times the total number of states, provinces, ARRL countries, and nine-land counties. Others multiply QSO points by total number of nine-land counties.

AWARDS:

Certificate to top score in each state, province, and ARRL country; 2nd and 3rd places if justified. Also, awards for top mobile, portable, multi-single, multi-multi, club, and Novice.

ENTRIES:

Submit summary sheet and log. Each new multiplier shall be clearly indicated. Send logs and a large SASE to III Wind Contesters, c/o John W. Sikora WB9IWN, 8747 Northcote, Munster IN 46321.

JAMBOREE ON-THE-AIR

Starts: 0001 GMT October 17
Ends: 2400 GMT October 18

It's Jamboree time again! Time for Scouts, former Scouts, and anyone interested to meet on-the-air for a weekend of good Scout talk. It gives amateurs and Scouts worldwide a chance to listen to or talk with other scouts and in some cases where

RESULTS

BRITISH AMATEUR RADIO TELEPRINTER GROUP
1981 SPRING CONTEST RESULTS
Single Operator

Callsign	Points	Total QSOs	Countries
W3EKT	598000	364	37
I5FZI	577720	296	46
EA8RU	537544	346	36
W3FV	466334	271	39
K7BV	445760	281	37
G3HJC	436028	247	34
WB3CCZ	380820	232	37
W4CQI	377936	249	35
GM3ZXL	377140	226	38
SM6ASD	373430	233	32

Multiple-Operator

Callsign	Points	Total QSOs	Countries
LZ1KDP	489464	296	39
LZ2KRR	465052	277	37
HA5KBM	403300	254	35
I5NUT	328388	197	38
HG6V	273734	216	33
OK1KPU	133952	120	28
OK3RJB	110770	130	30
SP1PBW	51192	103	19
HA6KVD	34074	47	16
SK6DG	18942	31	12

Shortwave Listener

Name/Call	Points	QSOs	Countries Heard
OK1 11857 (Czech)	350200	224	43
H.Ballenberger (DL)	284068	195	37
OK3 27010 (Czech)	249916	224	34
Y2-5724/C (DM)	173128	137	33
K. Wustner (DL)	165240	139	28
Y2-6992/F (DM)	145542	145	26
A. Schneifer (DL)	65800	68	27
Y2-8861/O (DM)	60080	51	28
Werner Ludwig (DL)	14460	19	5

RESULTS

160-METER
PHONE CONTEST
CLAIMED SCORES
Top Six, 1981

Single Operator:

Callsign	*State*	*Score*
W8LRL	WV	383,625
K0RF	CO	333,660
WB0CMM	CO	256,880
W9RE	IN	224,960
W3YOZ	MD	217,500

Multi-Operators:

W4CN	KY	198,645
WA9EYY	IL	193,475
WD0BNC	KS	176,985
WD0BRD	NE	169,750
W9ZX	IL	170,725
KA9F	IL	97,500

Final results to be published in November or December 73.

equipment is available for slow-scan television, to see them, also. By the way, this also includes Girl Scouts, Guides, and all Scout leaders.

Hams invite Scout groups to their shacks for the occasion, or Scouts seek out hams. Amateur radio clubs have lists of their members, and a list of such clubs is available from the ARRL, Attn: Sally O'Dell, Director Youth Activities, 225 Main Street, Newington CT 06111. Send an SASE with your request. Hams may contact local Scout offices for names of Scout leaders in their neighborhoods. Look for stations operating at camporees and other Scout events, K2BSA, the national headquarters amateur radio club station, and HB9S, the world Scout Bureau station.

Most operations will occur during the period of 0001 GMT Saturday to 2400 GMT Sunday, but since this is not a contest, operations may start Friday and go into Monday. There is no required contact format, no specific exchange, just Scouting fun. All operations must, however, adhere to FCC rules and regulations.

FREQUENCIES:

Scout frequencies published by the World Bureau are as follows:

Phone—3740, 7090, 7230, 14290, 21360, 28990.

CW—3590, 3750, 7030, 7130, 14070, 21140, 28190.

SSTV and RTTY on usual frequencies.

Since the 3740 and 7090 phone frequencies are outside the USA phone bands, overseas stations using those frequencies may listen inside adjacent USA phone bands or respond to CW calls.

Postcard-size certificates designed by an Australian Scouter and issued by the World Bureau are available from JOTA Coordinator Harry Harchar W2GND, 216 Maxwell Avenue, Hightstown NJ 08520, for anyone participating. Send an SASE with sufficient postage for their return, one ounce per eight cards. They may be requested before the JOTA weekend for distribution then, or for award at Scout Courts of Honor or other meetings.

Logs or lists of participants are not required, but reports of activity and photos are welcome for inclusion in the BSA report to the World Bureau and possible use in Scout publications. Send them to the JOTA Coordinator mentioned above.

CALENDAR

Oct 3-4	**California QSO Party**
Oct 10-11	**Nine-land QSO Party**
Oct 17-18	**Minnesota QSO Party**
Oct 17-18	**Scout Jamboree On-the-Air**
Oct 17-18	**Pennsylvania QSO Party**
Oct 17-18	**QRP ARC International CW QSO Party**
Oct 24-25	**CQ World Wide DX Contest—Phone**
Nov 7-8	**Antigua and Barbuda Independence QSL Party**
Nov 7-8	**IPA Contest**
Nov 8	**DARC Corona—1-meter RTTY**
Nov 8	**OK DX Contest**
Nov 14-15	**European DX Contest—RTTY**
Nov 28-29	**CQ World Wide DX Contest—CW**
Dec 28-31	**Q-QRP-Club Winter Sports**
Jan 9	**73's 40-Meter Phone Contest**
Jan 10	**73's 80-Meter Phone Contest**
Jan 16-17	**73's International 16-Meter Phone Contest**
Jan 16-17	**International SSTV Contest**

RESULTS

10TH ANNUAL COUNTY HUNTERS SSB CONTEST

Plaques to be awarded to the highest-scoring fixed US or Conadian station, DX station and mobile station, and second highest-scoring mobile station. Certificates to the top 10 fixed and mobile stations in the US and Canada and to the highest-scoring station in each DX country.

Fixed Station

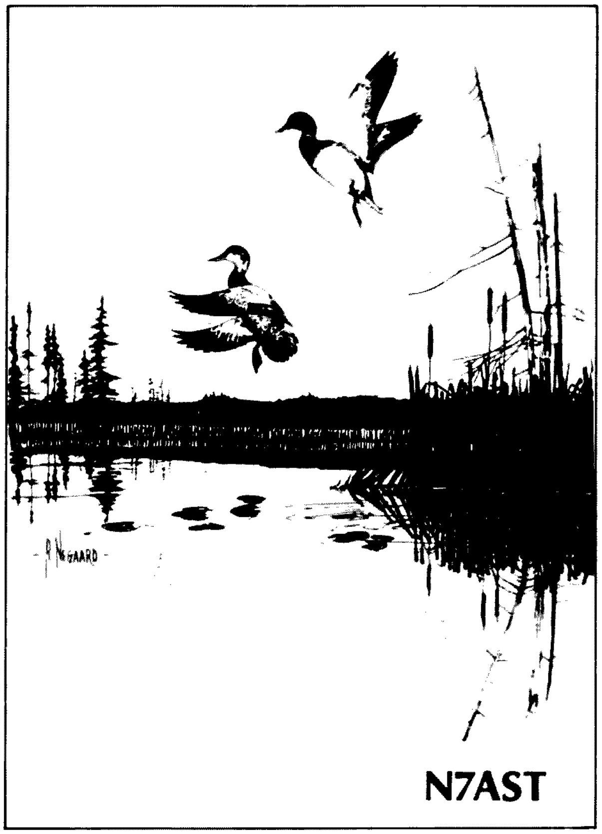
N7TT	5,680,752
AG9S	3,204,720
WB3CFD	1,481,063
VE1RQ	1,292,988
W1CHA	638,768
W9CA/4	414,630
W3ARK	275,850
K9GDF	165,750
WB6GMM	137,000
WB3IET	46,464

Mobile Station

N4UF	1,049,489
WA5DTK	1,034,150
WBØCQO	131,500
WØQWS	127,655 (check log)
W1EXZ	67,130
AC8Y	49,410
K3LHD	23,655
KSØAQS	14,300
W2PDM	6,720

DX Station

WB5KEA/KP4	2,801,568	SMØCHA	111,650
I2PHN	514,400	CT1TZ	81,900
SM5CAK	241,380	CT1UA	78,240
CT7SL	173,679	G4HBI	53,060
GW3CDH	140,400	SM4DHF	36,938



QSL OF THE MONTH

This month's winner was submitted by Andy Schaefer N7AST of Hackensack MN and Mesa AZ.

If you would like to enter the contest, put your QSL *in an envelope* and mail it along with your choice of a book from *73*'s Radio Bookshop to *73 Magazine*, Pine Street, Peterborough NH 03458. Attention: QSL of the Month. Entries which do not use an envelope (the Postal Service does occasionally damage cards) and do not specify book choice will not be considered. Sorry.

QRP ARCI CW QSO PARTY

Starts: 1200 GMT October 17
Ends: 2400 GMT October 18

The contest is open to all amateurs and all are eligible for the awards. Stations may be worked once per band for QSO and multiplier credits. Participants must be off the air at least 12 hours in not less than 6-hour periods.

EXCHANGE:

Members—RST, state-province-country, and QRP number. Nonmembers—RST, state-province-country, and power output. Novices and Technicians add /N or /T after the QRP number or power.

SCORING:

Each member QSO counts 5 points regardless of location. Nonmembers' QSOs are 2 points with US and Canadian stations; others are 4 points each. Nonmember Novice and Technician contacts count 3 points. Multipliers are as follows: 4-5 Watts—×2; 3-4 Watts—×4; 2-3 Watts—×6; 1-2 Watts—×8; less than 1 Watt—×10. Stations are eligible for the following bonus multipliers: if 100% natural power (solar, wind, etc.) with no storage, ×2; if 100% battery power, ×1.5. Final score is total QSO points times total number of states-province-countries per band times the power multiplier and times the bonus multiplier (if any).

FREQUENCIES:

1810, 3560, 7040, 14060, 21060, 28060, 50360.
Novice/Tech—3710, 7110, 21110, 28110.
All frequencies plus/minus to clear QRM.
Note: VHF/UHF contacts must be direct—no repeater contacts are allowed.

AWARDS:

Certificates to the highest scoring station in each state, province, or country with 2 or more entries. One certificate to highest-scoring Novice/Technician overall.

LOGS AND ENTRIES:

Send full log data, including full name, address, and bands used, plus work sheet showing details and time(s) off the air. No log copies will be returned. Please indicate if you are a Novice or Technician. All entries desiring results and scores please enclose a business-size envelope with return postage. It is a condition of entry that the decision of the QRP ARCI Contest Chairman is final in case of dispute. Logs must be received by November 20th to qualify. Send all logs and data to: QRP ARCI Contest Chairman William W. Dickerson WA2JOC, 352 Crampton Drive, Monroe MI 48161.

PENNSYVANIA QSO PARTY

1700 GMT October 17 to 0400 GMT October 18
1300 GMT October 18 to 2200 GMT October 18

Sponsored by the Nittany Amateur Radio Club, this is the 24th annual event. Stations may be worked once on each band on each mode. Mobiles may be reworked as they change counties. Repeater contacts do not count.

EXCHANGE:

RS(T), 3-digit sequential serial number, and ARRL section or Pennsylvania county.

FREQUENCIES:

SSB—3980, 7280, 14280, 21380, 28580.
CW—40 kHz up from bottom of CW bands.

SCORING:

Count 1 point for SSB QSOs, 1.5 points for CW QSOs, and 2 points for 80-meter CW QSOs. Pennsylvania stations multiply QSO points by the total number of ARRL sections, plus the total number of Pennsylvania counties, plus a maximum of one DX country. Others multiply QSO points by the total number of Pennsylvania counties worked. Mobiles in Pennsylvania calculate their total for each county and then add these county totals together for the final score.

AWARDS:

Handsome plaques will be awarded to the top Pennsylvania and out-of-state entrants. Certificates for section winners and the 10 top Pennsylvania entrants with a minimum of 10 QSOs. Special club award: An engraved gavel will be awarded to the Pennsylvania club whose members score the highest aggregate scores in the contest.

Be sure to indicate club affiliation on your logs!

ENTRIES:

Dupe sheets are required for entries with 100 QSOs or more. Mail logs, dupe sheets, comments, and an SASE (for results) by November 15th to: Douglas R. Maddox W3HDH, 1187 S. Garner Street, State College PA 16801.

MINNESOTA QSO PARTY

Starts: 1700 GMT October 17
Ends: 2259 GMT October 18

This year's contest is sponsored by a newly-formed club in the Brainerd, Minnesota, area, the Paul Bunyan Wireless Association. There are no mode or time restrictions, but only one transmitter is allowed in operation at one time. No crossband contacts are allowed. Novices compete with Novices, Technicians with other Technicians. Phone and CW are considered the same contest—please score as such. Net QSOs are not valid!

EXCHANGE:

RS(T) and ARRL section/country or Minnesota county.

FREQUENCIES:

Phone—3933, 7233, 14300, 21433, 28633.
CW—3633, 3733, 7033, 7133, 14033, 21033, 21133, 28033, 28133.

SCORING:

Minnesota stations multiply total number of contacts times the number of sections and DX countries. Others multiply number of QSOs by the number of Minnesota counties worked. Score one point for phone QSOs and two points for CW QSOs. Any contact with AD0S counts 10 points per QSO on each band, 80 through 10 meters. If you contact AD0S on 3 or more bands, add 25 points bonus!

ENTRIES:

Logs must include date/time in GMT, bands, modes, and exchanges. Logs must be postmarked no later than November 20th and addressed to: Paul Bunyan Wireless Association, c/o Steven Scott WD0EPE, 801 6th Street North, Staples MN 56479. Include a business-size SASE for returns. Usual disqualification and awards procedures.

Continued

See List of Advertisers on page 130

1st ANNUAL 40- AND 80-METER PHONE CONTEST

SPONSORS:
73 Magazine, Peterborough, New Hampshire 03458

CONTEST PERIODS:
40-Meter Event—0000Z to 2400Z January 9, 1982
80-Meter Event—0000Z to 2400Z January 10, 1982

MISCELLANEOUS RULES:
Work as many stations as possible on 40- and/or 80-meter phone during the specified times of allowable operation. The same station may be worked once on each band. Crossmode contacts will not count. Single-operator stations may operate a total of 16 hours on each band. All multi-operator stations may operate the entire 24-hour period on each band. Off periods must be noted in your logs and on your summary sheet. Off periods are no less than 30 minutes each.

OPERATOR CLASSES:
(A) Single-operator, single transmitter, phone only
(B) Multi-operator, single transmitter, phone only

ENTRY CATEGORIES:
(1) 40-meter band only
(2) 80-meter band only
(3) 40- and 80-meter bands

EXCHANGE:
Stations within the continental US and Canada transmit an RS report and state, province or territory. All other stations, including Alaska and Hawaii, transmit RS report and DX country.

POINTS:
A station may be worked once on each band. US/VE stations earn 1 QSO point per contact with the 48 states and Canada, 2 points for all others. DX stations (including Alaska and Hawaii) earn 1 QSO point per contact within your own country, 2 points for all others. Contacts made between 1000 and 1400 local time score twice the normal points per contact. Indicate points per contact on your log sheet.

MULTIPLIERS:
1 multiplier point is earned for each US state (48 max.), each Canadian province or territory (12 max.), or each DX country worked on each band.

FINAL SCORE:
Total QSO points times total multiplier points equals claimed score.

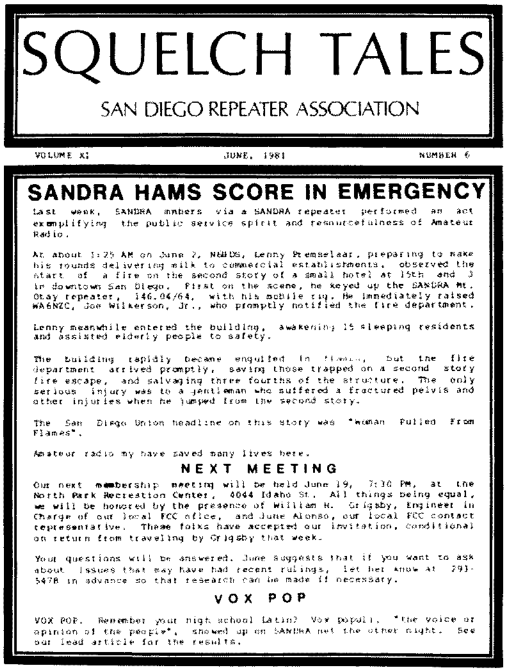
CONTEST ENTRIES:
Each contest entry must include a log for each band in your entry category, a dupe sheet for each band, a contest summary, and a multiplier checklist for each band. We recommend that contestants send for a copy of the contest forms. Enclose an SASE to the contest address listed below.

ENTRY DEADLINE:
All entries must be postmarked no later than February 11, 1982.

DISQUALIFICATIONS:
Omission of any required entry form, operating in excess of legal power, manipulating of contest scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are all grounds for immediate disqualification.

AWARDS:
Contest awards will be issued in each entry category in each of the continental US states, Canadian provinces and territories, and each DX country represented. A minimum of 5 hours and 50 QSOs must be worked to be eligible for contest awards.

CONTEST ADDRESS:
Send an SASE to: Whidbey Island DX Club
2665 North Busby Road
Oak Harbor, Washington 98277



SQUELCH TALES

SAN DIEGO REPEATER ASSOCIATION

VOLUME XI JUNE, 1981 NUMBER 6

SANDRA HAMS SCORE IN EMERGENCY

Last week, SANDRA members via a SANDRA repeater performed an act exemplifying the public service spirit and resourcefulness of Amateur Radio.

At about 3:25 AM on June 2, N6BDS, Lenny Premselaar, preparing to make his rounds delivering milk to commercial establishments, observed the start of a fire on the second story of a small hotel at 15th and J in downtown San Diego. First on the scene, he keyed up the SANDRA Mt. Otay repeater, 146.04/64, with his mobile rig. He immediately raised WA6NZC, Joe Wilkerson, Jr., who promptly notified the fire department.

Lenny meanwhile entered the building, awakening 15 sleeping residents and assisted elderly people to safety.

The building rapidly became engulfed in flames, but the fire department arrived promptly, saving those trapped on a second story fire escape, and salvaging three fourths of the structure. The only serious injury was to a gentleman who suffered a fractured pelvis and other injuries when he jumped from the second story.

The San Diego Union headline on this story was "Woman Pulled From Flames".

Amateur radio my have saved many lives here.

NEXT MEETING

Our next membership meeting will be held June 19, 7:30 PM, at the North Park Recreation Center, 4044 Idaho St. All things being equal, we will be honored by the presence of William H. Grigsby, Engineer in Charge of our local FCC office, and June Alonso, our local FCC contact representative. These folks have accepted our invitation, conditional on return from traveling by Grigsby that week.

Your questions will be answered. June suggests that if you want to ask about issues that may have had recent rulings, let her know at 291-5478 in advance so that research can be made if necessary.

VOX POP

VOX POP. Remember your high school Latin? Vox populi, "the voice or opinion of the people", showed up on SANDRA net the other night. See our lead article for the results.

NEWSLETTER CONTEST WINNER

Does your club want a newsletter but can't find a way to pay for it? You should consider the approach that is used in *Squelch Tales*, the monthly newsletter of the San Diego Repeater Association. By selling advertising, they are able to meet or exceed the cost of publishing their newsletter. This seems to work well for other clubs, too; about one in three of the club newsletters sent to *73* contains advertising.

The edition of *Squelch Tales* that we selected was 24 pages long—nine of those pages were ads. The club, which has almost 900 members, charges $30 for a full page, $15.00 for a ½ page and $7.50 for a ¼ page or business-card-size ad. Advertisers are encouraged to submit their own layouts and artwork, but the newsletter will also provide assistance free of charge.

Advertising can be a good shot in the arm for a club budget, provided the job is done right. First and foremost, the ads won't sell themselves. The newsletter staff will need to contact prospective advertisers and then *convince* them of the merits of spending money to reach the club's members. Likely candidates include the local ham gear dealer, electronics parts stores, and surplus houses. After all, this is where hams spend their money.

The cost of advertising should reflect the size of your club, the quality of the newsletter, and most important of all, the additional expense that is involved when you run the ad. It

3rd ANNUAL INTERNATIONAL 160-METER PHONE CONTEST

SPONSORS:
73 Magazine, Peterborough, New Hampshire 03458

CONTEST PERIOD:
0000Z January 16, 1982, to 2400Z January 17, 1982

OBJECT:
To work as many stations as possible on 160-meter phone in a maximum of 36 hours of allowable contest time. Multi-operator stations may operate the full 48-hour contest period. Stations may be worked only once!

ENTRY CATEGORIES:
(1) Single operator, single transmitter, phone only (2) Multi-operator, single transmitter, phone only

EXCHANGE:
Stations within the continental US and Canada transmit RS report and state, provinces or territory (i.e., 59 Iowa, 55 Ontario, etc.). All others transmit RS report and DX country.

POINTS:
Five (5) points will be earned for each valid contact with stations in the continental US and Canada. DX contacts outside the continental US and Canada score ten (10) points each. This year for the first time, an additional 5 points *bonus* may be earned for each contact made during the hours of *1000-1400 local time* on either day of the contest.

MULTIPLIERS:
1 multiplier point will be earned for each of the 48 continental states, twelve (12) Canadian provinces/territories, and DX countries outside the continental US and Canada worked during the contest.

FINAL SCORE:
Total QSO points times total multiplier points equals claimed score.

CONTEST ENTRIES:
Each contest entry must include logsheets, dupe sheets for 100 contacts or more, a contest summary sheet and a multiplier check sheet. Please note those contacts made between 1000-1400 local time so you'll be sure to get appropriate contest credit.

ENTRY DEADLINE:
All entries must be postmarked *no later than February 18, 1982.*

DX WINDOW:
Stations are expected to observe the DX window from 1.825-1.830 MHz as mutually agreed by top-band operators. Stations in the US and Canada are asked not to transmit in this 5-kHz segment of the band.

DISQUALIFICATION:
If contestant omits any required entry form, operates in excess of the legal power authorized for his/her given area, manipulates operating times to achieve a score advantage, or fails to omit duplicate contacts which may reduce the overall score more than 2%, disqualification may result.

AWARDS:
Contest awards will be issued in each entry category in each of the continental US states, Canadian provinces/territories, and each DX country. A minimum of 5 hours and 50 QSOs must be worked to be eligible for contest awards.

CONTEST ADDRESS:
To obtain information, entry forms, or to submit a contest entry, forward a *self-addressed stamped envelope* to:

160-Meter Phone Contest
Dan Murphy WA2GZB
Post Office Box 195
Andover NJ 07821 USA

doesn't make much sense to sell an ad for less money than it costs to print and mail.

A good rule of thumb is that the revenue from one page of advertising should pay for two or three pages of the newsletter. For example, a 10-page newsletter that costs $80 to print and mail might have four pages of ads costing $20 each. To keep the readers happy, you can't replace editorial material with ads. Nor can you expect advertisers to pay a small fortune to reach a handful of people.

Advertising alone does not make a good newsletter. *Squelch Tales*, like our earlier winners, has a nice mix of club news, technical tips, and humor. One nice touch is a classified section in which members can list gear. The success of this newsletter is largely the result of a hardworking staff. Editor W6GIC has been associated with the publication for ten years. Her enthusiasm is matched by that of W6UZL who, as a retiree, has plenty of time to gather the news. Rounding out the team is WA6IPW, who uses his background as a printer to ensure that each new edition looks professional yet is reasonable in cost.

If your club is suffering from newsletter blues, perhaps an injection of advertising will help. This revenue, combined with some hard work, will yield a publication that members can look forward to receiving each month. For those of you working on newsletters: Keep up the good work and make sure that your club's publication is being sent to *73*.—N8RK.

HAM HELP

I need manuals or schematic and alignment data on the Knight Star Roamer and the Hallicrafters S-38 "D" receivers. Xerox copies will be OK.

O. L. Sabetto W8ZXG
1717 Burgess Road
Cleveland OH 44112

I am looking for software and equipment compatible with a NorthStar Horizon computer to work RTTY. All help appreciated.

Marc Rubin
16692 Bolero Lane
Huntington Beach CA 92649

I am in need of manuals or any information on the following equipment: Data Engineering, Inc., Space-Matic Electronic keyer; Kyokuto FM 144-10SXRII 2-meter FM synthesized rig; and Ebina Electronics Corp. M7505 10-kHz-30-MHz frequency counter. I will pay for copy or copy and return.

Bob Carson N8CUX
Box 364
Smithfield OH 43948

I would like to get in touch with amateurs interested in Esperanto, the auxiliary language, for the purpose of forming an international ham net.

Ernest Black K2REV
1265 Reservoir Road
Saugerties NY 12477

FCC

INQUIRY BEGUN ON SPREAD-SPECTRUM MODULATION IN AMATEUR RADIO SERVICE (DOCKET NO. 81-414)

The Commission has begun an inquiry and rulemaking into whether to allow certain amateur radio users to use spread-spectrum modulation techniques.

In another action, the Commission is exploring the broader area of wideband technologies, including spread spectrum, and said the inquiry/rulemaking involving amateurs would provide the FCC with useful data about the performance of such techniques in the presence of other communications systems.

Wideband modulation techniques differ from conventional modulation schemes—such as amplitude modulation (AM) and frequency modulation (FM)—in that the bandwidth of the transmitted signal is much wider than the bandwidth of the information being sent. Because of the increased bandwidth, such techniques are implicitly prohibited by current rules.

Spread-spectrum techniques were originally developed for military applications concerning covert communications and/or resistance to jamming. The radio frequency signal transmitted in a spread-spectrum system occupies a very large bandwidth, perhaps many megahertz, as compared to the information signal's bandwidth. This wide bandwidth provides for a military signal that is very hard to detect or jam.

The Commission concluded that spread spectrum might offer unique advantages to civilian communications users also. The coding techniques used in spread-spectrum systems, for example, allow message privacy, selective addressing, and code division multiple access (many users simultaneously). These last two advantages provide the user the ability to selectively access only one or a fraction of the total number of receivers sharing the same spectrum. Spreading the signal at the transmitter and collapsing it at the receiver results in a low signal power density and helps the system reject interference. These features suggest the feasibility of overlaying spread spectrum on occupied spectrum, leading to increased spectral efficiency.

In March, the Commission's Private Radio Bureau authorized the Amateur Radio Research and Development Corporation (AMRAD) to conduct limited tests using spread-spectrum modulation. When this special temporary authority expires, AMRAD must submit its findings to the Commission, which will consider them in this proceeding.

Experimenting will be limited to amateur Extra and Advanced class licensees, whose members have been tested in advanced phases of radio electronics. Because spread-spectrum systems are inherently more complex than narrowband systems, the Commission said these licensees were best qualified to build and operate the necessary equipment so as not to interfere with other radio users. (Material covering spread-spectrum techniques will be added to future amateur Extra and Advanced class tests.)

Due to legal and technical considerations, the Commission proposes authorizing spread-spectrum modulation only in the 50-54-MHz, 144-148-MHz, and 220-225-MHz bands. However, it welcomes requests for special temporary authority to perform limited experiments in the amateur bands above 225 MHz.

The Commission will not limit system design, but only proposes that a system's authorized bandwidth be equal to or less than the width of the amateur band the system is operating in and be contained within that band. Although no interference problems are anticipated, local engineers-in-charge will be allowed to require stations transmitting spread-spectrum signals to cease operation, if necessary, to stop interference. Provisions to facilitate monitoring by the Field Operations Bureau and by other amateurs are proposed. Commenters may address the issue of interference potential in overlaying spread spectrum on the three aforementioned bands.

The inquiry notice lists questions that might guide those wishing to comment in this proceeding. Interested persons should obtain a copy of the notice.

Action by the Commission by Notice of Inquiry and Proposed Rulemaking (FCC 81-290). Commissioners Fowler (Chairman), Lee, and Quello, with Commissioner Washburn concurring and issuing a statement. For more information, contact Mike Kennedy at (202)-632-7073.

HAM HELP

Active or retired police amateur radio operators who are members or potential members of the International Police Association interested in forming an IPA Ham Radio Net please contact the Secretary-Treasurer of IPA, U.S. Section, Region 10, at 89 Oakridge Avenue, Nutley NJ 07110.

Rudolph A. Deutsch WA2MAU
89 Oakridge Ave.
Nutley NJ 07110

I am in need of a service manual and/or operations manual with schematic for the Hammarlund HQ-170. I also need service manuals for the Kenwood 599D twins (R-599D, T-599D). I'll pay postage and copying costs.

Frank Flohr
1016 18th Terrace
Key West FL 33040
(305)-296-2555

I am in need of the addresses for the following companies: Ferroxcube, Fair-Rite Products, and Stackpole. I would appreciate hearing from someone who can tell me where these companies are.

Norman R. Boyce Jr.
117 S. Webb Rd.
Plant City FL 33566

LOOKING WEST

Bill Pasternak WA6ITF
c/o The Westlink Radio Network
Suite 718
7046 Hollywood Blvd.
Hollywood CA 90028

HOORAY FOR HOLLYWOOD DEPARTMENT

About a year and a half ago, my friend, Jim Davis KA6IUH, was the program director for Los Angeles radio station KMPC. Thanks to Jim, I had a chance to meet and become friends with a number of darn nice people involved in one way or another with the KMPC operation. Among them is a man named Gary Owens. For many years, Gary was the afternoon mainstay of KMPC, though I suspect he is best known to the rest of the nation as the "announcer," with his hand always to his ear, on the old Rowan and Martin "Laugh In" series. Anyhow, one afternoon while I was visiting Jim in his office, I asked if he minded my asking Gary if he would record some public service announcements about amateur radio. Jim did me one better. He suggested we both ask Gary; we did, and Gary graciously agreed to do them.

That evening, I called Lenore Jensen W6NAZ. Lenore is the ARRL's Los Angeles area public information assistant. She's also directly responsible for 99.9% of all the amateur-radio-related announcements you hear on radio and see on TV. We worked out the details of what the announcements should say, and a week later Gary, Jim, and I recorded the copy onto tape. A few days later, my organization, the Westlink Radio Network, formally donated these recordings to the American Radio Relay League for use in their ongoing campaign to foster public awareness of amateur radio. Since then, they have been heard on radio stations nationwide.

In early July, a plaque thanking Gary for his efforts on behalf of all amateur radio operators was awarded to him by the ARRL through Lloyd Sigmon W6LQ. Having Lloyd be the presenter could not have been more appropriate since he was the man in charge of KMPC when Gary came to the station 19 years ago. Also present at the awards ceremony were Lenore (W6NAZ) and Bob (W6VGQ) Jensen. After thanking Lloyd and the League for the recognition, Gary promised to hook up a code-practice oscillator to the key, and practice a bit of CW with it. No, Gary isn't a ham, at least, not yet. But if he ever decided to take the plunge, he would be a welcome addition to our service.

As the individual who instigated this whole affair, I also would like to express my sincere gratitude to Gary. People in Gary's position are constantly bombarded with requests for similar freebies. I know a number of people who flatly reject any such request for any reason, and I cannot blame them for doing so. Remember, in the case of PSAs such as ours, virtually everything is donated including the talent. The latter is usually the most expensive part of producing a commercial of any sort. There's a Hollywood saying which goes, "Big names cost big bucks," and this is rightly so since for an entertainer or air personality, his or her voice and appearance are their livelihood.

Famed broadcaster Gary Owens (left) receives a Brass Key plaque from Lloyd Sigmon WGLQ, on behalf of the ARRL. (Photo by Bob Jensen W6VGQ.)

What's nice is that a person of Gary's caliber and standing has as high a regard for our hobby service as to donate his talent in the hope that we can grow and prosper. For this, I can only say to him a simple but meaningful, thank you! I also want to thank Jim Davis KA6IUH along with Lenore Jensen W6NAZ. Putting these PSAs together was a team effort and everyone involved deserves a hand.

A SPECIAL REPORT

The following is excerpted and being reprinted from the Spring, 1981, Southern California Repeater Remote Base Association Newsletter. I am bringing you this information for several reasons. First, like all other bands, the 420- through 450-MHz spectrum is facing its own form of crisis in many geographic areas, and herein you will find the details of how one group of dedicated radio amateurs plans to deal with the problems that lie ahead. Second, outside of those who use the band in Southern California, little is known by the outside world. Through this input, it is my hope (and I suspect that of SCRRBA as well) that all amateurs will have a better understanding of the need for ongoing voluntary spectrum management to prevent chaotic conditions from developing within our amateur relay spectrum. The report was prepared by Gordon Schlessinger WA6LBV of SCRRBA's Technical Committee. Due to its length and scope, it will be presented in several parts. First, some background for those of you unfamiliar with the group.

Like all other voluntary spectrum management organizations in California (and perhaps nation wide) the SCRRBA was a child of the original California Amateur Relay Council. From it came such well known regional organizations as the Northern Amateur Relay Council and the Southern California Repeater Association (which in 1978 again split into two "special interest" groups now known as TASMA and 220-SMA). Over the years, this column has followed the political motivation leading to these changes toward regionalization and specialization, so I will not repeat them here. Those interested can find more detail by reading the back issues of *73* from mid-1972 through the present. I also tried to detail some of the history of California frequency coordination in my *Practical Handbook of Amateur Radio FM and Repeaters*, also available from *73*. (Yet another excellent reference is "The Remote Base: An Alternative To Repeaters," authored by Gordon Schlessinger WA6LBV and Bill Kelsey WA6FVC. This article appeared in the April, 1977, issue of *Ham Radio Magazine*. While technical in nature, it did spend time explaining some of the colorful history of UHF-relay communication in this region)

SCRRBA REPORT, PART I

For the Southern California UHF relay community, the future is now. In many respects, the future arrived yesterday. We are big; we are complex, and we have big complex problems to be faced. *Right now.* Whether or not we face them, whether or not we solve them, will entirely determine if we will continue to operate our relay systems in the future as we have in the past. Let there be absolutely no misunderstanding about this: A crisis in frequency coordination is already upon us.

In Southern California, we have developed a phenominal number of UHF relay systems, leading to the virtually complete utilization of the 440-450-MHz region of our 70cm band. This fact alone creates unprecedented difficulties for the Technical Committee both in coordinating channel pairs for new systems and in managing the present array of coordinated relay stations.

UHF Frequency Coodination In Crisis

"We begin with data. In Southern California, the 440-450 portion of the band is entirely used for 'relay station' input and output channels. The 420-431-MHz portion of the band, which previously supported some relay 'main input and output' pairs, has now been devoted entirely to link channels and a co-shared 6-MHz ATV simplex channel. The 431-440-MHz portion is utilized for 'weak signal' DX communications, satelite work, an ATV repeater input channel (output on 1250 MHz), and a few one-way link channels.

"Within the 440-450-MHz portion of the band, three channel pairs are reserved for simplex operation and associated special-purpose activities. This results in a theoretical 197 pairs for mobile relay channels available for coordination.

"At the present time, the Technical Committee frequency coordination data base shows a total of 320 systems coordinated to these 197 pairs, with several additional coordinations performed but not yet included in the latest computer printout. We therefore have, at present, an average of 1.6 coordinated systems per channel pair. Additionally, there is a backlog of applications awaiting coordination, for which supplemental data has been requested and has not yet been received. Finally, we are receiving a relatively constant number of completed applications for new UHF frequency coordinations each month. In the near future, we will exceed an average of 2.0 systems per channel.

"Compounding the channel-loading figures are some secondary considerations. The band was initially coordinated from the 'top down,' with the earliest coordinated systems utilizing output channels in the 448-450-MHz portion of the band. (In this discussion, only the output channel frequencies will be mentioned; the input channels, 5 MHz lower in frequency, are implicitedly included). Many of these early systems tend to be widely utilized, often by individuals who hold cross-membership in other groups as well. Consequently, the top end of the 440-450-MHZ band is already entirely filled. Additionally, one of the ostensible benefits of our Southern California location is also a constraint on the frequency-coordination process. High performance, wide-coverage systems coordinated to our highest mountains, dominate a channel over much of the populated Southern California land area. A channel pair which is in use on Santiago Peak or other mountains cannot easily be co-shared with another system anywhere else in the Southern California coastal region. Thus, to the degree that more and more systems are established on these mountains, the number of channel pairs available to be coordinated elsewhere in Southern California is reduced.

"Under these constraints, the Technical Committee must coordinate new systems onto channels which already contain at least one other operational system somewhere in Southern California. On this basis alone, there are potentially very large problems in UHF frequency coordination looming ahead. But there are additional problems that must be addressed."

Next month, we will cover these and begin to look at possible solutions as outlined by SCRRBA in its Special Report.

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
4006 Winlee Road
Randalistown MD 21133

Ah, autumn! The leaves out here in the country are changing to the bright collage of red and gold, and I find myself outside, spraying WD-40 on the kids' swing set to *protect* the pivot from winter's rust. While I am outside, I often hear the familiar rumble of the postman's truck. Let's see what kind of goodies we can turn up in this month's mailbag.

A good starting point is this letter from Frederick C. Wood WB3JKC, here in the Baltimore area, who writes about his attempt to get on RTTY. Fred states that he is "...twelve years of age and a General class license holder." He recently acquired an old Model 19 Teletype® machine, along with an HF transmitter and receiver. A home-brew demodulator provides good receiving copy, but transmitting is his problem.

Fred installed the circuit shown in Fig. 1 in his transmitter, but has the following questions:

1) Where do I connect to from the FSK unit to the Model 19 machine keyboard? I do not have a manual for the Model 19 machine.

2) To obtain the 170-Hz shift, which I will be using for RTTY, simply, what are the adjustment procedures for the trimmer capacitor and the 100k shift pot?

3) Why is the keyboard grounded as indicated?

Fred concludes that he has been unable to find the answers to these questions despite several months of reading, and signs himself a "frustrated 12-year-old." I know that others have found themselves in the same situation as Fred; let's look at the answers to his questions.

To begin with, the Model 19, which is really a Teletype Model 15 with tape equipment, provides the connection for the keyboard on the machine's left side, your right as you look at it, on the "30" terminal block. This screw-terminal block has six terminals on it, numbered 31 through 36, and the keyboard is brought out to 32 and 34.

Now, before you just go and hook the keyer to these terminals, there is one more item you must attend to. On an unmodified Model 15 keyboard, there is a filter, officially dubbed a "9222 Filter," which serves to suppress sparking at the keyboard contacts. Composed of a coil and a few capacitors, this is the last thing you want to put across a shift-pot circuit! The filter is normally wired across the contacts and located above the keyboard contact assembly; remove it.

We move on to your second question, regarding adjustment of the circuit. The variable capacitor is set to provide the correct degree of shift, whereas the potentiometer is used to precisely set the shift. The way I set them up is first to turn the pot to maximum, that is, the higher position above ground. This will provide the maximum shift. Now adjust the capacitor to produce an 850- or 900-Hz shift. From here on, leave the capacitor alone! The pot may be used to back down the shift to 170 Hz, or whatever, without worrying about exceeding the 900-Hz maximum shift. I mounted the pot in a little box on top of the transmitter, with a jack in the back to receive the keyboard line coming from the printer.

Now, about those grounds. Remember that the keyboard must be isolated from the TTY loop. Also, the shift-pot circuit is constructed to work against chassis ground of the transmitter. You see, a ground by any other name is still a wire (or something like that). All those symbols mean is that the "cold" side of the keyboard, pot, and transmitter chassis are all connected together. You don't have to pound an eight-foot copper rod through your shack floor next to the Model 19!

While some are working on machines a score or more years old, others are looking at more modern devices. Such is the subject of a letter received from Robert LeMaster, Sr. WA9NZQ/5 over in Bentonville, Arkansas. Bob writes that he has searched high and wide for video RTTY systems to build that do not use

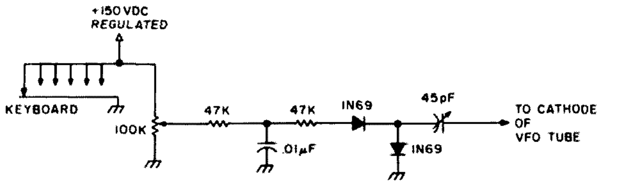


Fig. 1. One version of the "shift-pot" circuit.

a computer. He feels that he has no use for a computer and does not want to buy one just to use on RTTY.

Well, Bob, I'm not going to try to convert you to "computerism" here. We have talked at length in the past about the versatility one gains with a computer on RTTY. If you are interested in a "glass Teletype" only, several have been described in *73* in the past and are listed below:

"Build This Exciting New TVT," *73 Magazine*, March, 1976, p. 76.
"ASCII/Baudot With A Prom," *73 Magazine*, June, 1976, p. 114.
"A RTTY/Computer Display Unit," *73 Magazine*, July, 1976, p. 118.
"The XITEX Video Terminal," *73 Magazine*, December, 1978, p. 132.

I will point out, though, that by using a microprocessor-based system, you can gain a good deal of "smarts."

How about the ability to transmit and receive at several speeds, hold canned output in buffers, like a brag tape, and have the machine clean up your typing; all this is easy with a CPU controlling the station, very hard without it. Now, I am not talking about buying a $1000 system and tying it down to RTTY, nor am I thinking of buying a large system and using it occasionally on the air. An attractive alternative is to put together a small computer, on one board, with the program in permanent memory and a limited amount of on-board read/write memory.

Such a computer is termed a "dedicated" one, and can be put together very inexpensively. For example, a simple 6802-based system was described by Pete Stark in *Kilobaud Microcomputing* last year. The whole system fits on a small PC board. Write Pete at PO Box 209, Mt Kisco NY 10549, for details of the "Kilobaud Klassroom Komputer."

Ah, but you say, what about programming? Watch closely here in *73* and you soon shall see a super program, written for the 6800 (will also run in 6802 without modifications) which provides all the features a RTTY station needs. Requiring less than 4K of memory, it is designed for most 6800 systems using serial terminal interfacing via an ACIA.

Need more help? Scheduled to appear on the horizon very soon is a newly-updated edition of *73*'s *RTTY Handbook*. Containing all new material regarding RTTY equipment, this promises to become a new classic which belongs in every RTTY station. Among the new material will be video RTTY, both with and without a computer, along with new transmitting and receiving circuits, and a few bells and whistles. Watch for the announcement in the Radio Bookshop section of *73*.

Before I close this month, let me acknowledge a letter from Cal Sondgeroth W9ZTK, who writes concerning the program published in this column last July. Cal has taken a razor to the program and honed away sixteen bytes or so to make it more compact. Among his suggestions are to store variables on the 6800's Page 0, to allow direct addressing, and storing the START and STOP bits integral to each data byte. In other words, where I used "10101000" for the numeral "4", Cal would use "00101010." In his version, the bits are, reading from left to right, a "0" START bit, the five data bits ("01010"), a "1" STOP bit, and a "0" DON'T CARE bit. My order includes a "1" CASE bit, five data bits, and two DON'T CARE bits.

That CASE bit is needed to tell the program whether the character about to be sent is FIGS or LTRS, and to prompt the appropriate change of case, if required. I will grant that the one DON'T CARE bit could be used for the same purpose, but it seemed more general to store only the data and plaster the START and STOP bits externally.

The reason I did not use Page 0, by the way, is that this routine is part of a larger program, and most of that page is accounted for by other variables. In the practical system, however, Page 0 makes sense to use. It's just that here, as an example, I chose to use extended addressing.

Some reviews coming up in the next few months. I will try to sprinkle a few letters in here, too, maybe even a surprise or two! All for you, in RTTY Loop.

NEW PRODUCTS

BONE-CONDUCTION HEARING AID

Individuals with hearing impairments may soon be able to enjoy sound-oriented pastimes like ham radio by using a bone-conduction hearing aid developed by Matsushita Electric Co.

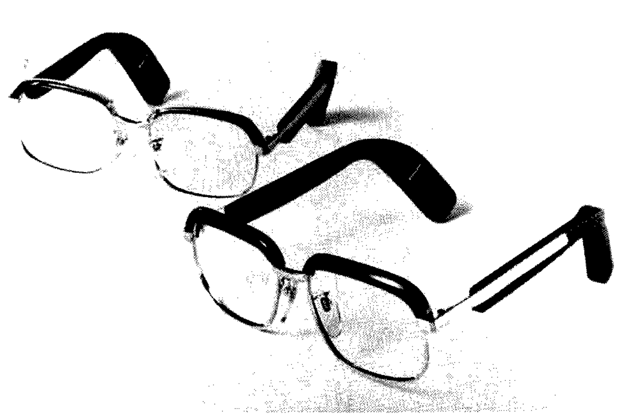
This electronic breakthrough bypasses the eardrum by vibrating the bones near the inner ear. A small microphone, amplifier, battery, and vibrating device are built into the frames of special eyeglasses. Matsushita plans to release this new hearing aid for the US market in the near future.

For more information, contact *Ruder and Finn, Inc., 110 East 59th Street, New York NY 10022.* Reader Service number 481.

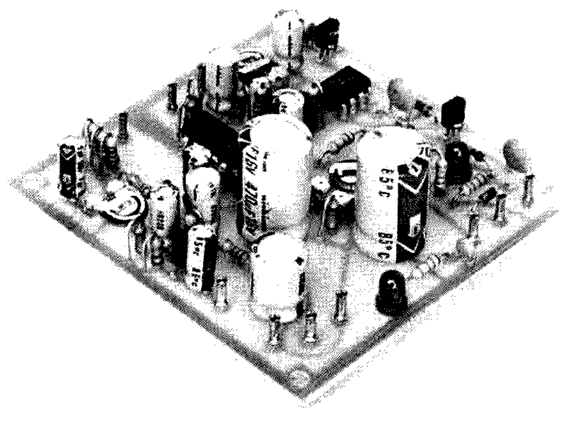
NEW HAMTRONICS® REPEATER MODULES

Hamtronics, Inc., long noted for FM transmitters and receivers commonly used for building repeaters, has now completed their line of repeater modules by offering inexpensive COR and CWID modules.

The 3" x 3" COR module kit contains an electronic relay to actuate the transmitter when the receiver squelch opens. Adjustable tail and time-out timers are provided on the board, as well as an audio mixer to combine the ID tone with the receiver audio for application to the transmitter. Another nice feature is a separate speaker driver amplifier stage which allows a local speaker to be operated completely independent from



Bone-conduction hearing aid from Matsushita.



Hamtronics® COR module.

the repeater audio level setup control, without using hard-to-find L-pads.

The 3" × 7" CWID module kit contains a tone generator controlled by a 158-bit diode matrix. Adjustments on the board control the ID speed, tone, and time. A special output filter eliminates the key clicks found on many repeater IDers. Although many articles have appeared recently on PROM IDers, many still prefer a diode matrix because it can be easily reprogrammed at any time without further expense. The CWID module is constructed on a double-sided PC board with plated-through holes for easy assembly. The CWID and COR modules are designed to be used with Hamtronics® transmitter and receiver modules as well as most other types. For further information, contact *Hamtronics, Inc., 65F Moul Rd., Hilton NY 14468; phone (716)-392-9430.* A complete 1981 catalog, which includes all Hamtronics® FM and SSB equipment, is yours for the asking. (For overseas mailing, please send $2.00 or 5 IRCs.) Reader Service number 477.

BILAL ISOTRON ANTENNAS

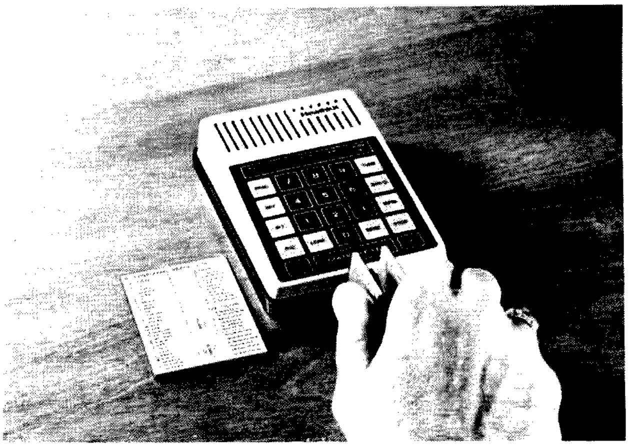
Isotron antennas, designed and manufactured by the Bilal Company, employ a unique new embodiment of a full-size harmonic antenna which permits the radio amateur who has limited space to get on the air from an apartment, condominium, mobile home, or other space-limited environments. There are no compromises in matching or tuning Isotron antennas to your transmitter. This unique design allows direct feed with standard coaxial cable and does away with the need for radials.

How is it that an eighty-meter antenna, for example, can be only four feet tall, eighteen inches deep, sixteen inches wide, and weigh a mere eight pounds... yet perform as well as a full-size antenna? Bilal claims that the answer is in research and development. Isotron antennas were five years in development and testing, and now are available in 80-, 40-, and 20-meter models.

For more information, call or write to *Bilal Company, Star Route, Florissant CO 80816; phone (303)-687-3219.* Reader Service number 483.

Continued

Benjamin Michael Industries' military-time clock.



The Heath μMatic Memory Keyer.

MILITARY-TIME CLOCK

Benjamin Michael Industries, Inc., has announced the addition of the Model 173DM to its line of professional military-time-format clocks.

The 173DM features dual, independent digital clock circuits housed in a solid walnut case. The unit is suitable for placement on any desk, communications console, briefing table, etc. Military time is displayed on the left clock face while standard 12-hour format with AM/PM indicators is used on the right. Each clock is independently set, allowing display of different time zones if desired. This arrangement makes the 173DM ideal for applications requiring the use of both Universal Coordinated Time (Zulu) and local time.

Both large displays are of the LCD type for excellent visibility and ultra-low power consumption. The 173DM features quartz-crystal accuracy and over one year of operation on a single, readily-available battery. The absence of a power cord makes the unit ideal for desk-top use and eliminates the need for resetting after commercial power failure.

For more information, contact *Benjamin Michael Industries, Inc., 65 E. Palatine Road, Prospect Heights IL 60070.* Reader Service number 480.

UNIQUE MICROPHONE SYSTEM

Mobile operating will never be the same! Daiwa's RM-940 brings the total freedom of cordless operation with a lightweight, compact microphone, infrared sensor, and control/charger unit.

The electret condenser microphone can be hung around the neck like a pendant (cord supplied), or conveniently clipped to a shirt pocket. A latching pushbutton switch activates the tiny infrared transmitters on the microphone. Audio and transmit/receive switching are then transferred via infrared beam to a sensor mounted near the sun visor or the rearview mirror. The maximum usable distance is 3.5 feet. An additional sensor can be added for broader coverage.

Infrared microphone system from MCM Communications.

The control/charger unit features Velcro pads for easy mounting and microphone plugs compatible with most Kenwood, Icom, or Yaesu rigs (specify when ordering). Other plugs can be installed to suit particular needs. A maximum of eight hours of charging time will provide a minimum of five hours of continuous use. The control/charger unit also provides a visual (LED) and audible (soft beep) indication whenever the microphone is switched on. Optional microphone wind screens are available. For more information, contact *MCM Communications, 858 E. Congress Park Dr., Centerville OH 45459.* Reader Service number 478.

HEATH'S μMATIC MEMORY KEYER

Reports say a sneak preview of the new Heathkit® SA-5010 μMatic Memory Keyer created much interest at the 1981 Dayton Hamvention. The keyer is now featured in the latest Heathkit Catalog from Heath Company.

Described by a Heath spokesman as compact and modern in styling, the SA-5010 uses a custom microprocessor to provide up to 10 buffers for storing up to 240 characters of text or commands. These variable-length buffers eliminate wasted memory space by letting the user store text in several buffers and then string them together in any sequence. Command strings also can select the speed, weight, spacing, and auto-repeat count for each message so selected. This feature is said to make the μMatic so versatile that Heath has applied for a patent on it.

The SA-5010 employs a 20-position keypad for entries, and features easy-to-use integral capacitive "touch" paddles. A rear panel jack is provided for use of a mechanical paddle, if so desired.

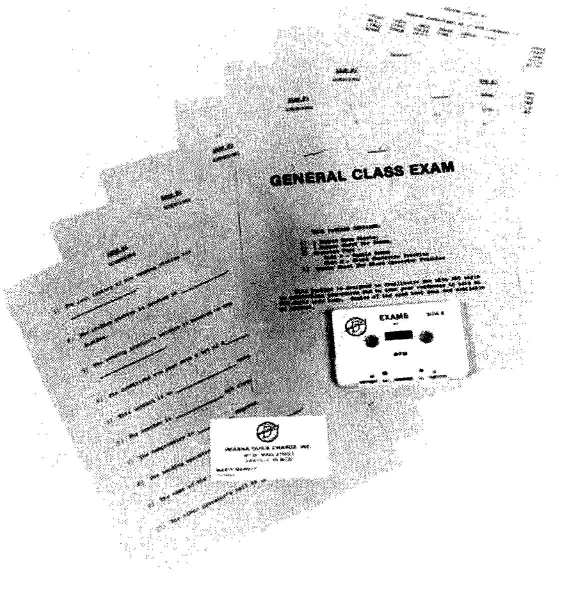
A "practice" mode sends random code groups of random length and selectable types. The 100 different random sequences are repeatable, so the ham can check copy for accuracy. All 100 sequences are altered each time the keyer is turned on, to give a total of 6,400 different practice sessions. Each sequence sends approximately 3,000 characters before repeating. The user can choose any speed between 1 and 99 words per minute, and any of 11 weight settings.

CMOS memory with battery backup is said to retain the buffer contents, as well as the last-selected speed, spacing, weight, and repeat count whenever the keyer is turned off or unplugged.

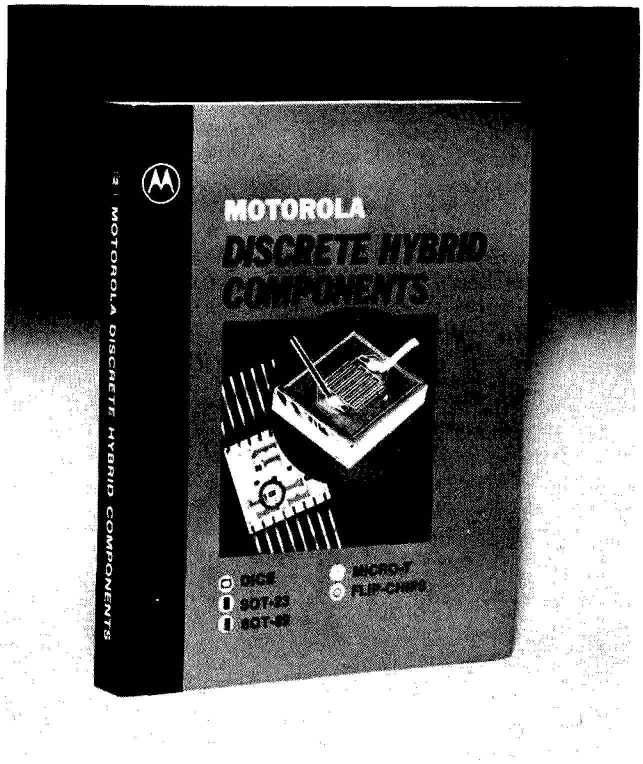
Built-in diagnostics check the microprocessor each time the keyer is turned on, and also test buffer memory whenever the μMatic Memory Keyer is reset. For the left-handed CW operator, a special two-key function reverses the paddles. The keyer even remembers to turn itself off if the user forgets!

The SA-5010 features built-in sidetone oscillator and speaker with variable pitch and volume controls. Phone jack and ear phone are included for private listening. A plastic case covers the die-cast zinc base, which is weighted to reduce movement during keying. The keyer requires the optional 120 V ac Heathkit PS-5012 power supply. Step-by-step instructions make this a two-evening kit.

The SA-5010 μMatic Memory Keyer and nearly 400 other



The Indiana Quick Charge CW exam package.



Motorola's Discrete Hybrid Components catalog.

build-it-yourself electronic kits are featured in the latest 104-page Heathkit Catalog. For a free copy, write *Heath Company, Dept. 350-115, Benton Harbor MI 49022.* In Canada, write *Heath Company, 1480 Dundas Street E., Mississauga, Ontario L4X 2R7.* Reader Service number 485.

CW EXAM PACKAGE

Indiana Quick Charge, Inc., has recently completed a Morse code practice package for the new-style FCC exams. The package consists of five completion-style exams, two answer sheets, and one cassette tape. The A side of the tape has five segments of text, each approximately five minutes long. The B side has mixed characters practice ranging from a little below the test speed and gradually working up to the speed desired. Each sample test is on a separate sheet, with an answer key for all the included sample tests. The cassette is well produced, with excellent keying characteristics. All the text and mixed characters are computer-generated, assuring evenness and accuracy.

Designed to test the user's readiness to take an FCC code exam, it should be stressed that the text included is composed, and is not a word-for-word copy of any actual FCC tests. It is similar only in style and length, and is intended to test the skill and ability of those who are preparing to take the actual test. Two packages are currently available: the General class practice at 13 words per minute and the Extra class practice at 20 words per minute.

For more information, write: *Indiana Quick Charge, Inc., 367 West Main Street, Danville IN 46122.* Reader Service number 479.

UHF ALL-MODE AMP

The D1010 amplifier is a solid-state all-mode amplifier designed to be used in the 430-to-450-MHz amateur band. It will amplify a 10-Watt signal to more than 100 Watts output; 2 Watts input produces 25 Watts output. The D1010 can be keyed with as little as 300 milliwatts. This makes it a versatile amplifier for all low-power transceivers and HTs. The D1010 is biased as a linear amplifier, therefore, it will amplify FM, SSB, CW, and ATV signals.

Other features include remote operation with the optional RC-1 remote head, external or internal keying circuitry, over-temperature protection, and the typical *rugged* packaging that is a part of all Mirage products.

The D1010 carries a 5-year warranty on all parts except the rf power transistors which are warranted for 1 year.

The D1010 will be an asset for any station, whether on OSCAR, mobile, remote base, or SSB/CW DX.

As with all Mirage products, they are only available through their worldwide dealer network. For further information, contact *Mirage Communications Equipment, Inc., PO Box 1393, Gilroy CA 95020.* Reader Service number 476.

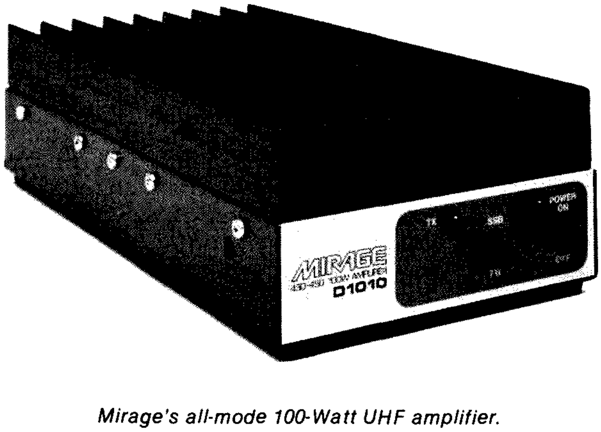
HYBRID COMPONENTS DATA BOOK

A new data book detailing the specifications of discrete semiconductor components has been published by Motorola. The new Discrete Hybrid Components Data Book covers 10 different discreet-product categories, including a variety of transistor, diode, thyristor, and optoelectronic lines, and includes five different packaging methods: standard chips (dice), flip-chips, Micro-T™, SOT-23, and SOT-89.

The book includes an easy-to-use cross-reference between standard discrete packaged devices and equivalent *unencapsulated* chips, and provides both electrical and physical data for each of the chips.

All Hybrid components described in the Data Book are available from Motorola or through authorized Motorla Hybrid Components distributors.

The Motorola Discrete Hybrid Components Data Book is avail-



Mirage's all-mode 100-Watt UHF amplifier.

M-Squared Engineering's HT receiver coverage expander.

able from *Motorola Semiconductor Products, Inc., PO Box 20912, Phoenix AZ 85036.* Reader Service number 484.

HANDI-CON V

The Handi-Con V (HC-V) is a self-contained VHF-HI converter intended for use with fully-synthesized 2-meter hand-held transceivers. Multiband operation will expand receiver coverage to 2400 possible channels. A replica of either the 154-158-MHz Public Service or the 159-163-MHz Marine Band is created at the receiver input. This allows reception of fire, police, sheriff, and other emergency services or coastal/inland marine communication, coast guard, and National Oceanic and Atmospheric weather service, respectively.

Frequency selection is achieved as normal through the keyboard or thumbwheel switches of the transceiver. Connection is made by simple series insertion between radio and antenna using standard BNCs. Operation with transceivers using threaded antenna mounts is achievable with readily-available adapters.

The passband of the HC-V includes the 2-meter band, enabling multiband as well as multi-channel monitoring with transceivers that have scanning capabilities. The combined sensitivity is much less than 1 μV for most transceiver/converter combinations.

An internal clamp network provides protection from accidental transmitter rf to both converter and transmitter for up to 5 Watts for up to 5 seconds. The "off" position disables all converter circuitry and restores normal transceiver operation without having to disconnect the HC-V.

The HC-V operates on a single AAA battery with an estimated battery life of up to 6 months or more at a use duty-cycle of 30-40%. The case size is 2-1/4" x 1-1/2" x 1-3/8".

For more information contact *M-Squared Engineering, 1446 Lansing Ave., San Jose CA 95118; phone (408)-266-9214.* Reader Service number 482.

LETTERS

HOLLOW WIN

Today, I received word from Bill Gosney, your Contest Editor, that I had been disqualified from *73 Magazine's* 1981 160-Meter Phone Contest due to excessive power output from my station.

First, let me say that I was not surprised and, second, that I plead guilty! But how, you might ask, did the contest committee come up with this information? Here is how.

After recopying my log sheets, duping, and finalizing my contest results (910 QSOs/ 400,000 points), I came to a paragraph on the summary sheet that required my signature. I had to swear that I had abided by all rules and regulations of *73 Magazine* and the FCC. Well, I could not bring myself to sign it because during the contest I used the home-brew linear (4-1000) that I had completed the day before the contest.

I know that if I had made my own summary sheet instead of using *73*'s, I could have avoided that hurdle like most of the other guys did, but I could not. Instead, I contacted Dan Murphy WA2GZB, the contest chairman, and informed him of the situation. He advised me to go ahead and send my logs into him, anyway.

I also told him that, in my opinion, everyone who had done really well in the contest also had used an rf amplifier of a power equal to mine. Dan acknowledged that he was aware of that fact and said those guys were not as honest as I in admitting to using an amplifier. I call these people hypocrites because they tell people they are using legal power and that their antennas are doing a spectacular job.

During the contest, my signals were never louder than those of some of the other big boys. Don't you find that interesting? I don't know of one contest station I have visited that did not have a 160-meter amplifier. Why all the secrecy? One has to use an amplifier on 160 during a contest to be competitive because everyone (or almost everyone) does. I would like to add that I did not use an rf amplifier before the LORAN shutdown in early January. I wonder how many other contesters can say the same thing.

I knew that I would be disqualified when I made these admissions, but I feel that about 90% of the other guys in the contest also should be disqualified or should at least have the guts to disqualify themselves.

Willy Worth WB3GCG
Brandywine MD

I admire your honesty, Willy. It's too bad you didn't let your conscience be your guide before the contest as well as after.

As a contester, I cannot understand what fun it is to win by violating the rules. To my mind, an operator who plays the game that way is no better than a small-town bully; he always gets his way, but so what?

A hollow victory is no victory at all.—Jeff DeTray WB8BTH.

NOISE-BRIDGE CORE

I am writing to point out a small error in your otherwise excellent article on the noise bridge ("QRM-Free Antenna Tuning, August, 1981).

The Indiana General core specified is made in a number of different ferrite "mixes" and you must specify which one you want. The commonly used one is the Q1 mix.

Also, Indiana General has changed their numbering system, so the CF-102 is now known as the F625-9. Thus, one should ask for F625-9 in Q1 mix.

If you order from Amidon, you should specify an FT-37 core with 61 mix if you want a core just like the F625-9 in Q1 mix. Are you confused by now? The T50-2 is an iron-powder core and, in my opinion, would not be as good as ferrite in this application.

Another way to get the proper core for this transformer would be to order from Palomar Engineers and ask for their F-37-Q1 core. This is exactly the same as the Indiana General F625-9 in Q1 mix. Send 60¢ each along with $1.50 per order shipping to Palomar Engineers, 1520-G Industrial Avenue, Escondido CA 92025.

Jack Althouse K6NY
Palomar Engineers

NOTES ON FLYING

In reference to "A Flier's Guide to the Airways," August, *73*, I have been an admirer of Jim Weir and the RST Company ever since its founding—a truly outstanding and innovative operation.

I do have a couple of nit-picks, however. First, one does not become aeronautical mobile until one is outside the limits of the continental USA. Otherwise, you are air mobile or simply mobile. By the same token, one does not become maritime mobile by being in a rowboat with an HT in a local lake.

Second, the article must have been in the editor's in-basket for a number of years [Are our faces red?—Editors]. Aviation gasoline now costs about $2 per gallon and the aircraft mentioned in the article would use at least $15 worth of fuel per hour.

The article was very useful to me because I had never heard of the Advisory Circular 20-98.

One problem Jim did not mention involving air mobile operation is noise. Most cockpits present a very noisy environment and the average microphone just can't cope with it. Even many of the "noise canceling" mikes don't hack the program. I use a Turner "Road King 50 Trucker's CB Special" and it is so effective that most people do not realize that I am in an aircraft (a noisy Mooney). Unfortunately, this microphone has been out of production for some years. If you see a used one, grab it.

Ken Hargrove W4OQP
Orlando FL

Thanks for the clarifications, Ken. Seems inflation has caught up with the magazine business in more ways than one.—Editors.

A PHOTON TORPEDO

I take exception to the theory put forth by W4FD and W4ATE (July, 1981, p. 52) that photons of light constitute the medium through which radio waves propagate. The theory sounds somewhat plausible, but has one major deficiency. Namely, if radio "waves" need some sort of medium to travel in (such as an "ocean" of light photons), then what sort of medium exists for the propagation of light "waves"?

Perhaps, the authors would suggest that since radio waves travel through light waves, then light waves must travel through X-rays and X-rays through gamma rays. In other words, perhaps there is an infinite succession of media, each having a shorter wavelength than its predecessor. But this is impossible, because the energy of photons increases as their wavelength decreases. An infinite series of media would require an impossible amount of energy.

The authors apparently would like to ignore the fact that light photons often behave like waves. Light has definite wave-like properties which easily can be demonstrated with a lens or diffraction grating. Now since a "wave" is usually interpreted as the propagation of some sort of "disturbance" through some sort of "substance," it is "logical" to assume that space is filled with some sort of "aether" which transmits "light vibrations." Of course, no such substance has ever been discovered (except for the ocean of photons proposed by the above authors).

Perhaps, the authors then might suggest that light waves are propagated merely by virtue of their particle-like properties alone. If photons are really particles, then they can travel through a vacuum without any assistance from a "medium" at all. We simply will ignore their wave-like features. But if this is true, then we don't need the authors' theory at all, because it turns out that radio waves also consist of photons and therefore would not require a "light-assist"! Radio and light are the same form of energy. The fact that radio photons have longer wavelengths has no bearing on the matter.

I also take exception to the authors' implication that a photon has a rest mass "as does any solid." The man who discovered the photon (Albert Einstein) proved that a photon cannot have a rest mass be-

cause otherwise it could not travel at the speed of light. A photon does have energy and this energy can be equated to mass by the famous $E = mc^2$ equation. Therefore, the more energetic a photon is (I.e., shorter wavelength), the more mass it will appear to have.

This apparent mass can be observed In such phenomena as the solar wind, as the authors correctly pointed out. But photons do not exhibit mass properties such as elasticity or rigidity, which are necessary for the transmission of vibrational energy through a physical medium.

John C. Day
Ormond Beach FL

That's easy for you to say!—Editors.

KUDOS

I was quite pleased to see a review of *The Radio Amateur's Conversation Guide* by the two very competent Finnish linguists OH2BAD and OH1BR in your July, 1981, issue. I previously had read of this book and its authors in the NRRL magazine, *Amatorradio*. In defense of the lack of a pronunciation guide in the book, I would like to make the following comments.

Given the international scope of this book, it would be almost impossible to give pronunciation guides in agreement with everyone's language. I will agree that there is a need for such a pronunciation guide, a need which could have been answered by use of the International Phonetic Alphabet (IPA). However, not everyone is familiar with the IPA, and extra pages would have been spent to explain the numerous phonetic symbols in each of the languages represented in the book. The availability of the cassette, therefore, is a much easier and more readily accessible answer to the need for a pronunciation guide.

Realizing fully that most Americans are considered almost as linguistically ethnocentric as French Quebecoises, the appearance and hoped-for acceptance of such a work as *The Radio Amateur's Conversation Guide* is heartening, to say the least.

The age-old myth of the difficulty in learning a second language is easily dispelled by the simple truth. Each of us had learned the essentials of one of the world's most notoriously confusing languages before any of us had learned to read or write. Adding another language is a simple matter of concentration, the same concentration that we all use to learn the International Morse code.

In passing, I might also add that Jukka and Miika Heikinheimo are both accomplished linguists. Miika is a scholar of ancient languages and theology, and Jukka, who studied Russian and Spanish at Helsinki University, operates a translation bureau, complete with computerized text processing equipment. Both are to be congratulated for this excellent book.

Nils R. Bull Young WB8IJN
New Carisle OH

Si Habio dit-dit?—Editor.

MULTIMETERS

After reading your "*73 Magazine* Staff" article titled "Maximize That Multimeter" in the June issue, I feel compelled to write and give my feelings about some bad ideas expressed in this article.

First of all, a plastic meter case could render the unit worthless in the presence of typically encountered rf levels.

"Multimeters" generally do not have the need for three leads, but virtually all VTVMs do. The constant input resistance of VTVMs allows for the convenience of the important isolation resistor. A VOM, because of its input resistance change with range change, doesn't have this facility. For this reason, a VTVM is necessary for dc voltage measurements with the presence of a signal. The VOM without the isolation resistor tends to drastically affect the circuit impedance (especially video and rf circuits, but high-impedance hi-fi amp circuits are not immune). Rf getting into the VOM tends to be rectified by the commonly-used meter-protection diodes, causing erroneous readings. In our studio, a Simpson 260 VOM lying on the service bench will give a half-scale reading when the leads are inserted but not connected to a circuit.

At the transmitter, we have found that a VTVM with a 100-megohm resistor in place of the 1-megohm original has both given the scale a $\times 10$ factor and made it entirely immune to the presence of rf around the 5-megawatt ERP transmitter.

Using a meter which has a 1.5-V cell to power the ohmmeter section *may* produce enough voltage at the probes to turn on a silicon device, but does not do so for all conditions. For example, the full 1.5 V occurs at the probes only for infinite resistance, but at zero Ohms the voltage is zero. The amount of voltage at the probes is between zero and the 1.5 V as measured on a linear scale having 0 V at 0 Ohms and 1.5 V at infinite Ohms. A VTVM is the best meter to first visualize this relationship on. Therefore, simply use an ohmmeter range which gives a reading with less than about 0.25 V across the probes, and silicon devices are not turned on. The accuracy of this method is good enough for 99% of your service needs.

Franklin E. Swan W9SIA
Chicago IL

TORTURE

Concurrent with the ongoing debate about dropping the code requirement for a ham license, the media recently recounted an interesting story about one of our Vietnam POWs who used code to communicate with the outside world in an unusual way. To verify that the story is true, I wrote to the Honorable Jermiah A. Denton, Jr., now a Senator from Alabama, and he did indeed blink out "torture" with his eyelids while making a forced TV interview. A copy of his reply is attached.

Dear Mr. Crom:

I sincerely appreciate your comments of June 24, and am glad to respond to your request for my views on the Morse code requirement in FCC licensing of ham radio operators.

The FCC, as you are probably aware, has 2,400 personnel with which to supervise every facet of communications in the USA, with only 450 of these in the field. Rigid rules and reliance on self-policing from other operators are both logical and necessary.

Requiring proficiency in Morse code is one way, a good way—an economical way—to maintain both quality and discipline in what could quickly become a nightmare in amateur radio operations. In my particular case, had I not known Morse code, I would have been denied the one viable option of communication open to me while a prisoner of war, so I am definitely in favor of it.

Jeremiah A. Denton, Jr.
United States Senator
Washington DC

It is hoped that this incident will help motivate others to put in the little extra effort that will help keep ham radio from becoming an extension of the CB mess.

Russell C. W. Crom AG9N
Mt. Prospect IL

BEING POSITIVE

After being a subscriber and reader for quite some time, I thought I would drop a note to you and tell you how much I enjoy both your editorial and also your magazine. I always read your editorial first, followed by Awards, Leaky Lines, and Looking West. Keep socking it to those Connecticut "good old boys," Wayne. At least you seem to remember from week to week where you have drawn your lines.

I don't know if you still plug dealers in your magazine but if so, please log up a couple of gold stars for the Electronic Center in Lincoln, Nebraska. I acquired a Kenwood TR-7800 from them at a recent hamfest in St. Paul. The nicads used for memory retention would not charge. I called them up on their toll-free number and they advised me to send it to them. I did so and had it back in 12 days fully operational. Their tech claimed pilot error for the malfunction, but whatever the reason, it works fine now.

Bob Cronberg KBØXR
Plymouth MN

Wayne, Bill, Dave, and Bill appreciate your pat on the back, Bob. Any fans of our other columns out there?—Editors.

MR. DX

I would like to express how much I enjoy the new DX column by Yuri VE3BMV. This is not the kind of DX column that I am accustomed to reading in any other monthly ham radio magazine.

His column has real information that can be used on the air, up-to-the-minute info on the rare ones, and great operating aids for the DX hunter. It is obvious that Yuri has a great deal of knowledge of DXing, and is not reluctant to share it with us.

I look forward to this valuable addition to *73 Magazine.* You fellows at the front office have really snagged a rare one by getting Yuri.

Ron Brown WA3CEC
Dundalk MD

Sh-h-h-h! We don't want Yuri to get a big head.—Editors.

BOHME?

In your editorial in the July issue of the magazine, you mentioned possible implemenation of types of high-speed communication. I have had some experience in Bohme, which at the time had capability of 600 wpm. This was in 1943 when I was CO of WVNT, the hub of Signal Corps communication in the Middle East.

It is my belief that this was the first time the Signal Corps attempted to operate their own 40-kW point-to-point station outside of the USA. The location was Asmara Eriteria, elevation 7600' above the Red Sea port of Massowa, and 65 miles by road from there. The station was fitted with punched tape (Kleinschmidt, or Bohme) transmitter heads, and the receivers were located 6 miles away with triple diversity operation output back to transmitter location where the tapes were made for retransmission via Manual Station to Cairo, the Persian Gulf, and other stations. We also handled all communication for the operations in north Africa until the invasion of Oran and Algiers, when a similar station was set up there (Algiers).

Today, with solid-state equipment (Hal) I find that 200 wpm is possible, and understand that printers are available commonly to 600 wpm. My Hal equipment will print (on monitor) 300 baud, 30 characters/second, or 1800 characters/minute, or 360 words/minute. This is not bad for starters. I have experimented personally with 100 to 150 words/minute. I am going to try to work out something with a friend who has the same equipment I have, and will report results.

I would appreciate any feedback that can come about as a result of this work, I have a kW to a 20-meter dipole and about 600 W possible on 15 and 40 meters where, unfortunately, few RTTY stations operate. I have not tried 75 meters, where I have heard some operators.

Henry B. Plant W6DKZ
4160 Holly Drive
San Jose CA 95127

CW at 200 wpm? It's a good start, but we can do even better. Let's get some reliable 1200-baud ASCII systems working. The FCC seems receptive to STAs right now. Don't forget to write it up for 73.—Editors.

KAHANER REPORT

Larry Kahaner WB2NEL
PO Box 39103
Washington DC 20016

FOR WHOM THE BELL TOLLS

AT&T and the Bell operating companies no longer have the only wheel in town. You've seen the commercials for a company called MCI: "You haven't been talking too much, just paying too much!" MCI, a company which didn't exist until several years ago, offers a cut-rate long-distance service which pushes AT&T long lines out of the picture.

The system is ingenious but at the same time simple. You dial a local access number (5 digits); when you hear the beep, you enter a 6-digit code number (that's so they know who to bill the call to), then the area code and phone number you want.

The call is routed from the local access number through a network of microwave relays until it reaches the final destination area. Then the call connects back into the local phone network and your hookup is completed.

As I said, simple. Ma Bell is cut out of the action except for the two local calls.

AT&T tried to keep MCI from skimming the cream off the long-distance business, wouldn't connect their network, and generally made life miserable for the company. MCI took them to court and won a whopping $1.9 billion. AT&T is, of course, appealing the decision.

Don't get me wrong. AT&T did have reasonable grievances about the new kid on the telephone block. AT&T invested in an entire network, local and long distance, and MCI is taking the most lucrative part away. It's difficult sometimes to feel sorry for a monopoly which racked up a $6-billion profit last year, but they do have a point.

Anyway, MCI is doing very well. 1981 fiscal year net income totalled $21 million.

Ironically, they're still not happy. They don't want their customers pressing so many buttons. They want you to hook directly into the local phone loop without all the fingerwork.

AT&T maintains it isn't possible. MCI says it is, and they proved it. MCI cut a deal with a small independent telephone company in northwest Iowa—Northwest Iowa Telephone. NIT's 2,100 customers in three Iowa cities have an equal choice between dialing via AT&T or MCI.

If a caller dials "6," then the 10-digit long-distance phone number, he goes MCI. It he dials "1," then the 10-digit long-distance phone number, he travels AT&T. Service was expected to begin Aug. 1.

MCI President Bill McGowan told a group of reporters, "AT&T could do this for us, but they don't want to. AT&T argued that it couldn't be done, but this agreement proves otherwise."

One funny note in all of this: The agreement was broached by the small telephone company to protect its interests from MCI which was planning facilities in Sioux City, an area partially serviced by NIT. MCI would have siphoned off some of the long-distance revenue which AT&T kicks back to the local operating companies. MCI, which used to fight the big bully, was, in this case, a bully itself.

And a footnote—Why did MCI choose the number "6"? Well, because it corresponds to the letter "M" for MCI!

Okay. So MCI—and to some extent Southern Pacific which operates the SPRINT system—have installed networks to replace long-distance service. Bell still has the local loops, right? Yes, but even that's up for grabs. It began about five years ago when Xerox proposed something with the space-aged name of XTEN. It was to be a local digital network, mainly for high-speed data traffic to and from major metropolitan areas.

This was the plan: Xerox was going to install a centrally-located microwave dish on the tallest building it could find. (The second tallest would have worked, too.) Then on your office building, you install a microwave dish which feeds data from you (by way of a network inside the building) to the central dish. The data is then sent via satellite or AT&T long lines. You bypass the local phone company, which can't carry high-speed data in most cases, anyway. Of course, you're not the only one using the system; others in your area are doing the same thing, using dishes on their buildings. Xerox envisioned a mini-network feeding into one, possibly two, central points.

Xerox convinced the FCC that this was such a good idea that the Commission authorized DTS, Digital Termination Service, in the 10-GHz range. Xerox couldn't be happier. After all, they were the only ones thinking of such a thing, and they expected to clean up.

Well, things got a little out of hand. Management appeared unstable; changes were made. In short, way behind schedule and a couple of bucks behind, Xerox dumped XTEN earlier this year.

But alas! Another company (named ISACOMM) has jumped into the scene and asked the FCC for permission to offer a similar service.

Local users, once they connect via microwaves to the central point, will have their messages transmitted by satellite to

users in other cities with the same setup. Not only is AT&T out of the long-distance action, but out of the local action as well.

ISACOMM is owned by Insurance Systems of America, a consortium of insurance companies. The reason why they backed the network seems clear. Insurance companies must move lots of high-speed data quickly and cheaply.

But ISACOMM isn't stopping there. According to the filing, the firm plans videoteleconferencing, voice, and other services. Although the intent, at first, is clearly to serve its backers, it may, one day, expand to the consumer.

The initial plans call for the linking of 30 cities. The first central site is Atlanta.

So, what have we got here? Competition for AT&T and the local Bell operating companies for the very first time.

Don't ask for whom the bell tolls, Ma Bell. It tolls for thee.

JUST FOR THE RECORD

The FCC has added some new commissioners: Henry Rivera, a New Mexico lawyer, and Mimi Dawson, a congressional aide. This complements the full commission, consisting of Chairman Mark Fowler, James Quello, Joseph Fogarty, Abbott Washburn, and Anne Jones.

In a personnel change more directly affecting hams, we learned at deadline that Carlos Roberts, chief of the private radio bureau, was planning to leave at the end of August. He was offered a job as director of land mobile development for M/A Com Labs in Gaithersburg, Maryland. You may know M/A Com as the parent of Microwave Associates, a firm that sells microwave gear for amateur use.

His replacement will be James McKinney, now chief of the field operations bureau. McKinney is well respected and has always held ham radio in high regard. On several occasions, at FCC meetings, McKinney has called amateurs the best disciplined group that the Commission manages. Maybe he hasn't listened to 80m lately, or perhaps his 2m rig is on the blink. Or maybe, just maybe, compared to everyone else, we're tame. That's a scary thought.

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 8

right outside the back door of the room. Chuck and Tim quickly put up an antenna and were batting 'em out on 15 meters. I was able to get in edgewise and operate, but most of the time the band was open to Europe instead of the US. I didn't find the pileups that I did when operating from Turks and Caicos Islands.

The next morning we had an appointment with the Prime Minister of the country. He wanted to thank me for sending Tim down last year with the four trunks of ham gear to help them after the hurricane. That was the worst hurricane the island had had in a hundred years or so. It wiped out most of the banana crop, demolished hundreds of buildings, and screwed things up for a long time to come.

This gave me an entry to talk about the possible development of ham clubs on St. Lucia to get teenagers interested in amateur radio. The PM was very interested in this and I think we may be able to get that started. The idea is simple... interested hams or clubs in the US could provide the funds for club stations to be set up in youth centers in St. Lucia. Their government would provide someone to teach the fundamentals of electronics and radio, while the students learned about operating by running the club stations. Thus, the youngsters would get the enjoyment and enthusiasm of being able to operate while they are learning the basics of radio. With this grounding, the teenagers would have a head start toward technical careers in electronics or communications. Technical people are needed desperately in small countries such as St. Lucia.

This plan is similar to the one I outlined for Jordan and which got their youngsters started in careers in electronics.

If any hams or clubs are interested in helping this project, I think we can furnish a first-rate club station for about $1,500, buying the equipment at wholesale. Part of the bargain is an opportunity to make a visit in a year or two and see the hams which your station has developed. I would like to have as many hams as possible share the thrill I had when I visited Jordan and had a chance to meet the hundreds of young hams which my first visit had brought about.

St. Lucia has an advantage over most countries in that there is no duty on ham equipment. Canada managed to cost itself millions of dollars in lost technicians and engineers by putting a heavy duty on ham gear. Indeed, there are many countries where just the duty alone on a small rig is more than the average educated local earns in several months. I'm not talking about a sideband rig—just a simple CW transmitter. I remember talking with a ham in Egypt who had to spend four months' wages to import a ham rig sent to him by an enthusiastic American ham. It *could* have been done at less expense if the American ham

That's the Prime Minister talking with me... with Tim to the right of me and Chuck to the left side of the picture.

The small and crowded streets of Castries on St. Lucia are jammed with traffic much of the day... just like New York. The pace of life there is slower and the prices more reasonable. Note the lady with the bundle on her head. Most of the cars were Japanese... with some Russian versions of the Land Rover growing in sales.

had sent it in pieces, but even so, the duty would have been painful.

St. Lucia is a wonderful place to visit, but I discovered that a visit can be dangerous. I found several Americans living on the island. They came down just for a visit, found out about the low cost of living there and the beauty of the island...and moved down. I understand that one can rent a small house on St. Lucia for about $100 a month. And, while most of the bananas are exported to Britain, you can live economically on local foods.

By the way, bananas grow quickly, so the devastation of 1980 was already just a memory. Each time a banana plant grows and provides its bananas, it is cut down and a new plant grows from the roots. Fresh pineapples, coconuts, mangoes, papaya, sugar apples, and so forth are growing all over the island.

The hams on St. Lucia reflect a wide area of interests. One runs the electronics store in Castries, the main town. Another is a lawyer. Another runs the yacht club (and issues the ham licenses).

We were taken on a trip around the island, all the while in touch with most of the active hams via the .34/.94 repeater. This was a beautiful trip, showing us the dry, the rainy, the mountains, and the flatlands which make up this small island. It's about 40 miles from one end to the other. I hope you'll get a chance to see my slides.

On the southern tip of the island, we went to the top of a mountain and I had the kick of working a chap who was visiting Barbados. Not bad for a 2m hand transceiver.

We enjoyed meeting the businessmen of St. Lucia at the Rotary meeting, and the hams got together for a big cocktail party, complete with marvelous snacks...and Miss St. Lucia, the recent winner of the island beauty contest.

None of the hams was into scuba diving, but they did take us to St. Lucia Divers, where Chuck, Tim, and I arranged for a dive trip. Actually, Chuck and Tim went snorkling while the divemaster and I went down with scuba gear. I had along my camera and a new flash unit, and snapped pictures until the film was done. The dive spot was beautiful, even if it was about 20 miles down the coast from Castries...a long, bone-jarring boat ride. The underwater scenery was great for both snorkling and scuba, with a headwall going down sharply for the adventurous. There were plenty of gorgeous coral formations and colorful fish.

After the dive, we packed up and went a boat-banging twenty miles back to Castries. I think the ride was more exhausting than the dive. Anyone with a tendency toward seasickness should not make that trip. Sherry wisely opted to hear all about it later. She'd made a similar trip with Chuck and me at Turks and decided not to go through that again. The next trip to St. Lucia, I think we'll stay at the hotel right by the diving spot...near the town of Soufriere.

The four-day extended weekend "vacation" was over all too soon. Our hosts picked us up at around 6:00 am and drove us the hour and a quarter to the airport and we were on our way. The plane stopped for a few minutes at Guadeloupe, but they wouldn't let me off to collect one more country visited.

We soon were back in the air with the next stop St. Croix, where they have an international airport. Here, we had to get off the plane and go through US Customs. I declared the only thing I'd bought...a straw hat. On the next hop, we flew over Puerto Rico, where I was able to take a long shot of the disk at Arecibo, and then on up the islands. We went right over Providenciales, where we had visited in March, and I took a picture of the Bob Cooper estate and TV receiving dish. Soon we were in Miami and then on our way to Washington...and Boston.

Speaking of Miami, on our way down to St. Lucia we had to stop there. We were met by two good friends of Tim's, Don and Mary Johnson, who took us for a visit to N&G Electronics...and a Mexican lunch. They made the stopover between flights a fun time. I was particularly impressed by the N&G store and the amount of ham gear they have in stock. They showed me the plans for their new store, which they will be starting on soon. It will be in the same general area, not far from the airport, but will be much larger. A good deal of their business comes from Latin America.

Outside of a short DXpedition to Swaziland and Lesotho in August, I had nothing much planned for a while. Those countries were to take me over the 100 mark in countries visited. Should I start working for 200 or just settle down and take it easy? I was on the air from both of them, as well as South Africa.

INFORMATION STATIONS

At long last, microcomputer technology is beginning to really get involved with amateur radio. There is no question in my mind but that it is going to take over and amateur radio will never be the same.

You've probably at least seen pictures of the Radio Shack pocket computer. Well, this is not a very big computer, but it is a decided development over the pocket calculators. It has a small BASIC language built in, so it can be programmed to do almost anything...and that includes some word processing.

A recent development in this line is the new Casio pocket computer (FX-702P)...a six-ounce computer with a five-pound manual. This, along with the Sinclair ZX-80, which is selling for $150 to $200 most places, could be mated with a ham rig to provide a sort of instant message service. Let me go into that in more detail.

Those of you who are already busy with microcomputers are aware of the growing interest in telephone bulletin boards, data services, and that sort of thing. Well, these can just as well be organized over the air. Instead of having a W1AW sending hours and hours of voice and CW messages every day, a radio bulletin board (RBB) station could sit, listening to a channel, for any inquiries. A request would bring on the sending in ASCII of a message which would be a menu of what is available from the RBB station.

The inquiring station would then select some part of the menu and ask for that information...which would be sent by the RBB station. What sort of information would be appropriate? Well, how about the latest in DX news, listing calls, QSL managers, times and frequencies, dates of expected operation? New countries then could be found easily. Or, how about Westlink news? Or other news reports? Then we could have the latest in FCC news, with release, proposed rule changes, dockets, and the dates for comment, perhaps even some ideas on the dockets to help amateurs explore all aspects of the proposed rule changes.

There are many information broadcasts which would be of value to amateurs, once we get to thinking about them. We could have a repeater update, hamfest information, a net directory listing all active low-band nets, their frequencies, times, and special interest. Traffic nets could be listed. Satellite information. The more you think about it, the more information comes to mind which would be of interest.

Using the old 300-baud standard, which to me is about like forcing everyone to send Morse code at two words per minute, we could send about 230 words per minute. This, as I mentioned recently, is the reading speed of a very slow reader. This makes as much sense as two words-per-minute CW. I think we'll have to start out with that, but I would suggest an immediate push for 1,200 baud as quickly as possible. That brings us up to about 1,000 words per minute, which is a lot better...but nowhere near what we really want.

Since 9,600 baud is being used with success over ordinary telephone lines, I would recommend that we move in on that standard. That would give us around a 7,300 words-per-minute transfer of information. Now we're talking a second or two for each transmission and the ability of many stations to access the RBB station in a short time.

HOW IT MIGHT WORK

Let's imagine our bulletin-board station set up on a synthesized channel. Let's further ask it to identify occasionally and send out regular pulses to hold the channel...perhaps one every second.

If I want to check on the latest DX news, I would type in "M?" on my built-in microcomputer system. Then, the next time the RBB polled the channel my rig would respond with that request for the menu. The RBB would immediately send a "bullipp" which would read out on my screen as the menu of information available. Number 7 might be my hot DX news, so I would type a "7" and a half-second

later, the RBB would poll my rig and trigger it to send the "7". The RBB would then dump the DX news, which might sound like a "beedlerupp" and I could then read out the hot scoop from my screen.

Obviously, we're going to have to experiment with error-correcting codes which will tell the other station how many bits of information are going to be exchanged. If the right number does not get through, the message can be repeated...or the missing part of it repeated. We're talking milliseconds, but we still may have to cope with CW jamming and other aggravations.

TRAFFIC HANDLING

Once we have a communications system which will perk along dependably at 7300 words per minute, we obviously have made it possible for a way to handle traffic that will knock the sox off voice or CW message handling. Not only can our messages go through without error in a second or two, but we also can address them for automatic relaying on any band. Relaying stations can be set up to poll a channel for traffic going to that area, perhaps pulsing every minute or so with a quick identifier. A hundred relay stations could all use the same channel without interference.

And once we are set up for that, imagine the value of this system for emergencies. A small pocket computer plugged into our mobile rig would enable us to join such an emergency net and have our traffic sent and received...or relayed...all automatically. Voice may be a little easier to use, but the speedy, error-proof digital system would win out. Of course, they are working hard on voice-to-digital encoding systems. They may eventually get one which works well. Going from digital to voice is a lot simpler...that's even built into my pocket Talking Clock now. And I saw talking wristwatches at the Consumer show in Chicago. They were junky, but a hint of what is coming.

EXPERIMENTING

I assume that we will have the usual number of hams who will do everything in their power to try to fight progress, complete with jamming experimental message-handling stations. Well, you may be able to drive a few pioneers up the wall, but you really are not going to be able to stop the marriage of computers and amateur radio. If you can't help us to grow and invent new communications techniques, at least don't make it so difficult for those of us who are really trying.

I came into amateur radio not very long after the last spark transmitter had been outlawed. If you read your old magazines, you'll find that there were a bunch of old-timers hanging in there, chanting "spark forever" right up to the minute it was illegal for them to use those rigs. They fought progress as hard as they could. We had a similar situation with sideband, with old-timer AMers hanging *in* there, bitching and moaning and making a mess out of the bands.

Will CW finally blow away as the cost of microcomputers keeps coming down and a computerized communications system is not much more expensive than a CW rig with a keyer? Well, who needs five words per minute when the same rig can shoot out 7300? For what? For emergencies? Hell's bells, if there ever is a time when we need automated fast communications, it is during an emergency. We need to be able to hook mobile, hand-held rigs, low bands, satellites, repeaters...everything together automatically. If we have the system going on an everyday basis, we'll have it there when we need it.

With satellites tied in, we will be able to reach any amateur in the world via autocall through our traffic-handling nets. We'll have instant access to enormous amounts of information through RBB stations. And the best part of it is that we really have very little to invent. We already have most of the basics that we need, with experimentation required to find out the best way to get it all to work...and then time to get enough amateurs involved to make the system work.

WHAT'S WAYNE DOING?

This is more of a letter to the several thousand personal friends who read *73* every month. Hello, Shep....

80 Microcomputing, which I started last year, is doing exceptionally well, running about 300 pages and more per month. I've also started a monthly dump of the programs from this magazine on cassettes called Load 80...another winner. Then there is the *Encyclopedia 80,* a monthly book of material on the TRS-80...things not published anywhere else...and a cassette dump of the programs for this called Encyclopedia Loader. That brings the monthly publications to eight, if we include *Desktop Computing.*

There are six more publications in prospect, including one for satellite TV, one for women's health, an Apple magazine... and so on. *Deskop Computing* will be out this month, the first computer magazine written totally in plain language.

As if that isn't enough to keep track of, we are working toward starting a technical institute to teach microcomputers, electronics, and publishing. I'm hoping that something can be done to get our government to help students from Third World countries to come and get an associate degree in electronics so that they will be able to go back home and help the growth of communications...and education.

Russia and Cuba are still going strong helping emerging nations with education, but their education has that political flavor we really don't need today. I wish that the US would recognize the importance of helping smaller countries develop and not ignore them until it is too late.

The Instant Software division is in a fast-growth mode. It takes up most of the Elm Street building and has the largest microcomputer lab in the world. Over 10,000 programs have been sorted through and evaluated, with about 1,000 being okayed for mass publication. Most of these are for the TRS-80, but we're making a major effort to get these converted for use on the Apple and Atari. We're also working to get programs written or converted for the Casio computers...the 702P and their new 9000.

My recent visits to the major microcomputer firms have been encouraging. A year ago, none of them really appreciated the importance of software to the sale of their product...now only Radio Shack seems to still have its corporate head in the software sand. This could be the breakthrough that Apple needs to get ahead of Tandy. Of course, this means more and more business for Instant Software.

Our Irish plant is now running, supplying software for Europe and Africa. I was in Africa for three weeks in August. There was a microcomputer exposition in Johannesburg, and I spoke there on world microcomputer industry trends, software developments, and so on. I also had an opportunity to address the Apple dealers and bring them up to date on the world Apple situation.

Outside of that...and being the president of the Peterborough Chamber of Commerce this year, I'm loafing around. As Dorothy Parker once wrote, burning your candle at both ends makes such a pretty flame.

HAM HELP

I'm looking for ham call license plates for my collection. I would like to swap for or buy plates from other states and provinces.

Bryan Hastings KA1HY
64 Concord Street
Peterborough NH 03458
(603)-924-6902

Does anyone know of any CW nets that a greenhorn might be able to check into to improve his CW operating proficiency? I'm not permitted to handle third-party traffic and even in the Novice band I get clobbered by QRM. Any suggestions would be appreciated. Many thanks.

Clano R.E. Strachan C6ANI
PO Box N4106
Nassau NP Bahamas

I am looking for information on the HW-12-22-32 triband conversion made by Dynalab.

Jim Fyles WB0CZI
820 El Paso Blvd.
Denver CO 80221
(303)-428-6860

OSCAR ORBITS

Courtesy of AMSAT

TUNING IN TO OSCAR 8

OSCAR 8 is the only amateur satellite available for everyday communications. Using the satellite for two-way contacts requires a 2-meter signal of about 100 W ERP. This can be achieved either by using a linear amplifier or by erecting a high-gain antenna which is movable in both azimuth and elevation. Such complexities are unnecessary, however, if you simply want to listen to OSCAR 8. In fact, listening to OSCAR 8's 10-meter downlink is a fairly simple procedure and an excellent introduction to the fun of satellite communications. The satellite operates in Mode A (10-meter downlink) on Monday, Tuesday, Thursday, and Friday. The only equipment required is a receiver capable of tuning the high end of the 10-meter band and an omnidirectional antenna or dipole for 10 meters. You will also need some idea of when the satellite is in range. The simple method outlined below will help you determine when to listen for OSCAR 8, and it requires nothing more than a pencil, paper, and a pocket calculator. The method works satisfactorily for all locations in the northern hemisphere.

WHEN AND WHERE

The first step in using the data in the chart of orbital information on this page is to divide a sheet of paper into three columns labeled "Orbit No.," "Time," and "Crossing." Select a day that OSCAR 8 is scheduled to be in Mode A, and write the corresponding orbit number from the chart in your first column. Then get the time and equatorial crossing longitude from the same row of the chart and write them in the second and third columns. You should now have one row of data on your paper, the same data found in the chart for the date you have selected. At this point, you are ready to calculate the equatorial crossing time and longitude for each orbit of the selected day. A pocket calculator will be helpful for this, but even so, the process will be time consuming. We all must make sacrifices in the name of progress!

Now, add 1 to the orbit number and write the result just below the first orbit number. Add 103 minutes (1 hour, 43 minutes) to the original time in row one and write the result in column two of the second row. Finally, add 26 degrees to the longitude in row one and write the result in column three of row two. You should now have two complete rows of data in the homemade table you are constructing. Repeat this procedure, adding 1, 103, and 26 to the most recent numbers in columns one, two, and three until the total in column two exceeds 2400 hours, indicating that you have reached the end of one day's calculations. Whenever the total in column three exceeds 360, simply subtract 360 from the number before writing it into the table. There should be 14 or 15 rows of data in your completed table.

What you have just done is to develop a table showing the orbit number, crossing time, and equatorial crossing longitude for each orbit in the selected day. In essence, you have filled in the gaps in the charts printed in the magazine, which show data for only the first orbit of the day. A new table must be created for each day you plan to listen for OSCAR 8.

We are almost ready to choose a time for listening to OSCAR 8, but you must first determine your longitude. This is easily done by consulting a road map, most of which show longitude and latitude around the perimeter. Now examine your homemade table. Scan the third column, looking for crossing longitudes which are between approximately 10 degrees west of your longitude and 35 degrees east of your longitude. You should find two or three suitable longitudes in your table. When you find them, go across to column two and circle the times corresponding to these longitudes. On the day in question, those are the best times to start listening for OSCAR 8. If you live near the equator, you will begin to hear the satellite a few minutes before the calculated time, while more northerly listeners will hear it after the calculated time.

This is a relatively crude calculation, but it should allow you to hear OSCAR 8 reliably. It is important to remember that the satellite operates on Universal Time (UTC). Thus, when we speak of Monday being a Mode A day, we are referring to Monday UTC, not Monday local time.

WHAT YOU'LL HEAR

The OSCAR 8 10-meter downlink spans the frequency range from 29.400 to 29.500 MHz. A Morse telemetry beacon on 29.400 MHz transmits continuously at 20 wpm, sending coded information about the condition of the satellite. The telemetry consists of several groups of three digits each. Listening for the telemetry beacon is a good way to be sure you are hearing OSCAR 8 and not some other amateur activity on the same frequency.

When the satellite is in range, you will hear many QSOs in progress simultaneously in the 100 kHz that comprises the communications passband. Although satellite users tend to stick to a band plan which calls for CW at one end of the passband and SSB at the other, there is considerable mixing of the modes. OSCAR contacts tend to be short, since the satellite is in range for a maximum of only 20 minutes.

If you have 435-MHz receiving capability, try listening to OSCAR 8's Mode J transponder. Its downlink is 435.100 to 435.200 MHz. Mode J is activated on Saturday, Sunday, Tuesday, and Friday (note that OSCAR 8 is in Modes A and J simultaneously on Tuesday and Friday). The Mode J telemetry beacon can be found at 435.090 MHz.

You may have noticed that Wednesday is not mentioned as either a Mode A or Mode J day. This is because Wednesday is set aside for special experiments and the satellite is not available for normal communications use, although you are welcome to listen to the day's activities.

When listening to OSCAR, you will notice that the frequency of the transmissions from the satellite is constantly changing. This is the famous Doppler shift, caused by the high relative velocity between you and the satellite (thousands of miles per hour!). You will need one hand on the tuning knob almost continuously during an OSCAR 8 pass.

OSCAR represents an exciting opportunity to learn and perfect a new communications technique, and listening will get you started. For more information about amateur satellites, write to the Amateur Satellite Corporation (AMSAT), PO Box 27, Washington DC 20044.—WB8BTH.

ORBITAL INFORMATION

OSCAR 8 ORBITAL INFORMATION FOR OCTOBER

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
18212	1	0051:34	75.3
18226	2	0055:25	76.2
18240	3	0059:16	77.2
18254	4	0103:07	78.2
18268	5	0106:57	79.1
18282	6	0110:48	80.1
18296	7	0114:39	81.0
18310	8	0118:30	82.0
18324	9	0122:21	83.0
18338	10	0126:12	83.9
18352	11	0130:03	84.9
18366	12	0133:54	85.9
18380	13	0137:45	86.8
18394	14	0141:36	87.8
18407	15	0002:19	63.0
18421	16	0006:10	63.9
18435	17	0010:01	64.9
18449	18	0013:52	65.8
18463	19	0017:43	66.8
18477	20	0021:34	67.8
18491	21	0025:25	68.7
18505	22	0029:15	69.7
18519	23	0033:06	70.7
18533	24	0036:57	71.6
18547	25	0040:48	72.6
18561	26	0044:39	73.5
18575	27	0048:30	74.5
18589	28	0052:21	75.5
18603	29	0056:12	76.4
18617	30	0100:03	77.4
18631	31	0103:54	78.4

OSCAR 8 ORBITAL INFORMATION FOR NOVEMBER

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
18645	1	0107:45	79.3
18659	2	0111:36	80.3
18673	3	0115:27	81.2
18687	4	0119:18	82.2
18701	5	0123:09	83.2
18715	6	0127:00	84.1
18729	7	0130:51	85.1
18743	8	0134:41	86.1
18757	9	0138:32	87.0
18771	10	0142:23	88.0
18784	11	0003:06	63.2
18798	12	0006:57	64.1
18812	13	0010:48	65.1
18826	14	0014:39	66.0
18840	15	0018:30	67.0
18854	16	0022:21	68.0
18868	17	0026:12	68.9
18882	18	0030:03	69.9
18896	19	0033:54	70.9
18910	20	0037:45	71.8
18924	21	0041:36	72.8
18938	22	0045:27	73.7
18952	23	0049:18	74.7
18966	24	0053:09	75.7
18980	25	0057:00	76.6
18994	26	0100:50	77.6
19008	27	0104:41	78.6
19022	28	0108:32	79.5
19036	29	0112:23	80.5
19050	30	0116:14	81.4

HAM HELP

I would like to contact anyone concerning the construction of the "Heterodyne Deviation Meter" as published in the ARRL *Radio Amateur's Handbook* and in the *FM and Repeaters Handbook*. In particular, I need to know the type of crystal used.

Dave Harper W4NIQ
Route 2, Lincove
Fayetteville TN 37334

I am looking for a schematic or manual on several pieces of equipment: (1) Sylvania Electric TV marker generator, type 501; (2) Weston model 779 Analyzer VOM; (3) Hallicrafters model S38C; (4) RCA Voltohmyst #195A. I will be glad to pay for any copying costs.

Lorin McNutt KA9BZP
5460 West 1200 South
Fairmount IN 46928

I need information on a crystal filter marked as follows: Filtech Corp. Crystal Filter C.F. 7.825 MHz—model 2131 P/N 780055. I believe this unit was made for Hy-Gain equipment and will greatly appreciate any data on: (a) no. of poles; (b) bandwidth @-6dB and @-60dB; (c) impedance in and out; (d) insertion loss in dB; (e) present address of Filtech Corp. Thank you.

C.A. Carhoun, WB1ACU
11A Harold Street
Harwich Port MA 02646

I am looking for a source of technical information on the VHF/UHF Radio Telephone Service, i.e., IMTS, MTS, etc. Any information will be appreciated

G.S. Wienand WD4DLY
312 Madison Ave.
Cape Canaveral FL 32920

I need a manual and schematic for the following: Hammarlund HQ-170 receiver, Heath MM-1 multimeter, United Electronics Laboratory (UEL) model F 5-inch oscilloscope (schematic only for the scope).

William N. Richmond WD4CPQ
122 E. Adair St.
Louisville KY 40214

I am in need of a schematic diagram for a Heathkit Twoer, model HW-30. I will be glad to pay any reasonable duplicating and mailing costs, or I will duplicate on receipt and send back by mail.

David Snell KA7INW
324 Galaxy Drive
Butte MT 59701

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PROPAGATION

J. H. Nelson
4 Plymouth Dr.
Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14A	7A	7	7	7	7	7	7	14	14	14A	21A
ARGENTINA	14	14	7	7	7	7	14	21	21A	21A	21	21
AUSTRALIA	21	7A	7B	7B	7B	7B	7B	7B	14	14	21	21A
CANAL ZONE	14A	7	7	7	7	7	7	14	21	21A	21A	21
ENGLAND	7A	7	7	7	7	7	14	21	21A	21A	14	14
HAWAII	21	14	7B	7	7	7	7	7B	14	21	21	21A
INDIA	7	7B	7B	7B	7B	7B	7A	14A	14	14	14	7A
JAPAN	14A	14	7B	7B	7B	7	7	7B	7B	7B	14	21A
MEXICO	14	7A	7	7	7	7	7	14	14A	21A	21A	21
PHILIPPINES	14A	14	7B	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	7A	7	7	7	7	7	7A	14	21A	21A	21	14
SOUTH AFRICA	14	14	7	7B	7B	7	14	21	21A	21A	21	14A
U.S.S.R.	7	7	7	7	7B	7B	7A	21	21A	14	14	7
WEST COAST	21	7A	7	7	7	7	7	14	21	21A	21A	21

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	21	14	7	7	7	7	7	7	14	14	21	21A
ARGENTINA	21	14	7	7	7	7	7A	14	21A	21A	21	21
AUSTRALIA	21A	14	7B	7B	7B	7B	7B	7B	14	14	21	21A
CANAL ZONE	14A	14	7	7	7	7	7A	14	21	21A	21A	21
ENGLAND	7	7	7	7	7	7	7	14	21A	21	14	14
HAWAII	21A	14	7B	7	7	7	7	7	14	21	21A	21A
INDIA	14	7	7B	7B	7B	7B	7B	14	14	14	14	14
JAPAN	21A	14	7B	7B	7B	7	7	7	7B	7B	14	21A
MEXICO	14	7	7	7	7	7	7	14	14A	21	21A	21
PHILIPPINES	21	14	7B	7B	7B	7B	7B	7	14	14	14	14A
PUERTO RICO	14A	14	7	7	7	7	7A	14	21	21A	21A	21
SOUTH AFRICA	14	7	7	7B	7B	7B	7	14	21	21A	21A	21
U.S.S.R.	7	7	7	7	7B	7B	7B	14	21	14	14	7B

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	21	14	7A	7	7	7	7	7	7	14	21	21A
ARGENTINA	21A	14	14	7	7	7	7B	14	21	21A	21A	21
AUSTRALIA	21A	14A	14	14	7A	7	7B	7	14	14	21	21A
CANAL ZONE	21	14	7	7	7	7	7	14	21	21A	21A	21
ENGLAND	7B	7B	7	7	7	7	7B	14	21A	21	14	14
HAWAII	21A	21	14	7	7	7	7	7	14	21	21A	21A
INDIA	14	14	7B	7B	7B	7B	7B	7B	14	14	14	14
JAPAN	21A	14	14	7B	7B	7	7	7	7	7B	14	21A
MEXICO	21	14	7	7	7	7	7	7A	14	21	21A	21A
PHILIPPINES	21A	14A	14	7B	7B	7B	7	7	14	14	14	21
PUERTO RICO	21	7A	7	7	7	7	7	14	21	21A	21A	21
SOUTH AFRICA	14	7	7	7B	7B	7B	7B	14	21	21A	21A	21
U.S.S.R.	7	7	7	7	7B	7B	7B	7B	14	14	14	7B
EAST COAST	21	7A	7	7	7	7	7	14	21	21A	21A	21

First letter = day waves   Second = night waves
A = Next higher frequency may also be useful
B = Difficult circuit this period   F = Fair
G = Good   P = Poor   * = Chance of solar flares

OCTOBER

SUN	MON	TUE	WED	THU	FRI	SAT
				1 G/G	2 G/G	3 G/G
4 G/G	5 G/F	6 F/P	7 F/F	8 F/F	9 F/F	10 G/F
11 G/G	12 G/G	13 G/G	14 G/F	15 G/F	16 G/F*	17 F/F*
18 F/P*	19 F/P	20 G/F	21 G/G	22 G/G	23 G/F	24 F/F
25 F/F	26 F/F	27 F/F	28 F/F	29 G/G	30 G/G	31 G/F

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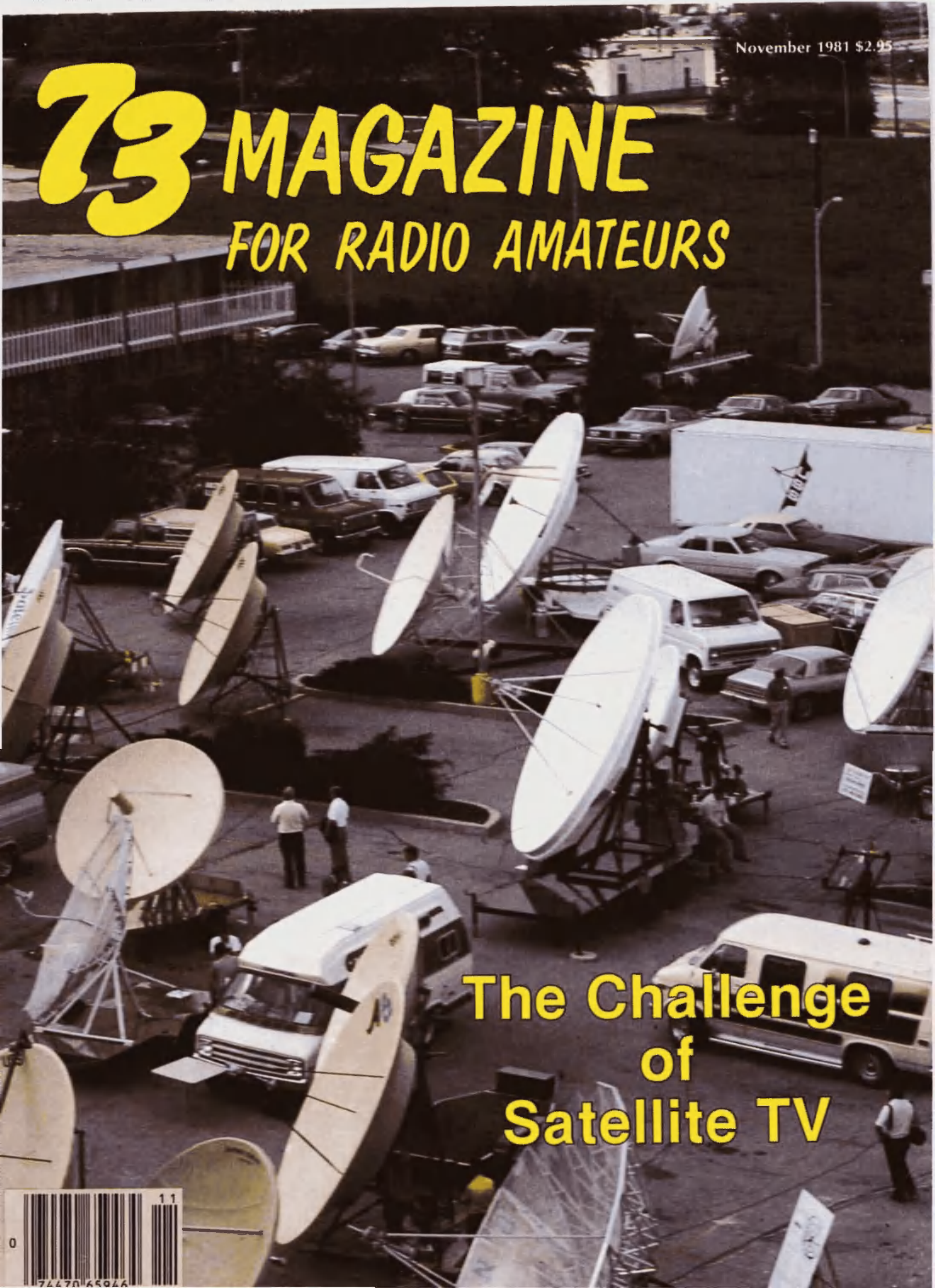
73 MAGAZINE FOR RADIO AMATEURS



The Challenge of Satellite TV

nov. 81

73 MAGAZINE

Cover: More than 50 satellite antennas were on hand at an August, 1981, trade show and seminar in Omaha, Nebraska. Photo by Tim Daniel N8RK.

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

DARKEST AFRICA

What would *you* say if the phone rang one day and someone offered you an all-expenses paid trip to Africa . . . for two?

It was July 4th, a Saturday, and I was sitting there writing an editorial. Weekends are the only time when there are no interruptions and I can concentrate on writing, so I was annoyed when one of the phones rang. I got all over the aggravation when I found I was talking with South Africa . . . that there was going to be a microcomputer exposition in Johannesburg in a month and they wanted me to come down at their expense to address the group.

With a new magazine being launched in September, I was hesitant. We have a lot riding on the success of *Desktop Computing* and I didn't want to take any chances.

When they threw in short visits to Swaziland and Lesotho, I was hooked. With 99 countries visited so far, this would put me well over one hundred. Plus I wanted to know what was going on in South Africa as far as both amateur radio and computers are concerned and there is nothing like a personal visit.

It had been 15 years since I had been to Africa, with the exception of Egypt. In 1966, I talked some other hams into going over for a hunting safari in Kenya, using as my guide a book by Herter on how to go on safari for $660. We'd visited Kenya, Uganda, and Tanzania at the time and my impression was that all of these countries were headed away from civilization, with the latter two going back to the bush the fastest.

Sherry looked over the routing to South Africa and found that the best (lowest cost) route was via Rio de Janeiro on the way over and via Nairobi in Kenya on the way back. The overnight stop in Rio would help us to get to South Africa rested, so that was a good move. I had her add a little to the Nairobi stopover so we could see the town, visit the game park, and even get down to the south coast of Kenya, below Mombasa, for a couple days of rest on the Indian Ocean. This would give me a chance to compare Kenya of today with what I'd seen 15 years ago.

The first big hassle was getting the visas for all of those countries within a few days. This had to be done in Washington, so we brought along our passports and the reams of papers, photographs, and visa fees when we went down to meet with the new chairman of the FCC, Mark Fowler. A professional visa expediter worked hard on it and got the passports back to us at Kennedy Airport in New York just minutes before our departure. That's enough to push anyone ulcer-prone over the edge.

Just to add to the comfort and relaxation of my trip, things were coming to a head at home on Hawthorne-Green Institute, a cooperative deal with a local college in New Hampshire to teach computing using our staff and laboratory, a prospective new magazine (which had me flying to California and New York in the last few days before taking off for Africa), two other prospective magazines (more traveling), and contracts with three microcomputer firms for software development (more travel).

A call from South Africa assured me that my ham licenses had been taken care of for ZS, 3D6, and 7P8, complete with rigs to use in all three countries. The first reports were that the 7P8 was impossible, that no licenses had been issued in ages, but then at the last minute they got it through. A small plane had been chartered for the 3D6-7P8 trip.

Finally, exactly one month after that phone call from South Africa, Sherry and I were on a Pan Am plane heading for Rio and Johannesburg. We had our passports and visas, a change of clothes, lots of cameras and film, and hopes for an opportunity to help both amateur radio and computing to grow.

What would I find in Africa? In 1966, I had seen the disintegration of Uganda as a result of the transfer of power to the blacks. They had forced the white farmers to leave the country, with the result that the farms, which had been the major source of income for Uganda via their exporting of coffee, sugar, and food, had virtually gone out of business. I saw hundreds of deserted farms and little left in the way of crops. I suspect that this weakened the country and made possible the takeover by Amin a short while later.

Next they threw out the Asians, who had been running almost 100% of the small businesses and stores, effectively destroying what was left of the economy of the country. Tanzania followed a similar pattern, as discussed in detail in a book *South of the Moon*, by Lyttel. Both countries were heading rapidly away from civilization . . . back to the bush.

In Kenya, the first president, Jomo Kenyatta, kept the white and Asian infra-structure relatively intact, thus preserving the country much better than the others. When Kenyatta died three years ago, he was succeeded by President Moi and I wondered what changes I would see.

When I visited Kenya 15 years ago, there was hope for some black hams. Would there be any now? Any DXer knows that there are very few active hams in all of Africa . . . and how many of you have ever worked a black amateur in Africa? I wanted to know what the possibilities are for developing black amateurs in

W2NSD/1 ON-THE-AIR SCHEDULE NOVEMBER, 1981

Date	Band/Mode
3	15-20m Phone
10	20m RTTY
17	15-20m Phone
24	20-40m Phone

We'll be on the air 7:00-10:00 pm eastern time on the dates listed above. Look for us in the first 25 kHz of the General class portion of the band. When two bands are listed, we'll spend 90 minutes on the first band and then switch to the second.

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Africa. I felt that if amateur radio is going to get the support it needs from the 57 countries of Africa, black amateurs are a must.

The flight to Brazil is much like those to Europe, only longer. You leave in the evening and arrive early the next morning, pooped. At best, I get no more than short naps on a plane. Between the frequent meals, the movies, people walking around and talking, and the crying children, there is little peace on these long flights.

One day is not enough to really see all of Brazil, let alone Rio. We arrived early in the morning to find the city heavily hazed over and went straight to our hotel and a catch-up sleep. That afternoon we visited some friends and laid the groundwork for a return visit to talk with the government in Brasilia about setting up ham clubs in the high schools.

Brazil, as you may have read in the September *Reader's Digest*, is aiming to become a high-technology country. I pointed out to them that there is a parallel between the number of hams a country has and its electronics and communications technology. Since this is no coincidence, the best way to get the needed technicians and engineers is to get amateur radio growing in Brazil . . . in the high schools.

Early the next morning we were back on a plane, headed for Johannesburg. We got in around midnight, with some delays due to the air controllers'

Continued on page 164

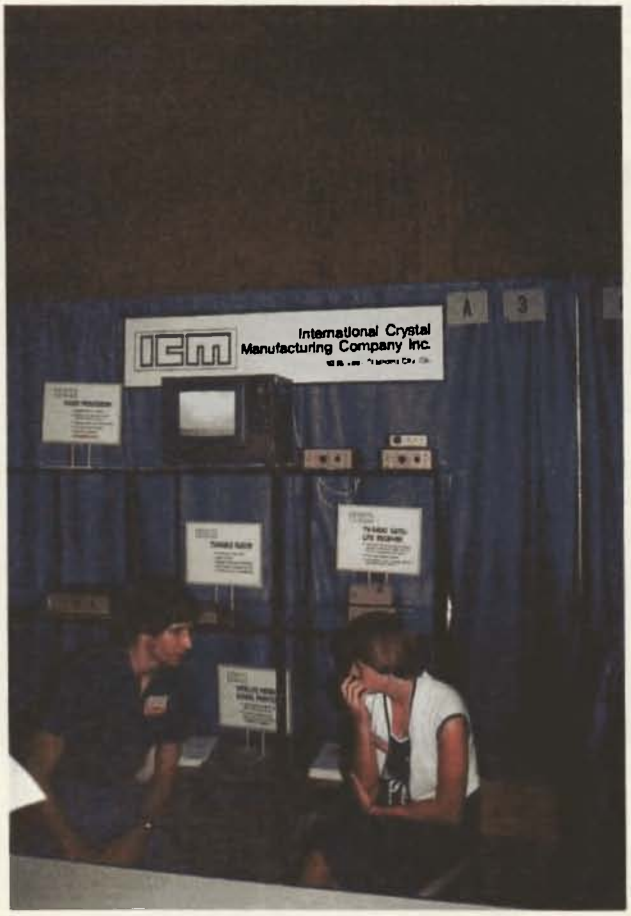
Well . . . I Can Dream, Can't I? by Bandel Linn K4PP

"Since you're arranging things for Field Day, let me suggest the use of my mountaintop ranch! Champagne and Reuben sandwiches will be provided by my staff . . ."

The Satellite TV Challenge

—73 Magazine's answer

Tim Daniel N8RK
73 Magazine Staff



International Crystal was one of the first firms to enter the home satellite TV market. They have expanded their line to include accessories that help make a good signal become better

Welcome to the satellite TV challenge. This issue of *73 Magazine* marks the start of a regular section devoted to the rapidly advancing TVRO (Television Receive Only) field. We at *73* are quite excited about this promising, virtually untapped, technology.

Why Satellite TV?

Hams are innovators. They make complex and expensive technology understandable and affordable. As a magazine, *73* has been in the forefront of amateur radio's innovations, first pushing solid-state gear, SSB, FM and repeaters, and, more recently, popularizing microcomputers. Along the way, *73* has shown that the spirit of ham radio is not confined to the spectrum and privileges allotted to us by the FCC. Similarly, satellite TV is more than just watching "free" movies. Don't take our word on it: read WA1DCP and W2IKQ's article, "Space Spinoffs," in this issue. There you will see that much of the pioneer work behind the home satellite TV industry has

R. L. Drake is a name that hams recognize. Their stylish TVRO receiver drew a crowd at SPTS Omaha. (See New Products section in this issue.) Drake is marketing the receiver in conjunction with another well-known amateur radio firm, Hoosier Electronics.

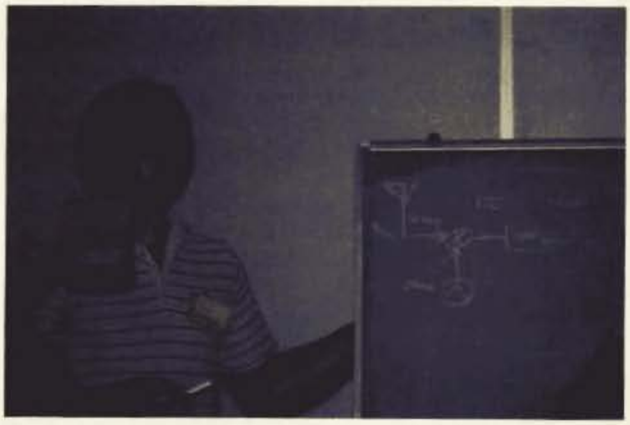
been done by hams. What does the future hold? That depends on you!

Natural Highs

Remember the thrill that accompanies the completion of a piece of homebrew gear or a kit? Or, how about the excitement each time you work a new country? These kinds of natural highs are part of the satellite TV world, too. Sure, you can spend a fistful of bucks to have someone install and debug a TVRO system. But, for a real adrenaline rush, put together your own system. When everything is finally in place and those first pictures appear after traveling 22,000+ miles, you will be *very* excited. Even then, your work is not finished. There are new satellites to find, picture quality to improve on, etc. The challenge and sweet feeling of success are waiting for you.

Getting Started

The satellite TV field is not what engineers call "steady state." You can't rely on things staying the same, nor can you expect to learn everything overnight. Getting started means a willingness to learn. There are new buzzwords to master and a new industry to become familiar with. For



Hamfest attendees will probably recognize this smiling face. John Ramsey is the man behind the Ramsey Electronics booth. Sat-Tec, a subsidiary of Ramsey Electronics, is manufacturer of satellite receivers. John took time out at the SPTS satellite TV seminar in Omaha to share some of the secrets of designing and building low cost TVRO gear.

SATELLITE TV BASICS

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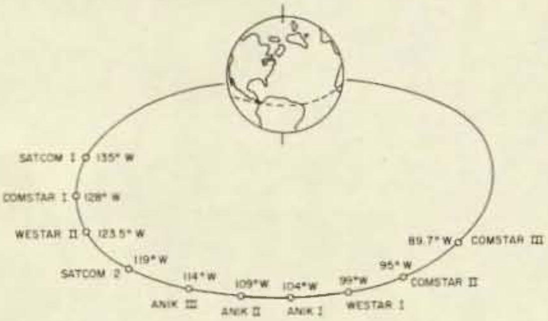
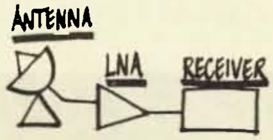
Nearly all of the TV satellites are in geostationary orbit around the Earth's equator. This belt is known as the Clarke belt, after famed science fiction author Arthur C. Clarke suggested the idea of orbiting relay stations back in the forties. The satellites are sometimes called "birds" and are located about 22,300 miles above the surface of the planet. Because they turn with the same speed as the Earth, they appear to be standing still. An antenna pointed at a Clarke orbit satellite does not have to be moved.



Geosynchronous satellites are located in the Clarke belt. This diagram includes only those birds that carry regular video programming.

The uplink is in the 5.9-to-6.4-GHz band. The mode is wideband FM video. Each satellite has either 12 or 24 transponders depending on design. Channel bandwidth is 40 MHz, but neglecting guard bands, practical bandwidth is 30 MHz. The sound is generally sent on a 6.2- or 6.8-MHz FM subcarrier. Downlink is in the 3.7-to-4.2-GHz band. Ma Bell here on Earth shares these frequencies and nearly dominates the band in metropolitan areas. Bell carriers are offset ±10 MHz from satellite carriers, so traps in the i-f can sometimes knock Ma Bell out of the picture.

The 24-channel birds use a method of frequency reuse to get the 12 extra channels. The trick is simply to send 12 channels vertically polarized and the other 12 horizontally polarized. Polarization is relative to the North Pole or the antenna skew angle on the bird and not your location.



Three-piece Earth station.

You need only three items to receive satellite TV:

1) A large dish-type antenna with a gain of 38 dB or more at 4 GHz. It depends on your geographical location and can be calculated (see "How Big a Dish?"). Surface accuracy of the dish must be within 1/8 inch to achieve any efficiency. A TV antenna rotator can be used to change antenna feed polarization. The types of antenna mounts are varied, but generally fall into two categories: polar mounts which have one turning axis and are similar to those used by astronomers, and azimuth/elevation mounts having two turning axes similar to those used by OSCAR chasers. Adjustable mounts are desirable now that several satellites have programming.

2) A preamplifier, known in the jargon as an LNA (low noise amplifier), boosts the very weak signal. It is a broadband design covering 3.7 to 4.2 GHz with 30 to 50 dB gain and a 1-to-2-dB noise figure. The GaAsFET transistors used in LNAs achieve these noise figures with ease at this frequency, but require care in handling. Careful choice of LNA noise figure and dish antenna gain are very important to receiving noise-free pictures. To avoid signal loss, the LNA is generally located at the dish antenna feedpoint which, for a parabolic dish, would be at the dish focus or focal point. A feedhorn of circular or rectangular design couples the LNA to the dish.

3) The LNA output is fed down low-loss coax to an FM receiver similar to that used by Ma Bell in the same frequency band. Sensitivity must be something around −50 to −60 dBm with a 10-to-15-dB noise figure. A received carrier-to-noise ratio of at least 10 dB will yield good pictures once the FM threshold of the receiver is exceeded. Noise or snow on the TV screen is referred to as sparklies. I-f bandwidth usually is somewhere between 20 and 30 MHz. Dual conversion is used, but single conversion designs are gaining in popularity. Subcarrier detectors recover the FM sound. The sound and video outputs of the receiver can feed a TV monitor, your VTR, or a modulator to get the signal into VHF or UHF for your TV receiver.

an introduction in a nutshell, read Stephen Gibson's "Satellite TV Basics," included here. From there you might want to tackle "How Big a Dish?", also included in this issue. All of this is just a fraction of the information we hope to bring to you via the pages of *73*. Whether you want to dive right in or just ease into the satellite TV challenge, we'll be here to show you the way.

What Good Is It?

Satellite TV can be more than just a technical toy. A TVRO system is a great way to educate and entertain your family. There are hundreds of hours of top-quality, commercial-free television available each week. For a glimpse at what satellite TV offers, see the "Satellite Channel Guide" in this issue. While there are important legal issues to consider, don't be put off by someone that says a home satellite receiver is illegal. That just isn't so. In a future issue we will have an in-depth look at the legal issues surrounding satellite TV.

Opportunity Knocks

Don't be surprised if you see a lot of familiar-looking names associated with the satellite TV industry. A recent satellite TV seminar and trade show in Omaha, Nebraska, was almost like a hamfest, with companies like R.L. Drake, KLM, and Wilson exhibiting the latest in home satellite gear. Individual hams and manufacturers are finding a lucrative market in satellite TV. Like any other growing field, it takes initiative to make it, but the opportunities are there. (For an intense three-day exposure to the commercial and technical aspects of home satellite TV, consider attending the next Satellite Private Terminal Seminar, sponsored by STTI, Box G, Arcadia OK.)

73 Magazine's coverage of the satellite TV challenge is not possible without your help. A key ingredient to our efforts is advertising. Please tell manufacturers "I saw your ad in *73*." Another reader responsibility involves filling out and returning the Reader Service card that accompanies each issue.

If you are working on something new, please take the time to share your knowledge with all of us. Input in the form of articles, product reviews, and ordinary letters is welcome. You can be sure that we will carefully consider your comments, but it may not be possible to answer all correspondence directly. ■

UPCOMING ARTICLES

"Bob Cooper: Profile of a Pioneer"
"Satellite Channel Guide, Part II"
Stephen Gibson on receivers
Product reviews and construction articles
"Satellite TV Glossary"

KLM, a big name in ham radio antennas, has joined the satellite game with several complete systems. Their automated tracking system allows you to turn your dish from bird to bird from the comfort of your living room.

While the experts debate the relative merits of spherical antennas like the one shown here, hobbyists are finding new and simpler ways to build this inexpensive "8-ball" design.

Reader Service for facing page ✓74→

Space Spinoffs for Amateur Radio

—the makings of a communications revolution

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Revolutionary changes in amateur radio may be on the way. With the cost of backyard TVRO (television receive only) systems plummeting and the telecommunications industry gearing up for rooftop data and video business communications, new forms of space-age amateur radio communications are becoming feasible. Here are some of the mind-boggling possibilities:

- National or global two-way amateur satellite communications, 24 hours a day.
- Dramatically improved moonbounce communications, using low-cost TVRO dish antennas at microwave frequencies.
- And national packet-switched microwave-linked repeater networks for voice, electronic mail, and information-bank access.

Right now, there's over 1100 MHz of amateur spectrum to work with, virtually unused (see Fig. 1). And that

73 Magazine publisher Wayne Green W2NSD discusses the ham radio, satellite TV tie-in with Portus Barlow WA1DCP, president of Downlink.

1215-1300 MHz*
2300-2450 MHz
3300-3500 MHz*
5650-5925 MHz*
10-10.5 GHz*
24-24.25 GHz*
***Satellite operation permitted on part or all of band.**

Fig. 1. Practical microwave amateur bands.

doesn't include the 31 GHz allocated above 24 GHz. Best of all, there is great promise for low-cost equipment becoming available for the bands between 1 and 24 GHz.

What equipment, you ask? Well, consider the mountain of gear available for 3.7-to-4.2-GHz satellite TV reception. Many hams have this equipment sitting in their backyards already, aimed at one of the eleven domestic (US and Canada) satellites. Hams already have played a key role in the TVRO technology that has exploded since Bob Cooper W5KHT "went public" in *TV Guide*. Here are some of the key developments:

- Bob Coleman K4AWB's plans for converting surplus microwave equipment.
- Oliver Swan's revolutionary low-cost "window screen" spherical antenna, capable of capturing signals from several satellites.
- Taylor Howard W6HD's low-cost, do-it-yourself TVRO-receiver design.
- Bob Luly KA6KBU's 22-pound, 12-foot, portable umbrella antenna.
- Steve Gibson's microcomputer-controlled antenna.
- Clyde Washburn's 24-channel, tunable TVRO receiver.

The result of all this innovation: under-$4000, consumer-TVRO systems. For an idea of what the future might hold, see the box.

"The next logical step is to start working on low-cost uplinking," says Stanford University Professor Taylor Howard. Let's take a look at how this might proceed. Right now, 1296 MHz seems to be the frontier, with just a handful of pioneers using the band for EME (moonbounce). Steve Mieth W6YFK, for example, is achieving EME echo with an 18-foot TVRO-style parabolic antenna, 80 to 100 Watts into the feed, and a preamp with a 1-dB noise figure. This sure beats those monster two-meter arrays and 1-kW rigs! Steve also has had some success on 2300 MHz with a similar setup. The 2300 band is interesting because of the dozens of companies manufacturing MDS receivers, as well as the surplus gear that is becoming available. Dxers with an eye on the 2400-MHz band may get a chance to try their hand at receiving signals from the UoSAT satellite, scheduled for launch this fall.

"The mystery is out of microwaves."

Another interesting band is 3.4 to 3.5 GHz which falls right below the 3.7-to-4.2-TVRO band. We could easily adapt low-cost TVRO low-noise amplifiers and antennas for this band, to say nothing of all that surplus Ma Bell and military gear available. Combine those possibilities with the 5.65-to-5.925-GHz band, which falls just below the 6-GHz uplink band. Power GaAs FETs and other transmitting devices are becoming available, so we theoretically have the basis of a full-blown amateur satellite communications system.

Consider this, again theoretically: Two Watts into the standard 12-foot-TVRO antenna is sufficient to communicate via a geostationary satellite with a 4-kHz-wide signal. For a full 36-MHz-wide video signal you'd need about five kilowatts.

That suggests some interesting possibilities. Why not lease a preemptable 4-kHz subcarrier on a commercial satellite? Think of it as a repeater with *very* good range! Say, the entire US, Canada, and Mexico! To keep things under control, an encryption circuit could be built right into the transponder receiver. This would allow the common carrier (RCA, Western Union, etc.) to shut out amateurs when the circuit was needed for another customer.

And what about the world of GHz and above? Hams are there experimenting, too, thanks to the commercial availability of Gunnplexers. The coming race for direct-broadcast satellite services will spin off some great equipment! Hams are already at 24 GHz during contests.

Taylor Howard W6HD offers some interesting thoughts about the specific developments that are in store for amateur radio. He sees antenna feed design, lower cost detectors, and microwave-frequency filtering on PC boards as key areas. On the uplink side, W6HD believes we need to develop low-cost solid-state amplifiers, high-stability multiplier chains, and inexpensive synthesizers. "The mystery is out of microwaves," Howard says, "and hams are the ones who will pioneer low-cost uplinking."■

Satellite TV net hams interested in satellite TV have been gathering on 20 meters, 14.310 MHz, starting at 1900 UTC on Sundays.

What's Next?

Here's a sneak preview of what's coming in home satellite TV. Watch for:

- A $350 electronically-switched polarization device, eliminating need for mechanical rotation of the feed horn.
- An easy-to-build, complete TVRO pre-packaged kit for under $2,000.
- Microprocessor-controlled dish antennas and receivers for satellite selection and tracking, and transponder scanning and selection, all tied in with programmable VTRs.

References

Robert Cooper, "The Satellite TV Primer," *73 Magazine*, November, 1979.

New Howard Manual, *Coop's Operations Manual*, *Gibson Satellite Navigator*, *Washburn Receiver Manual*, *Nelson Antenna Manual*, and *Coop's Satellite Digest* (monthly), all from STT, Box G, Arcadia OK 73007.

The Home Satellite TV Book, E. Terrence Easton, Playboy Press, February, 1982.

Satellite Channel Chart. Bimonthly guide to programming on all domestic satellites, including sports events. $15/year from WESTSAT Communications, Box 434, Pleasanton CA 94566.

SATGuide. Monthly guide to SATCOM I programming. $36/year from Commtek Publishing Co., Box 1700, Halley ID 83333.

—Satellite Central, part I

Photos by Tim Daniel

Stephen Gibson enjoys both computers and Earth stations.

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Hollywood CA 90038

eginning this month, I will cover the principles of satellite TV with an eye on details on how you can design and build or buy your own Earth station. In the months that follow, I will continue with the basics of each element of your TVRO (television receive only) terminal. I hope that this series, Satellite Central, will become a conduit for ideas and developments that will make construction and operation of your Earth station much easier.

I also hope to include satellite technical info and some program information of interest to add to the fun. There is more than just TV up on the satellites and we will cover every aspect in some detail so you can pursue your own brand of DX from the sky. This is an exciting new way for you to liven up your communications hobby because everyone around you can appreciate your efforts.

How Big A Dish? (Not All Locations Are Created Equal)

It seems appropriate to start off our discussion with antennas. Because the received-signal levels are very weak, we need rather high antenna gains. How much gain is needed? Good question. It works out that "where you are" is everything. Most of the birds with TV on them do not employ global-coverage antenna patterns. In fact, they are quite selective. Signal levels vary several dB over the continental United States.

Satellite designers predict the coverage patterns as "footprints" on a map. Fig. 1 is a footprint map for expected signal intensities from SATCOM 1, a very popular cable-TV bird. Despite the accuracy with which we can steer a *Voyager* probe into orbit around Saturn, we can predict only within a couple of dB or so what the signal level footprints will actually be. You may think that's very good (and it is), but it can make a big difference in your antenna (pocketbookwise) as we shall soon see.

Footprint Tracking Made Easy

The numbers on the map are signal levels in dBW (decibels above 1 Watt). They look pretty substantial. But the satellites are about 22,300 miles away, so there must be some loss. It works out to about −196 dB at 4 GHz. Using the center of the footprint, for example, where the power level is +36 dBW, the signal arriving here on Earth is really −160 dBW (+36 − 196 = −160 dBW), and that's weak! In fact, it's so weak that we don't have a receiver sensitive enough to get it! A typical TVRO receiver needs something like −80 dBW to work.

So we need gain and lots of it. Only one problem. The awful truth is that a yagi (even at Radio Shack specs) or a whole array of yagis don't have enough gain even if you could get them all to operate in phase. The antenna array needed to meet the receiver requirements would be gigantic and probably cost more than next year's national debt!

So why not add a preamp? Fine, but yagi antennas and the like also pick up terrestrial noise and a preamp won't make the noise go away; it'll just make it louder. Dish-design antennas are perhaps a better choice because they offer more gain per area/cost and they have narrow beamwidths which means they don't see as much noise. Table 1 is a list of practical antenna sizes and their gains.

6 feet	35.0 dB
8 feet	37.5 dB
10 feet	39.5 dB
12 feet	41.0 dB
15 feet	42.9 dB
20 feet	44.5 dB

Table 1. Typical dish antenna gains at 4 GHz based on diameter. These values can vary based on the efficiency of your feed arrangement and dish accuracy.

Note that a 20-foot dish has only about 44.5 dB gain, but we need 80 dB gain. Looks bad, doesn't it? So we're back to adding a preamp.

New problem. The preamp must have an excellent noise figure. In fact, the preamp has a special NASA-type designation called LNA, which is simply "low noise amplifier." It appears that we must somehow have enough antenna gain to overcome the incoming terrestrial noise and the noise generated by the LNA.

Noise is the Culprit

If we could find a place in the universe where there was no molecular activity we'd have a very quiet place. It would also be very cold. Radio astronomers use a scale known as the Kelvin scale to measure noise temperature in the sky. Zero degrees on the Kelvin scale is roughly some 273 degrees *below* zero degrees on the Centigrade scale. If we think of zero degrees Kelvin as zero activity and noise, then we have an absolute scale to measure noise in our system.

Typical sources of noise that can bother our TVRO

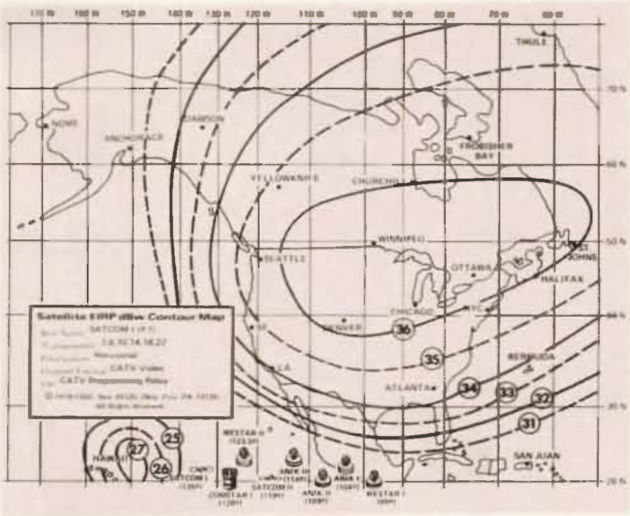
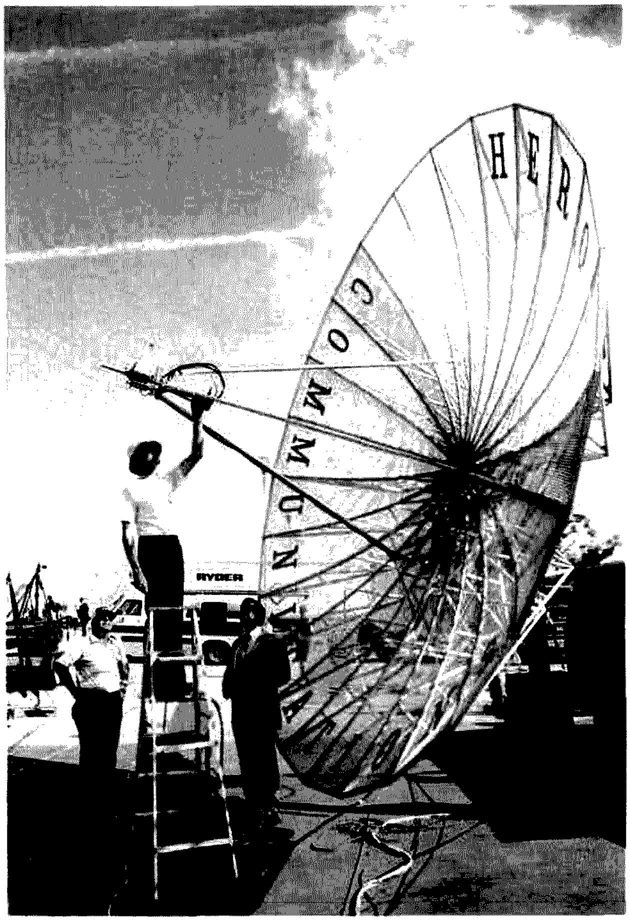


Fig. 1. Use this footprint map of antenna coverage patterns from SATCOM 1 to calculate the received signal level at your location. SATCOM and COMSTAR satellites have three other footprint patterns including this one for all 24 transponders. WESTAR and ANIK birds use a single pattern for all 12 transponders. WESTAR III, not shown, is at 90.0°.

Getting from here to there with a dish antenna requires some ingenuity. This is one company's answer to the problem.



An antenna shootout was featured at SPTS Omaha. It proved that all antennas are not created equal. Tests by two impartial engineers gave both manufacturers and buyers a chance to see which antennas were up to snuff.

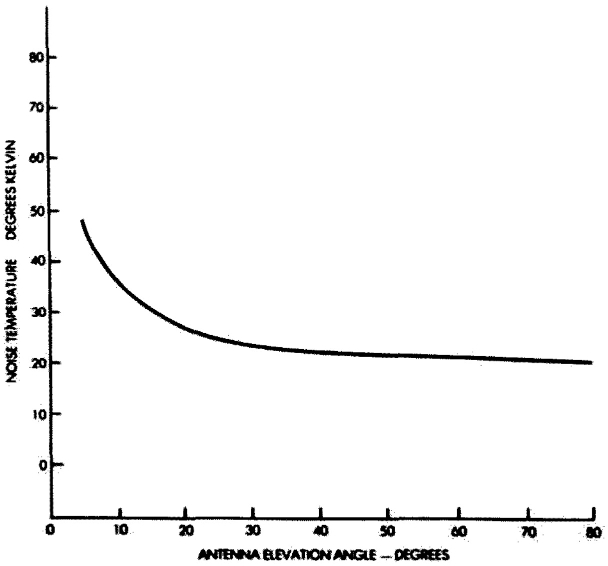


Fig. 2. Even large dishes intercept terrestrial noise, but the noise level drops as you tilt the dish back from the horizon towards the open sky. Typical dish angles for Clarke orbit birds may be from 20 to 60 degrees depending on your location.

are rain, the sun, other microwave services, and the Earth itself. In fact, the noise temperature of the Earth is about 290 degrees Kelvin.

Perhaps you've guessed that we need an antenna with enough directionality to ignore terrestrial noise. System designers express this as a ratio of carrier-to-noise, or C/N. As a rule, most receivers need a C/N ratio of about 10 dB. That is, the received carrier must be 10 dB hotter than the noise to get clear pictures. So all we really need to know is the satellite signal level at our location and the noise level. If we add 10 dB to the difference we should have the required antenna gain.

Simple Dish Math

We use this formula to calculate noise level: Noise Power = KTB, where K = Boltzman's constant, 1.38×10^{-23}, T = system noise temperature, and B = system bandwidth.

How do we use it to get a right answer? (All too often, you see a formula and plug in some sample numbers and voila . . . wrong answer!) Here are the exact steps to take. First, we see that the typical bandwidth of satellite TV signals is 30 MHz. A quick look at the above formula may cause you think if you could reduce the bandwidth a little, you could also reduce the noise. The question is, how much can we cut before the picture looks rotten? I'll cover that in another installment.

A noise figure of	equals a noise temperature of
290° K	3.0 dB
225° K	2.5 dB
170° K	2.0 dB
120° K	1.5 dB
100° K	1.3 dB
75° K	1.0 dB

Table 2. LNA noise temperature to noise figure conversion.

Next, we must know the system noise temperature. This is a mixture of antenna noise, LNA noise, and receiver noise. Inasmuch as we must surpass the noise threshold of the receiver by at least 10 dB, we can ignore receiver noise temperature and just deal with the antenna noise and LNA noise. Fig. 2 is a graph of typical antenna noise temperatures based on elevation angle. Notice that the noise appears to drop as we tilt the antenna back from the Earth towards the open sky.

Table 2 is a list of typical LNA noise temperatures you are likely to find. As of this writing, 100 degrees is considered a very good LNA for the money. That may change. If we now add the LNA noise temperature to the noise intercepted by the antenna we have a fair idea of the system noise temperature. For example, an antenna tilted back to 45 degrees elevation might intercept 20 degrees Kelvin noise. Suppose we chose a 100 degree LNA. Adding, we get an overall noise temperature of 120°. Then all we do is use the formula, Noise Power = KTB.

$1.38 \times 10^{-23} \times 120° \times 30 \times 10^{6} = 49 \times 10^{-15}$. Converting to a power ratio: Noise in dBW = 10 Log (Noise Power) = −133 dBW.

If you've managed to stay with the numbers so far, you can see that the signal from space (−160 dBW) is *weaker* than the noise level (−133 dBW). But if we add in some antenna gain—say 40 dB or so—we boost the signal from space up and out of the noise to −120 dBW: −160 dBW + 40 dB dish = −120 dBW signal level.

Then subtracting: −120 dBW (Noise) − (−) 133 dBW (Signal with antenna) = 13 dB C/N. The satellite signal exceeds the noise level by a robust 13 dB, giv-

ing us solid copy picture-wise.

Easy Formula Saves Time

To find the antenna gain you need for your particular location, you simply apply Gibson's Dish Antenna Rule: Antenna Gain = Noise Level − Signal Level + C/N.

Using our example figures: −133 dBW (Noise) − (−) 160 dBW (Signal) + 13 dB (Suggested C/N) = 40 dB dish! Based on the table of dish antenna gains, it looks as if an 11- or 12-foot dish would work . . . but only if we use a 100 degree LNA.

Try It For Your Location

All you really need to calculate the right dish size for your spot on the map is a footprint map and the two formulas above. If your location does not fall on a particular contour on the map, then do some interpolation and estimate. If anything, estimate lower than the map. Remember, we said the footprints were predictions and actual values have been found to vary a couple of dB.

Next, subtract the path loss of 196 dB. Then figure the noise level based on the LNA you've chosen and the 3-dB bandwidth of your receiver. Plug the numbers into Gibson's Dish Antenna Rule and hope the dish gain needed fits your pocketbook. If it looks as if you'll need to buy an acre of real estate for your giant behemoth, then try a lower LNA noise temperature or a receiver bandwidth of, say 22 MHz, and plug in the numbers to find the dish gain again. Just remember that you may need to hock the family jewels to buy a super-duper LNA.

Perhaps you see that the antenna and LNA are on a kind of teeter-totter. Bigger dishes mean you can use an LNA with a higher noise temperature; a smaller dish means you need a lower noise temperature LNA along with a higher price tag. We can resort to graphs to put the dish cost vs LNA cost ratio in perspective, but costs on LNAs are dropping like flies as are some antenna prices. Maybe you could see it better as: Gibson's Simple Path Loss Equation: Big Dish + Good LNA = Clear Pictures.

But that all seems obvious now. Instead, let's apply Clever Idea #1: Big Dish + Not So Good LNA = Good Pictures. Or we could also apply Clever Idea # 2: Not-So-Big Dish + Good LNA = Good Pictures.

You are free to experiment with the values and see the interaction. Maybe you'd like to write a computer program to translate your ideas via the formulas into a complete line-equation program. As a TVRO entrepreneur, this would be a nice bell and whistle for potential customers.

Satellite Central needs your input of comments and ideas, with full credit to be given, of course. The time is right for you to join in the fun of receiving TV from space. If you have a question regarding the topics we cover here, feel free to drop me a line (letters only, no calls please). Sorry, I can answer mail only if it is accompanied by an SASE.■

Satellite Channel Guide
—part I

RCA SATCOM 1 (135°W)
Polarization: ODD—Vertical; EVEN—Horizontal

TR—1	Nickelodeon—premium children's programming (6.8) ARTS (Alpha Repertory Television Service)—performing and cultural arts programming (6.8)
TR—2	PTL (People That Love)—religious (6.8)
TR—3	WGN-TV, Chicago—Midwest's leading independent station (6.8)
TR—5	The Movie Channel—24 hr/day first-run movies (6.8)
TR—6	WTBS, Altanta—Ted Turner's Superstation
TR—7	ESPN (Entertainment & Sports Network)—24 hr/day sports (6.8)
TR—8	CBN (Christian Broadcasting Network)—religious (6.8)
TR—9	C-SPAN—live coverage from the House of Representatives (6.8) USA Network—professional sporting events, Calliope, and the English Channel (6.8) BET (Black Entertainment Network) (6.8)
TR—10	Showtime (West)—first-run movies, entertainment specials (6.8)
TR—11	MTV (Music Television)—Pop/Rock Video (5.8 & 6.62 stereo)
TR—12	Showtime (East)—first-run movies, entertainment specials (6.8)
TR—14	CNN (Cable News Network)—24 hr/day news (6.8)
TR—15	Occasional Transmissions—sporting events, news & network feeds (6.2/6.8)
TR—16	Showtime (Spare)—occasional network remote and sports events feeds (6.8) AETN (American Educational Television Network) (6.8) CMN (Christian Media Network)—religious (6.8) NJT (National Jewish Television)—religious (6.8)
TR—17	WOR-TV, New York—the Big Apple's top independent station (6.8)
TR—18	Reuter's Monitor Service—commodity/stock market information (digital video) Galavision—the best in Spanish-oriented programming (6.8)
TR—19	The Shopping Channel—Shop-at-Home TV service (6.8) Spotlight—first-run movies (6.8)
TR—20	Home Box Office Cinemax (East)—time-structured HBO (6.8)
TR—21	HTN (Home Theatre Network)—quality P and PG movies (6.8) The Weather Channel (est. Spring 1982)
TR—22	HBO (Home Box Office) (West)—first-run movies, sports & entertainment specials (6.8) MSN (Modern Satellite Network)—general entertainment (6.8) Beta—programming for women (est. 1-4-82)
TR—23	HBO Cinemax (West)—time-structured HBO (6.8)
TR—24	HBO (East)—first-run movies, sports & entertainment specials (6.8)

Audio Services on SATCOM 1

TR—2	Satellite Radio Network (6.2)
TR—3	WFMT(FM), Chicago (5.8 stereo) Seeburg's "Lifestyle" Music (7.6)

COMSTAR 4 (127°W)
Polarization: ODD—Vertical; EVEN—Horizontal

TR—20	Occasional Transmissions—sporting events, news & network feeds (5.8)

WU WESTAR 2 (123.5°W)
Polarization: All Horizontal

TR—2(3)	Occasional Transmissions—sporting events, news & network feeds (6.2/6.8) Independent Network News (6.2)

RCA SATCOM 2 (119°W)
Polarization: ODD—Vertical; EVEN—Horizontal

TR—2	Occasional Transmissions—sporting events, news & network feeds (6.8)
TR—5	Occasional Transmissions—sporting events, news & network feeds (6.8)
TR—8	NBC Network Contract Channel—live/taped network feeds (6.8)
TR—9	American Forces Satellite Network—various network & independent programming (6.8)
TR—13	NASA Contract Channel (6.8)
TR—18	Occasional Transmissions—sporting events, news & network feeds (6.8)
TR—23	Alaska Satellite Television Project—various network & independent programming (5.8/6.8)

ANIK 2/3 (Canadian) (114°W)
Polarization: All horizontal

TR—1(1)	BCTV (British Columbia Television), Vancouver, B.C.—British Columbia's leading independent station (6.8)
TR—3(5)	Daily Live Coverage of the Canadian House of Commons from Ottawa (with French translation) (6.8) CHLT—TV, Sherbrooke, Quebec—French language independent network (TVA) programming (6.8)

TR—4(7) **CHCH—TV,** Hamilton, Ontario—Ontario's leading independent station (6.8)

TR—8(15) **Daily Live Coverage of the Canadian House of Commons from Ottawa** (with French translation) (6.8)
CHLT—TV, Sherbrooke, Quebec—French language independent network (TVA) programming (6.8)

TR—10(19) **CITV—TV,** Edmonton, Alberta—Alberta's leading independent station (6.8)

TR—12(23) **Daily Live Coverage of the Canadian House of Commons from Ottawa** (standard English) (6.8)
CTV North—various CTV network programming (6.8)

ANIK B (Canadian) (109°W)
Polarization: All horizontal

TR—4(7) **Occasional Transmissions**—sporting events, news & network feeds (6.8)

TR—6(11) **CBC North**—various CBC network programming (6.8)

TR—7(13) **Occasional Transmissions**—sporting events, news & network feeds (6.8)

TR—8(15) **CBC** (French Channel)—French language CBC programming (6.8)

TR—9(17) **CBC Occasional Transmissions** (6.8)

TR—10(19) **CBC** (English Channel-1)—English CBC programming (6.8)

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Satellite TV Receivers

— is there a better way?

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My original review of the Universal Communications 2300-MHz downconverter kits, which appeared in the April, 1981, *73 Magazine*, revealed the widespread interest in receiving MDS and commercial TV satellite transmissions. Indeed, my mailbox bulged with letters for several weeks after the article was published.

A large number of inquiries received concerned my briefly-mentioned thoughts of later converting a Universal Communications unit (or some semblance thereof) for reception of the 3.7-to-4.2-GHz satellite TV band, and (hopefully) assembling a complete but inexpensive TVRO system.

This article on TVRO is written to share my work and knowledge, plus the work of Steve Franklin of Universal Communications, with others desiring infor-

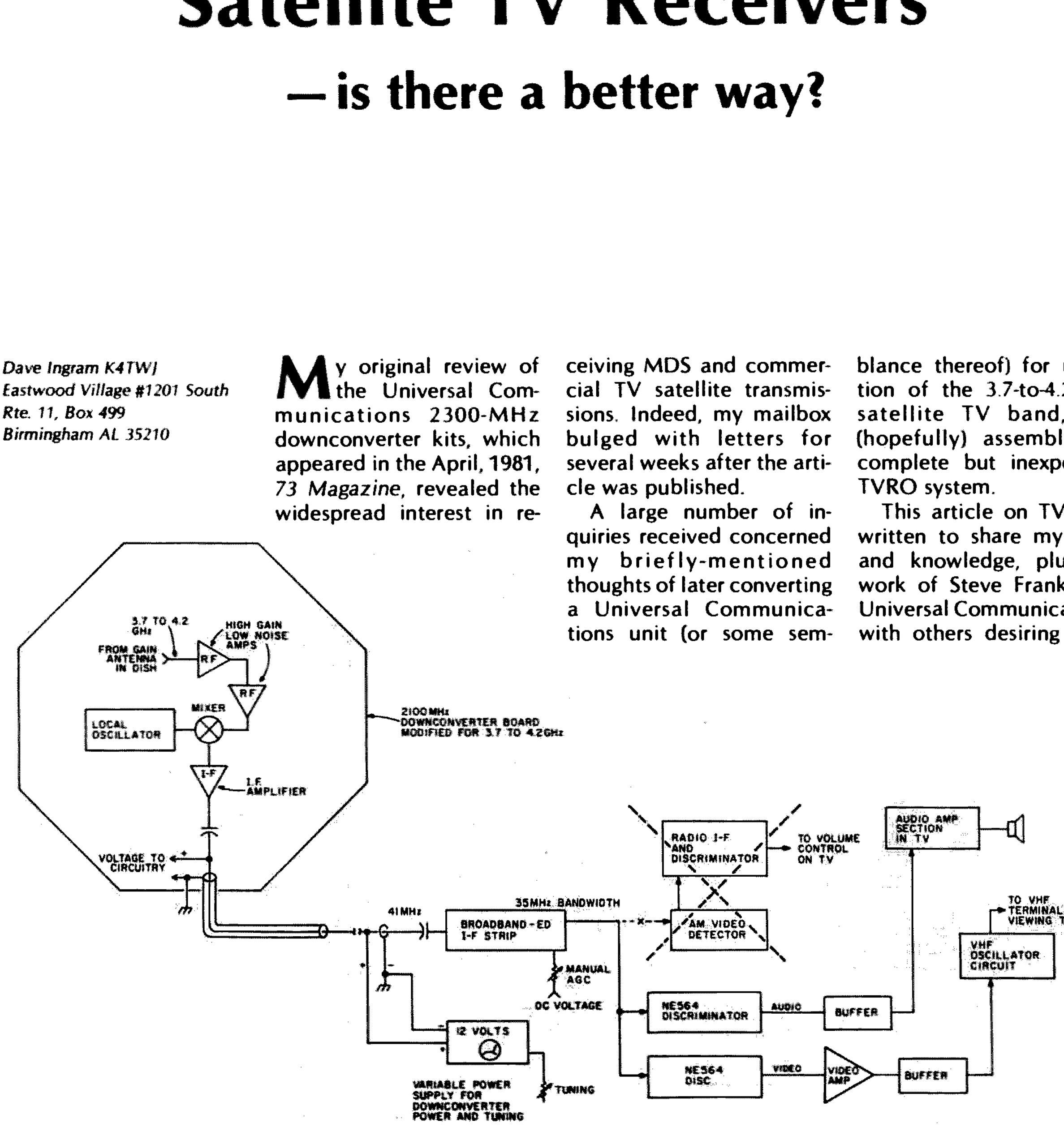
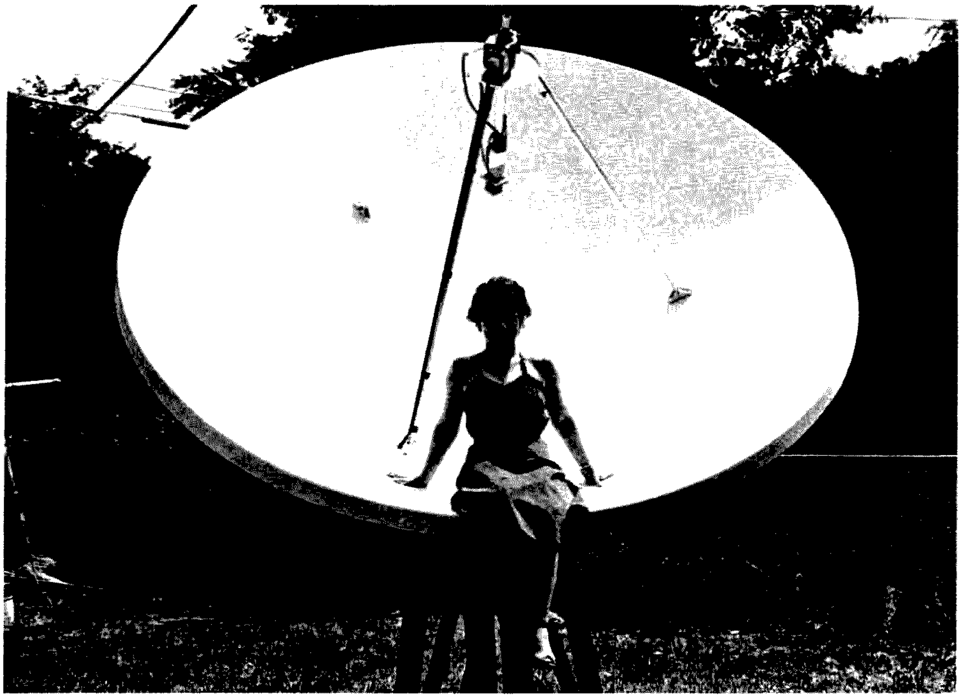


Fig. 1. The originally-planned TVRO described in the text. The 2100-MHz downconverter board is modified by cutting tuned lines to approximately half length, adding two high-gain, low-noise transistors, low-noise diodes, generating 41 MHz i-f, etc. Highly-modified televison is used mainly for its i-f strip, power supply, and audio amplifier section.

mation on TVRO designs. Perhaps I'll answer some questions that you've been pondering, or possibly I'll whet your thoughts on simpler and less-expensive ways of constructing TVROs. An excess of knowledge and concepts in this area of rising popularity is one thing we aren't experiencing at this time!



Deborah Franklin tries on a 10′ parabolic dish fitted with an Avantek LNA and 3.7-to-4.2-GHz downconverter described in the text.

The Originally-Planned Concept

Most of the presently-popular commercial TVRO systems employ a basically similar design: A high-gain, low-noise amplifier (LNA) is placed at the focal point of a 10- to 16-foot parabolic dish which is aimed at a specific satellite. The acquired signals then are fed to an indoor converter unit via hardline cable. That unit converts incoming frequencies between 3.7 and 4.2 GHz to the popular TVRO i-f frequency of 70 MHz, amplifies the signal, and detects the FM video and 6.2- or 6.8-MHz audio (depending on the particular satellite being received). The resultant baseband signals then are used to modulate a TV oscillator circuit which radiates into the TV set's VHF antenna terminals. Selecting various transponders of a satellite is accomplished by varying the indoor tuner's selected input frequency and downconverting that channel to the 70-MHz i-f range.

While the previously described concept is an optimum turnkey system, it seems that an enterprising amateur could shave frills and lower system cost with a different approach to TVROs. The hardline cable connecting the LNA to the tuner, for example, exhibits a typical loss of 15 dB—part of the gain provided by the LNA. It thus seems that if a low-noise figure could be obtained, a home-brew rf amplifier/tuner unit could be mounted at the dish and used to downconvert with techniques similar to those used in inexpensive 2400-MHz MDS converters. The resultant 35-MHz bandwidth i-f signal might then be processed by a highly-modified black and white TV (nothing dictates the use of a 70-MHz i-f).

Such TVs usually can be obtained from repair shops or friends (sets with bad picture tubes or flybacks are good candidates for this operation). The downconverter's output cable would sidestep the TV tuner and connect directly to the i-f input. The i-f stages would then be heavily swamped and stagger-tuned to increase bandwidth from near 5 MHz to near 35 MHz (additional i-f stages also might be required here). The AM video detector then would be replaced with a broadband FM counterpart, such as an NE564 discriminator chip, while another NE564 tuned to either 6.2 or 6.8 MHz would be used for audio demodulation.

A small TV oscillator circuit then could be home-brewed or obtained from a surplus outlet and used to feed the satellite TV signal to the antenna terminals of an unbutchered (and usually color!) TV set for viewing. The complete receiver is shown in Fig. 1.

The Universal Communications 2.1-GHz MDS receiver might be a candidate for a low-cost downconverter. The rf amplifier would have to be replaced with a low-noise, high-gain counterpart while the mixer and oscillator circuits would need to be trimmed to the new frequency range.

The greatest drawback to

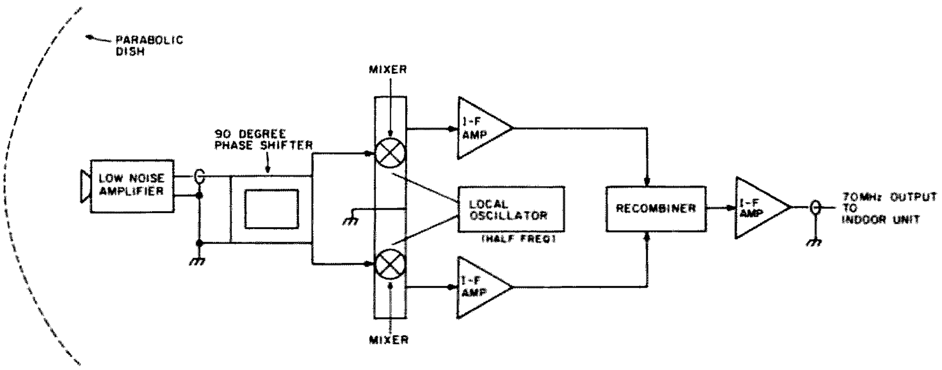


Fig. 2. The Universal Communications 3.7-to-4.2-GHz downconverter. The unit incorporates dual mixers operating 90 degrees out of phase and dual i-f amplification.

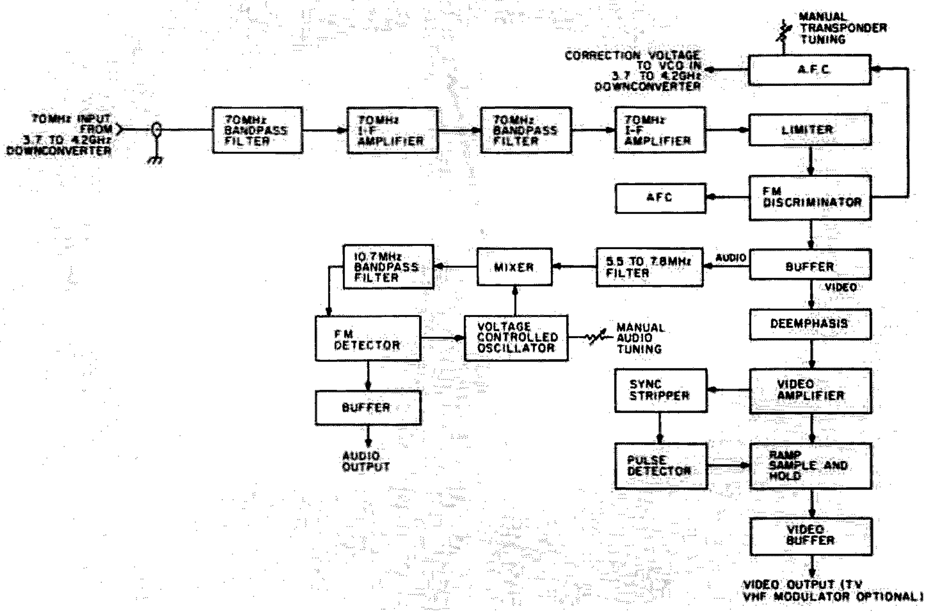


Fig. 3. Block diagram of the indoor tuning unit. Circuitry is straightforward, with video sampling similar to SSTV techniques being employed.

this scheme, shown in Fig. 1, may lie in the cumbersome modification of the downconverter and TV set. The price is right but the patience and expertise required are probably beyond the average hobbyist. Steve Franklin has shown that pictures can be received with such a system, but they are plagued by noise and image problems. The receiver that grew out of this approach uses a conventional low-noise amplifier and a doubly-balanced mixer, eliminating many of the problems that plague simple receivers.

Finally, an i-f section consisting of a few ICs, etc., plus FM discriminators for audio and video, were required to round out the system.

The Universal Communications Concept

A block diagram of the resultant Universal Communications 3.7-to-4.2-GHz downconverter is shown in Fig. 2, and a brief description of its operation follows. First, the LNA is an Avantek unit, GaAsFET, 4 stages, with 50-dB overall gain and a 120° Kelvin noise figure. The LNA cost (in July, 1981) is $650. Signals from the LNA are applied to the downconverter's 90° phase shifter, producing the two out-of-phase signals for application to their respective mixers (these mixers are similar to those used on 2.1-GHz downconverter boards).

The mixers are fed from a common local oscillator operating at half the desired frequency (this board-mounted oscillator is substantially less expensive than standard TVRO types). Outputs from the two mixers are then amplified to overcome phase-shift losses, applied to a recombiner, and followed by an additional stage of i-f amplification. The output signal is then passed to the indoor unit via a length of RG-59 coaxial cable. The downconverter, incidentally, could be mounted inside if desired, but hardline coax then would be required for interconnecting runs over 25 feet.

The TVRO unit placed inside the house functions in a straightforward manner: Its block diagram is shown in Fig. 3, and a description of its operations follows. The incoming 70-MHz i-f signal first undergoes a series of bandpass filters and i-f amplifiers before being applied to a limiter stage and an FM discriminator. The detected signal then is directed to a buffer stage which splits it and feeds two points. Following along the video path first, the signal undergoes de-emphasis and then is applied to a video amplifier which includes positive or negative video polarity output.

Next, a video sampling arrangement similar to more sophisticated SSTV techniques is employed: A sync stripper, pulse detector, and a ramp sample-and-hold circuit produce high-quality video outputs. These video levels then are buffered and applied to a VHF TV modulator which connects to the viewing TV via its antenna terminals.

Returning to the FM discriminator, satellite TV audio is bandpass-filtered and applied to an afc-locked converter and detector. This section consists of a voltage-controlled oscillator (vco), mixer, 10.7-MHz bandpass filter, FM detector, and an afc circuit. Simply described, this "closed-loop" system's afc monitors the FM detector's output and directs a proportional correction voltage to the converter's vco as required. An additional voltage input is employed for manual tuning of the audio. The output audio signal then is handled in a conventional manner.

As this article is being written, Universal Communications (PO Box 339, Arlington TX 76010) is gearing up to produce TVROs based on the previously-described concept. This arrangement definitely has broken the price barrier (*projected* cost, less dish and LNA, is $800!) while maintaining the quality of equivalent systems selling for over $1500. Its design is the most logical approach to satellite TV receivers I've seen, and I heartily recommend considering its concept. The question of system kits is presently unresolved, due primarily to problems encountered with home constructors "botching up" the simple MDS downconverters also manufactured by Universal Communications.

Summary

Satellite TV reception is a rising trend which promises increased popularity during the near future, and now is an opportune time to join that activity. The equipment capable of receiving weak microwave signals from these satellites is necessarily expensive: That restricts general-public reception and provides a measure of "cloaking" to the satellite signals. While home-brew TVROs can't sidestep the high costs of LNAs, GaAsFETs, etc., the contemplation of such setups gives one a relatively good understanding of the circuitry involved and a better overview of what he's getting for his money. ■

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Spread Spectrum
—a report from AMRAD

Editor's Note: Until recently, spread spectrum has been a term known only to a tew people involved in developing top-secret military communications. Today, the possibility of using spread spectrum for other radio services is being investigated by a group of radio amateurs known as AMRAD, Amateur Radio Research and Development Corporation. After receiving a Special Temporary Authority from the FCC, AMRAD pushed ahead to try spread spectrum on the amateur bands. AMRAD members are interested in experimental communications systems of all types. Membership is available to any interested person for $12 a year. This includes a subscription to the club newsletter. To join AMRAD, contact Gerald Adkins, Treasurer, 1206 Livingston St. North, Arlington VA 22205. • The following article is based on material appearing in the July, 1981, issue of the AMRAD newsletter.

The term *spread spectrum* has been used to describe a variety of communications techniques. The common feature of these systems is that a spread-spectrum (SS) signal has a bandwidth that is much wider than the bandwidth of a conventional signal carrying the same information. At first glance, spread-spectrum communications appear to waste valuable frequency space. In reality, SS offers several very important advantages over conventional amplitude- or frequency-modulation methods.

The military likes spread spectrum because it is very secure. You can't eavesdrop on a spread-spectrum conversation if you don't know the sequence used to code the signal. Another tactical advantage offered by SS is its immunity to jamming. Unless the enemy has a very wideband transmitter, he won't do much harm to your signal.

A similar sort of immunity exists for unintentional interference (QRM and QRN). The SS signal is also likely to resist selective fading that affects one channel. In the past, diversity-receiving techniques have been used to combat fading; now, spread spectrum offers hope.

Although a spread-spectrum signal takes up a large bandwidth, the spectral density is much lower than a narrowband signal. The same information is there; it's just spread over more spectrum. This opens up the possibility of a large number of SS signals sharing a band. Or perhaps spread spectrum can peacefully coexist with narrowband signals.

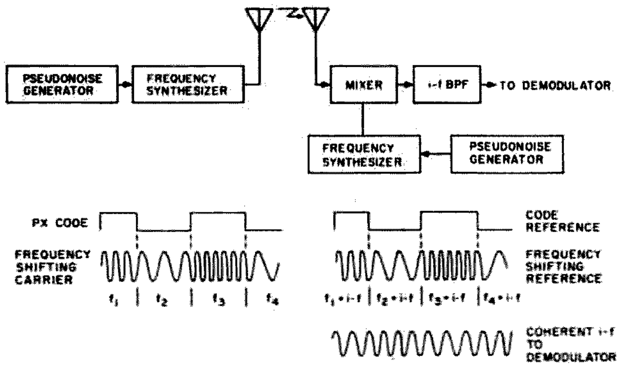

Fig. 1. Basic frequency-hopping system with waveforms. (from "Potential Use of Spread Spectrum Techniques in Non-government Applications.")

There are several types of spread-spectrum communications being used today. The AMRAD experiments are focusing on the frequency-hopping and direct-sequence techniques. This report will focus on the frequency-hopping project in particular: the use of commercial SS units on the 80-, 40-, and 20-meter bands. We won't go into much detail on the inner workings of frequency hopping; for more information, Rinaldo's article in the November, 1980, issue of *QST* and the FCC report, "Potential Use of Spread Spectrum in Non-Government Applications," are recommended. The FCC report is available from the National Technical Information Service, Springfield VA 22161. The accession number is PB81-165-284. The cost is $17 paper, $3.50 microfiche.

Frequency hopping is just what the name implies: The transmitter's carrier frequency jumps from channel to channel. The receiver follows along, in the same pattern. To keep the information secure, a frequency-hopped signal spends very little time on one frequency before moving in what appears to be a random manner. Fig. 1 shows a simple frequency-hopping system.

Experiment #1

We had a series of very successful frequency-hopping experiments carried out by Paul Rinaldo W4RI, Dick Kessler K2SZE (in Rochester, New York), and Olaf Rask WA3ZXW (in Annapolis, Maryland). Experiment #1 of the AMRAD Special Temporary Authority (STA) called for tests with a commercial/military frequency hopper in the 80-, 40-, and 20-meter bands. These rigs are capable of a frequency range of 2 to 15 MHz and hopping speeds adjustable from about 1 hop/second (1 chip, for you units buffs) to about 20 hops/second. The hopping sequence was assumed to be nonlinear because this rig was meant for military purposes. Normal linear sequences of short duration

are not useful for military applications.

Using these rigs is somewhat different from a standard single-sideband transceiver, but enough of the operations are the same that an amateur would feel right at home with this mode. I was able to sit in on a session that Paul had one evening and will describe what I heard.

First, both stations made contact using SSB (this was on 75 meters) on a service frequency. The next major item was making sure that the hopping-sequence generators on both rigs were set the same way. The rig has a set of thumbwheels on the front panel which are used to control the hopping sequence. Both stations set the wheels the same way. If the wheels had been set differently, the hopping sequences would be different, and the two stations couldn't talk to each other.

Now that the hopping sequences were set the same way, one station would transmit a special FSK signal which the other station would receive. This FSK signal serves to alert the other station to start hopping as soon as the FSK signal stops. The FSK signal was generated by using the Send Sync switch on the rig. To set up the second station to use this FSK sync signal, there was a FAM (frequency-agile mode) switch position to enable the second station to lock onto the FSK signal.

When the FSK signal stopped, both rigs were in the hopping mode. The speed at which the hopping took place was 5 hops/s, which is slow, as hopping goes, but has many interesting features. The mode of transmission was SSB, and Dick's signal came in very well. I was surprised that the rig's synthesizer was right on each hop, which meant that the SSB signal was very clear. No "duck talk" was present, such as comes from being a little off with an SSB signal.

One of the main advantages of spread spectrum was the so-called antijam or interference-avoidance feature which happens because the background QRM is being changed every hop. We were hopping at 5 hops/s with this rig, and I was able to observe this effect. Dick's voice was more readable than when in the (non-hop) conventional SSB mode. We made a few experiments by moving the hopping sequence up a little to see what it would do against solid, congested SSB.

In the first part of the experiment, we were in the 80-75-meter band, which resulted in the hopping sequence varying mostly in the CW portion, but it would visit phone stations now and then. What did this sound like? Well, all the sounds that hams are used to were present, but every one-fifth of a second the sound would change! What you would hear was a snatch of RTTY, a small burst of CW, a few sounds from some SSB stations, and some snap of QRN, each lasting only a fifth of a second.

It was easy to hear Dick's voice with this ever-changing background noise because Dick's signal was strong. There was some fading now and then, and this let us see what a weaker signal would sound like. When K2SZE's signal became weak, it was still readable even when it started to fade into the strange background sounds. My old CW training came back to me, and I mentally started to try to shut out the background, just as you do when receiving a weak CW station in heavy QRM. But this time the background sounds were changing!

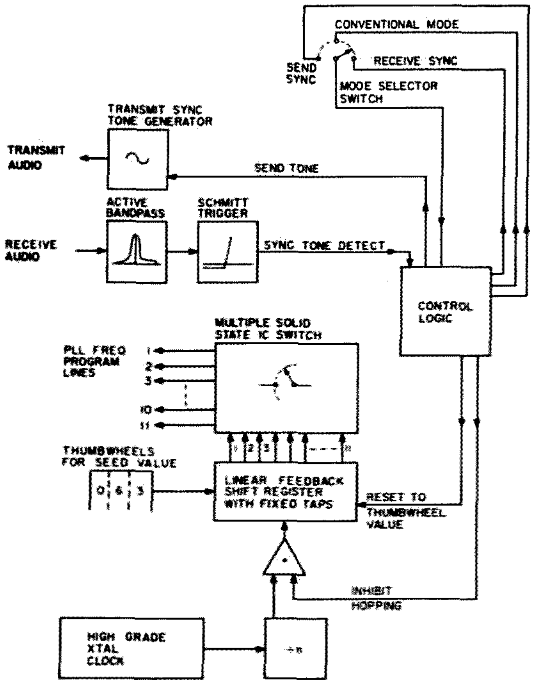

Fig. 2. Frequency-hopper controller board basic functions.

I would say that there was about 30% SSB sounds in the mix with the remainder being CW and RTTY. There was an advantage over normal SSB with this mix. Then we moved the hopping sequence into the 75-meter phone band. Both stations had to reset the service frequency higher and then go through the sync process again, which is not hard. This time, we had a mix of 80% SSB and 20% CW and RTTY. With this mix, Dick's signal was hard to hear. Because there was such a high percentage of SSB in the background, it was difficult to pick out Dick's signal from the rest. We tried to lock onto Dick's voice and ignore the rest. But this was difficult. Things were much better with more CW and RTTY in the mix and downright hard with a high percentage of SSB.

What conclusion can be drawn from this? With slow hopping (5 hops/s), SSB frequency-hopping does well against CW-like signals and poorly against voice-type signals. The fact that we were hopping at 5 hops/s didn't allow us to take advantage of a property that fast hopping has. If we were hopping faster (say 25 times a second), very short snatches of the background noise would be received. As the frequency is changing so fast, the sound of each of these snatches would just meld together and form a kind of buzz. The SSB voice signal would still sound like an SSB voice signal, but the background would sound very constant. With the right filters to treat the background buzz, the voice signal should be readable. This would happen even with a strong mix of SSB signals in the background because the amount of signal from each frequency would be very small. This is what we would like to try a little later with Experiment #2, which will allow us to build our own frequency-hopper rig out of old CB sets.

As part of the experiment, Paul turned on his Icom IC-701 so that we could hear with the other rig transmitting in the frequency-hopping mode.

Control Lines:	Function
1) SEND TONE	Turn on sync tone oscillator.
2) SYNC TONE DETECT	Presence of sync tone in receiver audio. Means that other unit has transmitted sync tone.
3) RESET SHIFT REGISTER	Clear out current contents of shift register and load value of thumbwheels.
4) INHIBIT HOPPING	Gate off the clock which drives the shift register.
5) MODE SELECTOR	Signal the mode we want to be in. There are three auxiliary lines associated with this line which are not named.
6) TRANSMIT ON	Key the unit's transmitter.

Sequence Logic
(Controlled by mode switch)
SEND SYNC

1) If hopping enabled, force to CONVENTIONAL MODE.
2) Lock out SYNC TONE DETECT.
3) Enable TRANSMIT ON. (turn on transmitter)
4) Enable SEND SYNC. (transmit sync tone)
5) Wait 3 seconds. (by an internal timer)
6) Disable TRANSMIT ON, SEND SYNC.
7) Disable INHIBIT HOPPING. (start hopping)

RECEIVE SYNC

1) If hopping enabled, force to CONVENTIONAL MODE.
2) Enable SYNC TONE DETECT.
3) Wait for SYNC TONE DETECT to go high. (sync tone received)
4) Wait for SYNC TONE DETECT to fall. (sync tone falls)
5) Disable INHIBIT HOPPING. (start hopping)
6) Lock out SYNC TONE DETECT.

CONVENTIONAL MODE

1) Enable INHIBIT HOPPING. (stop hopping)
2) Trigger RESET SHIFTREGISTER. (load thumbwheel values)
3) Lock out SYNC TONE DETECT. (in case we are resetting)
4) Disable SEND SYNC, TRANSMIT ON. (in case we are resetting)

Note: Conventional mode also is a recovery position which is used by the other two modes and by the operator to recover from a foul up such as no sync tone being received for a very long time when one is expected.

Table 1. Functional frequency-hopper control board logic sequence.

Paul picked out a place on 80 meters where it was quiet and let the receiver stay there. We didn't hear K2SZE's signal on this receiver, partially because it wasn't connected to an antenna. When we went to the transmit mode, every once in a while you would hear a snatch of sound like "aup" or "thu," but it would be gone as quickly as it came. This was the result of the rig's hopping in a random way.

Experiment #2—Proposed

A few of the AMRAD Spread-Spectrum Special Interest Group have been interested in doing something with old CB transceivers. Allan Kaplan W1AEL in Richardson, Texas, has a bunch of good ideas. His group was in active search of a number of Hy-Gain surplus CB boards to use as the basis of a 10-meter frequency hopper.

I was able to get hold of two SSB CB transceivers which were modified for 200 channels and had seen extensive use in another "service." These rigs have almost identical internals and use the standard μPD858C synthesizer chip. This chip has a number of components for a synthesizer built right onto the chip. External to the chip is an active bandpass filter, a main vco chip (which produces the output frequency), and a number of mixers and oscillators used to mix the vco output for use in the CB transmitter and receiver.

In order to frequency hop, there are three things that need to be done: 1) Change the mixer crystals so that the rig operates in the 10-meter band (this is in progress now); 2) Modify the feedback filter so that the synthesizer will lock up faster; 3) Hook the BCD frequency programming lines to a controller board.

The controller board (Fig. 2 and Table 1) will have a linear feedback shift register which has parallel output and will gate an IC which has 8 SPST switches implemented in solid state. This IC will do the actual switching of the synthesizer programming lines for isolation's sake.

A second stage of the board will be used to sense/send a tone which will be used the same way that the special FSK signal is used by the commercial rig mentioned above. When the signal appears, the clocking associated with the shift register will go into a make-ready-to-hop state. Then, when the signal ends, hopping will start and continue until the Stop Hopping switch is pressed. Lastly, a timing source is needed, and this will be supplied by a high-stability crystal oscillator which will be on board as well.

K2SZE points out that timing is critical with fast frequency hopping. For now, we don't plan to hop very fast. Only when we have gained more experience with slow hopping will we try the faster stuff.

One problem being researched is that of how to get the loop filters of the synthesizer to react faster. The loop filter sits between the output of the phase comparator/charge pump and the vco. Its job is to filter the correction voltage to the vco to eliminate high-frequency components. So, the output of the phase comparator/charge pump goes through a low-pass filter before being applied to the vco.

This loop filter in the two CB rigs consists of an active filter which is part of the μPD858C and a second filter which is a bandpass filter implemented as an active discrete transistor amplifier. The feedback network for the active filter within the μPD858C is via a resistor-capacitor combination attached to some of the 858's pins.

Both CB rigs are slated to be modified in the same way so that there will be two rigs which do the same thing right off. Differences in the synthesizer design or the controller board will probably produce a different hopping sequence. So, if you plan to do this *always* get at least two rigs of the same kind. Fig. 2 and Table 1 give more details.

For the Record

Since we started this project, we've learned a lot about the spread-spectrum mode which was heretofore unknown in the amateur community.

The FCC has certainly been forward looking with regard to spread spectrum as well as other advanced amateur technology.

At one point we talked about the idea of kits being made available for the builder. It turns out that we have a lot more ground to cover with the experimental aspects of spread spectrum before we can get to a prototype. The whole idea of the STA is to experiment. So, if you're not sure how to proceed and want to talk it over with someone, I suggest that you find someone close to you and work together. The converted-CB approach seems the simplest way to start. ■

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A Visit with SVØAY

—the road to paradise

"The difference between the permanent residents here and the tourists is that the islanders wear clothes!"

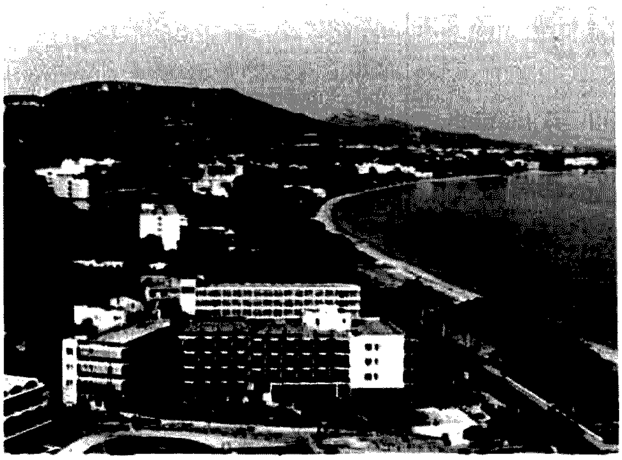
So says Joe Nearns SVØAY at his QTH on the western coastal road, only a short distance from a beach on the Greek island of Rhodes in the eastern Mediterranean. The island is so far east that the mountains of Turkey can be seen to the north only twenty miles away.

The principal business on Rhodes is tourism, and vacationers arrive daily from all over Europe to enjoy the delightful beaches and warm water, and to get a maximum tan in the hot sun. It is especially interesting to explore this island, with its over 3000 years of mainstream history.

The island of Rhodes was centrally located for the ancient Greek trading routes to the Middle East. The Apostle Paul is said to have taught there, and during the time of the Crusades, the island was governed by the knights for over two hundred years. Much remains of the fortifications of that era, including a wall around the ancient city which is still largely intact.

At the village of Lindos, on the eastern shore, the remains of a Greek acropolis can be explored, including the changes made during the middle ages. The "Colossus of Rhodes," one of the seven wonders of the ancient world, actually was the lighthouse marking the entrance to Rhodes harbor. The harbor is still very much in use today, guarding a mixture of picturesque Greek fishing boats, private yachts, commercial shipping, and pleasure-cruise vessels. In fact, one of the ways to visit Rhodes is to take a Greek Island cruise out of Athens.

Joe has a location almost ideal for ham radio, a good, unique callsign, almost no local competition (there are only two other hams on Rhodes), and a nice flat roof on his house for antenna tuning! It did, however, take him eight or nine months to get his call, after applying for it. He maintains daily schedules on 40 meters with a number of hams in the Greek islands as well as weekly schedules



The western beach area of Rhodes. Joe's QTH is just around the arm of the bay in the upper right, along the coast road.

Joe Nearns SVØAY at the rig in his shack at home in Rhodes.

A view of the harbor showing commercial and pleasure boats and some of the ancient fortifications.

George N1BEP sitting on the wall of the ancient acropolis at Lindos, southeast Rhodes. The small bay below the cliff is a tiny port for fishing and pleasure boats. The climbing scenes from the movie "The Guns of Navarone," starring Anthony Quinn, were filmed on the cliffs below the acropolis.

with Argentina and the Philippines.

Although Joe has lived in several other countries and has had LU and EL2EA calls, he still retains his US call, W5NTS. Joe doesn't go after DX on a regular basis—no contests or DXCC—and sometimes he says that he has to fight off the pileups that occur when conditions are good.

QRM is very bad on 40 meters from the broadcast stations, and during dry periods QRN is bad from the corona discharge on the local power lines, apparently due to salt deposits on the insulators—one liability of living near the beach.

The language is difficult to learn since it is hard to read the Greek alphabet. There is no English-speaking community on Rhodes. Therefore, Joe's two older children (boys) attend boarding school in Athens, and the younger girls study by correspondence course.

In their spare time, the whole family goes camping around in the many beautiful spots on Rhodes, especially after the tourists have left. ■

✓See List of Advertisers on page 130

Paul Grupp KA1LR
73 Magazine Staff

Reviewing Daiwa's New Meters

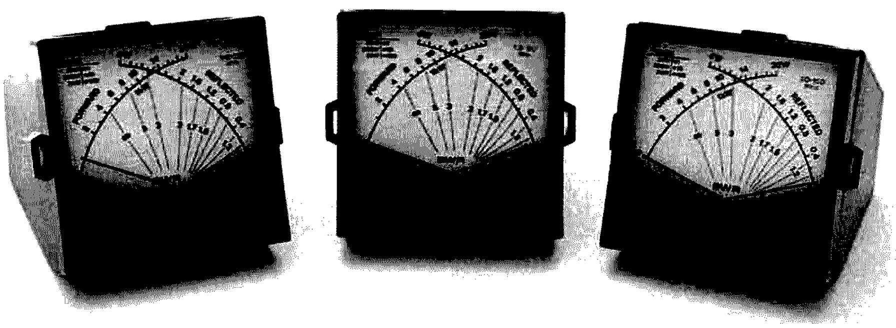
—fiddle-free swr measurement

Much as I hate to admit it, I am always in search of the ultimate swr meter. I am well aware that the subject of swr is a controversial one. In fact, swr is high on my list of discussion topics to avoid at all costs, right up there with the relative merits of quads vs. yagis, the number of angels that can dance on the head of a pin, and the ARRL. Particularly if the conversion is taking place on 80-meter phone!

After sober consideration and a mild sedative, most hams will agree that there are merits to having an swr meter in the antenna line at all times. I can't be the only one who has neglected to flip the antenna switch when changing bands or forgotten to tweak up an antenna tuner when moving from the phone portion of the band to CW. In these and similar situations, a well-designed swr meter in a prominent location can save the day, as well as a set of transmitter finals.

For this type of continuous monitoring, the last thing you need is the latest laboratory-standard instrument, complete with felt-lined wooden case and a calibration guarantee signed by the Almighty. Spend the money on intoxicating women and loose beverages instead. What you want is a simple meter that displays swr without requiring you to flip any switches or tweak any knobs. With very few exceptions, wattmeters are all pretty much alike. They differ primarily in the level of accuracy they provide, and almost all require you to flip switches and tweak knobs. Some of the most intriguing flipless, tweakless wattmeters can be found in the Daiwa line of radio accessories.

At first glance, these meters look somewhat imposing, with a pair of meter needles and a series of red lines marked on the front panel. First impressions aren't always right! Anybody can learn to read a cross-needle meter in less than a minute, and once you've learned how, you'll be hooked forever. The scale on the left side of the meter face reads forward power, and the scale on the right side reads reflected. These are the scales you would pay attention to if you are interested in measuring absolute values. Want to know swr? The point where the two needles cross displays standing wave ratio. No switches to flip or knobs to tweak! These meters may not replace the venerable Bird for test-bench applications requiring extremely high resolution and accuracy, but they are exactly what most hams need to monitor station performance on a day-to-day basis.



Swr meters from Daiwa.

Continued on page 180

Reader Service for facing page ✓81→

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Ham Shack Design for Beginners

—Novices, take note!

One set of questions usually asked by new hams concerns the practical aspects of setting up a new station. These questions are often difficult to answer since they can affect the new ham's entire family, assuming the station is to be located at home.

Question: I just got my call in the mail and now want to set up my station. What is the minimum I need for the operating position?
Answer: I have seen ham shacks ranging from a separate building containing a TV set, stereo, bathroom, and refrigerator to one built into a single desk drawer. However, at a minimum you need an ac line outlet, a ground wire, and a way to run your antenna feedline.

Q. Let's take these one at a time. What about the ac line?
A. It would be nice if you had a single 120-volt line direct from your house fuse box with 20-Amp service and a second 240-volt line for a linear amplifier. However, most of us end up plugging in a distribution box containing four or eight outlets, a fuse or breaker, a switch, and a pilot light. If you want to use a commercial box, there are several available, but they are only fused on one side; you really want fuses on both sides. See Fig. 1.

Q. Why fuse both sides? I thought that most 120-volt ac lines have a neutral or common which is grounded.
A. It is a matter of safety. If you get a lightning strike that enters your home wiring, it is nice to have both sides of the line fused so that there is a chance the fuses or breakers will blow and protect your equipment.

Q. I take it that when I want to operate the station I simply have to flip one switch and I now have power to all the equipment?
A. Yes, but you will also want to have one or two ac sockets which bypass the switch so that power is always available to your clock, desk lamp, or any other equipment which you might want to use independent of your rig. You also might consider using a key switch if you have any small children around so that they cannot turn on your station.

Q. How much power should I plan on?
A. As a rough approximation, complete a table for your station such as the one shown in Fig. 2.

Q. Well, just how many outlets do I want in total?
A. No ham in history has ever had enough outlets or current available. It is getting a little better now since many hams are also wiring

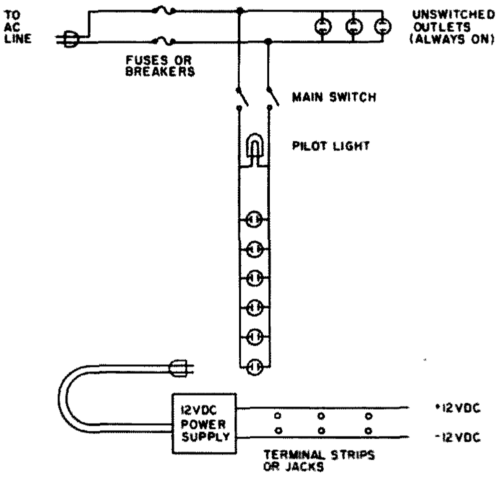

Fig. 1.

	Example (Watts)	Your Station
Rig	400	
Keyer	20	
Clock	10	
Outboard Active CW Filter	10	
Antenna Rotor	75	
Desk Lamp	100	
Total	615 Watts	

Example: 615/120 = 5.125 Amps 5.125/0.8 = 6.4 Amps total
Your Station:_____/120 = _____Amps
_____/0.8 = _____Amps total
Take the total power and divide by 120 to get the current, and then divide by 0.8 to account for any power factor. The number you get is the Ampere load you will have to supply from the ac line.

Fig. 2.

their shacks with both 12 and 5 volts dc.

Q. Why would I want to do that?
A. Typically, you will end up with a main rig and then a half dozen solid-state accessories. If you build them independently, there also will be a half dozen small dc supplies, each of which must be plugged into the ac line. If you plan ahead a little and set up a 12-volt power supply at a few Amps, you can power all of these units from the one supply. Most of the circuits around these days use 12 volts dc, with the exception of those using 5-volt digital logic. You can add a separate 5-volt dc supply or include a dropping resistor and voltage regulator in each of the 5-volt units.

Q. Will I be safer if I connect the ground bus to the ac power system?

A. Unless you are an experienced electrician, the only grounds you should use with the ac line are those built into the three-wire cords common on some equipment. Keep your ground bus separate.

Q. Since the ground bus is not connected to the ac line, what do I need it for?

A. You need a good ground primarily for safety. I use a 1" × 1/2" aluminum bar, running the length of my operating table. Every 6" I have drilled and tapped it to connect braid from the bus to each of the pieces of equipment. When I put a piece of equipment down on the operating table, I connect it to the ground bus before I plug it in, and when I want to remove it, I unplug before I disconnect the ground. If anything goes wrong, at least I don't end up with the 120-volt line voltage on the front panel of the equipment. See Fig. 3.

Q. Where is the ground bus connected to? Can I use a hot-water pipe rather than a cold-water pipe? How about the radiators? How about the this or the that?

A. Yes, yes, yes. If in doubt, connect it to all of them. No one has an ideal ground and you cannot hurt anything by connecting it to more than one ground. Just stay away from the ac wiring. The most important thing is to use wide braid or heavy aluminum wire, securely clamped. You should also remember that these mechanical (non-soldered) connections corrode and should be cleaned and tightened periodically.

Q. Is this ground bus the same ground that is shown in the pictures of antennas?

A. If you are using a coax-fed antenna, such as a dipole or beam, the shield of the coax will be connected through your rig or matchbox to the ground bus. But the bus plays little if any part in the antenna performance. However, if you are using a matchbox to feed a long wire with no radials, the ground bus provides the other end of the antenna circuit and is doubly important. See Fig. 4.

Q. What about antennas in setting up my shack?

A. Your shack must be located in such a way that you can run your antenna feedlines to the operating position. For this reason it is always nice to be close to an outside wall. Remember that no ham in history has ever had enough antennas, either. Plan ahead, and if you expect to run three lengths of coax into the shack, *plan* for at least six or eight and make whatever opening you drill through the wall big enough for the additional feedlines. It is much easier to stuff the extra space with loose fiberglass insulation than to go back and drill some more. Fig. 5 shows one possibility.

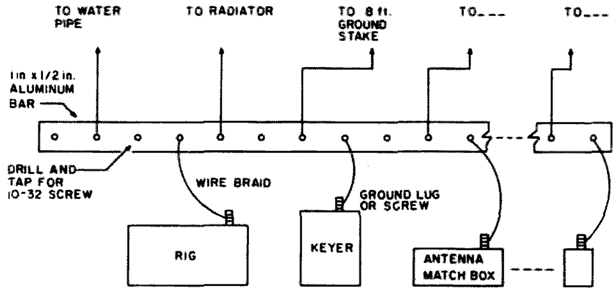

Fig. 3.

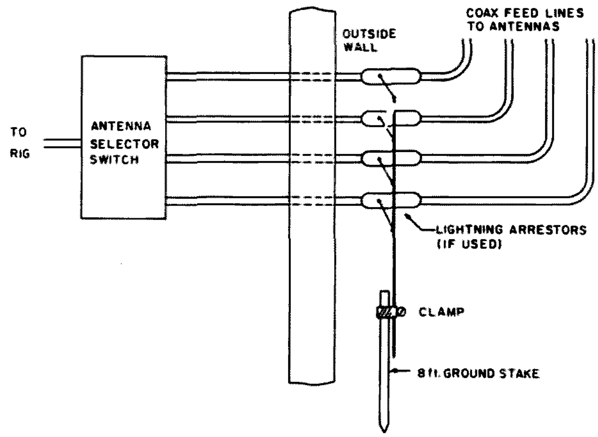

Fig. 4.

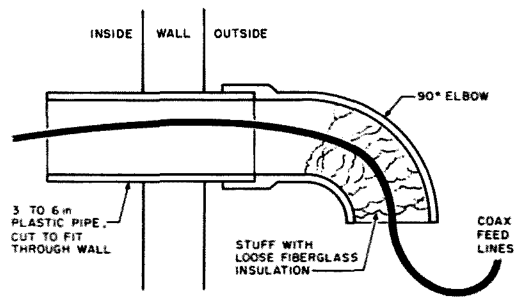

Fig. 5.

Q. I keep seeing pictures of ham shacks where the antenna coax, ac line, ground bus, and all of the wiring is hidden behind custom-made panels. Some of these shacks would put the best commercial installation to shame. Is this what I should plan on?
A. There is no question that designing and building a neat, custom-made installation provides some hams with just as much fun and challenge as working for DXCC. However, most hams "rack it and stack it" in the most convenient way. Whatever you do, remember that you will be making changes in your equipment, adding boxes and replacing boxes, so that you want the flexibility to change without major woodworking. If you do decide to "build it in," remember to leave room to get behind the units to work on the wiring.

Q. What about furniture?
A. My shack consisted of a folding cardtable for many years. I am now using an old desk with a spare door screwed on top to provide

more area (Fig. 6). Old desks are nice since they give you drawers for storing logs, callbooks, headphones, and several cubic feet of clutter which otherwise would lay around. You also can get more top area by mounting a shelf above the desktop with sections of 2″ × 4″ wood and L-brackets. Measure the height of the largest unit you expect to have on the bottom and then mount the shelf at least 4″ above this height to give heat a chance to escape.

Q. How about the little things, such as a chair, lights, and such?

A. Spend six or eight hours in a contest and you will find these are not such little things. Some phone operators literally use large armchairs as they claim "armchair copy." CW operators usually opt for a stiff-backed chair with a soft cushion. The cushion is optional until contest time. The key thing is to be comfortable for the periods you are operating. For this reason, you also will want to modify your rig to fit your needs.

Q. (with horror) Modify my brand new rig? Won't that reduce its value when I want to sell it?

A. These modifications won't. First, look at the knobs. On CW I tend to ride both the volume control and the tuning control. I found it much more comfortable to replace the 2″-diameter knob on my Heath SB-102 with a larger, 3″ knob, and the fluted volume control with an identical size non-fluted knob. You also can change the height of the knobs by either drilling holes in the desktop for the rubber feet (lower the rig) or by placing the rubber feet on small wooden blocks to raise the knobs. You also can tilt the rig (Fig. 7).

Q. Why tilt it?

A. Some people are more comfortable with the rig tilted backwards to put the frequency dial more fully in their line of sight. Others like to tilt it down. Since the total investment is a few pieces of wood, it pays to experiment. Also check that the room lights or your desk lamp don't reflect in or wash out the numbers on the new rigs with the digital dials.

Q. I already can see that I will run out of space quickly. Where else can I put things?

A. If you home-brew some of the station accessories, such as audio filters and keyers, you can mount them inside a 1″-high chassis and slip them under the rig. A second approach is to suspend them from the bottom of the shelf. Separate power supplies can be placed under the operating position on the floor, and you can always hide things such as antenna rotor controls in a drawer.

Q. You said that the shack location and arrangement could affect the entire family. How is that?

A. Late-night operations with a loudspeaker or most of the old RTTY units pose an obvious problem. If you set up in a remote corner of the basement, consider including an intercom so that you can be called for dinner. An extension telephone is almost a necessity, but be forewarned, it will ring just as it is your turn to call the A9 station on the DX net.

Q. Anything else?

A. There have been several million ham-years of experimentation with the arrangement of stations. The best bet is to visit a number of stations and see how they are arranged. Don't be over whelmed by the amount of equipment you see. What you are looking for is how do you sit and how do you reach things. Then experiment before you plug in a single wire. The only thing for certain is that you will change the arrangement before very long and end up with just the right arrangement to suit *you*. ■

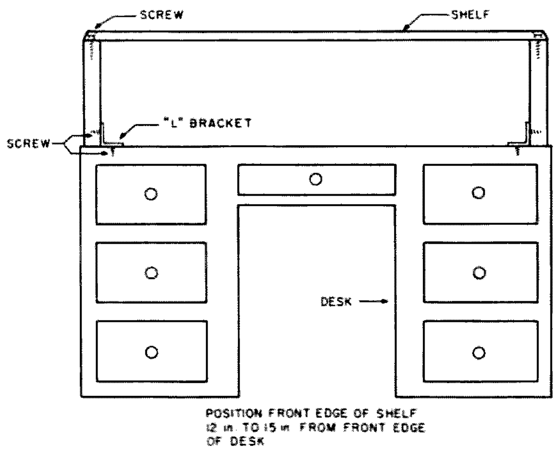

Fig. 6.

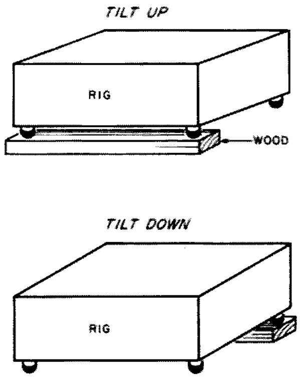

Fig. 7.

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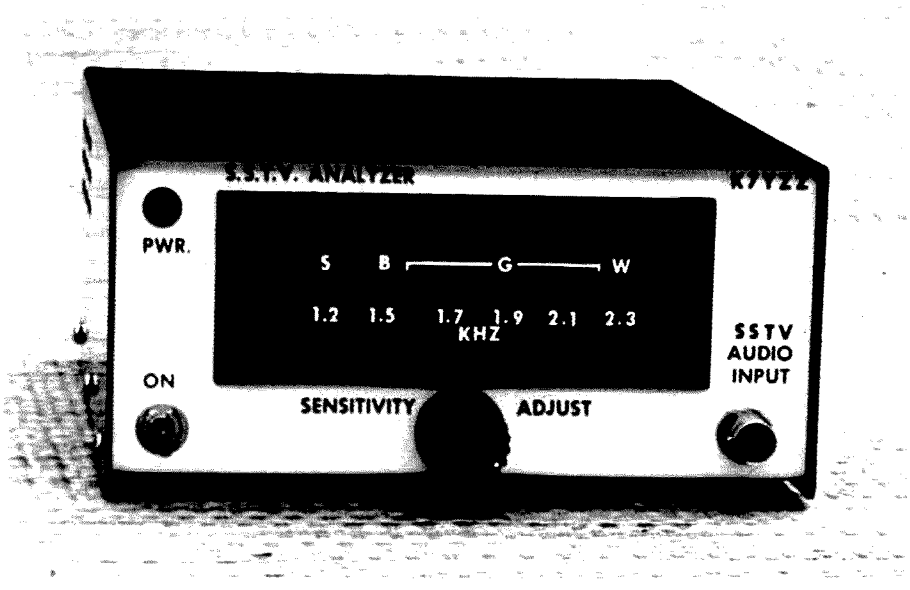
SSTV Signal Analyzer

—simple and inexpensive, even

For those of us who are experimenting with slow-scan TV, it becomes very apparent that one item required in the ham shack is a device that will indicate to the SSTV operator that the received or transmitted SSTV signal is properly adjusted for optimum gray scale. Audio frequency spectrum analyzers designed for displaying the SSTV audio signal on a small CRT have been described in previous articles.[1,2] These analyzers required the construction of high-voltage supplies to power the CRT and associated deflection circuits. Components of this type are becoming more and more difficult for the builder to locate.

A spectrum analyzer utilizing solid-state design was described recently that covered the audio range of 30 Hz to 16 kHz and was far too sophisticated for SSTV application.[3] Another pair of devices that appeared on the market were investigated for application in an SSTV signal-analyzer function. They were the LM331 frequency-to-voltage converter[4,5] and the LM3914 dot/bar display driver.[6] Several different circuit configurations were built in an attempt to use them as an SSTV audio signal analyzer. The initial results were very disappointing. The circuits were subject to input level sensitivity problems which adversely affected the display readings. The spectrum coverage also was determined to be unsuitable for SSTV application. However, from the results of the literature searched and with problems identified from the breadboard circuit experiments corrected, the configuration of a workable low-cost SSTV audio signal analyzer was developed.

The unit described in this article is of simple design and may be assembled from readily available components. It will provide the ham radio operator with information on the status of audio frequencies necessary for the proper transmission and reception of SSTV pictures.



The completed SSTV audio signal analyzer.

Circuit Description

The SSTV signal analyzer consists of five major items, an input signal amplitude limiter, an adjustable-gain operational amplifier, selective bandpass active filters, LED signal indicators, and a power supply (Figs. 1 and 2).

The incoming SSTV audio signal derived from the station's receiver or SSTV

picture-generating equipment is limited in amplitude by the limiter and is fed to an adjustable gain operational amplifier whose output is connected to six different audio bandpass active filters. The selection of component values for each audio frequency filter was made by a computer program for active filter design run on my microcomputer (Table 1). The SSTV audio frequencies selected were 1200 Hz (sync), 1500 Hz (black), 1700 Hz (gray), 1900 Hz (gray), 2100 Hz (gray), and 2300 Hz (white).

The audio signal appearing in the output of each active filter is fed to a transistor driving an LED indicator. When the appropriate SSTV audio frequency appears within the bandpass of the active filters, the resulting output causes the selected LED to illuminate.

Construction

The analyzer circuit was assembled on a perfboard pre-trimmed to fit the inside of a 6″ × 2¾″ × 7½″ cabinet. The perfboard is 4½″ × 4½″ (Radio Shack 276-1394) and is mounted on two ½″-high threaded metal standoffs. The IC sockets and component parts are point-to-point hand-wired on the back side of the board. This circuit has not been converted to a PC board. The bridge rectifier diodes and filter capacitors are assembled on a separate 2¼″ × 2″ perfboard which is mounted in the cabinet on ½″-high threaded metal standoffs.

The three-terminal voltage regulators are mounted on the back of the chassis which provides a ready-made heat sink. The total maximum current drain when all LEDs are illuminated is 82 mA, which is so low that the voltage regulators have a very small heat rise. The negative voltage regulator requires the use of insulating mounting hardware (RS 276-1371) for proper operation.

A piece of perfboard (4½″ × ¾″) was used to mount the six LED frequency display indicators. A strip of black plastic electrical tape was attached to the surface of the display board on the side facing the front of the cabinet to improve display contrast. A bezel with a high-contrast filter for LED displays (RS 270-301) was mounted on the front panel. Decals were applied to the optical filter to identify the SSTV audio frequencies being detected and displayed. The six LEDs were cemented in place on the display board using model airplane cement. The display board was mounted behind the bezel using the bezel's mounting studs and small 1/8″ fiber spacers.

Test and Adjustment

The power supply is the first part of the unit to be tested. Power is applied to the transformer and the regulator outputs are checked for the proper plus and minus 15 volts. The power supply is then connected to the circuit board and pin 4 of each LM324 is tested for plus 15 volts and pin 11 for minus 15 volts.

An audio signal generator[7,8] is connected to the input and the frequency of

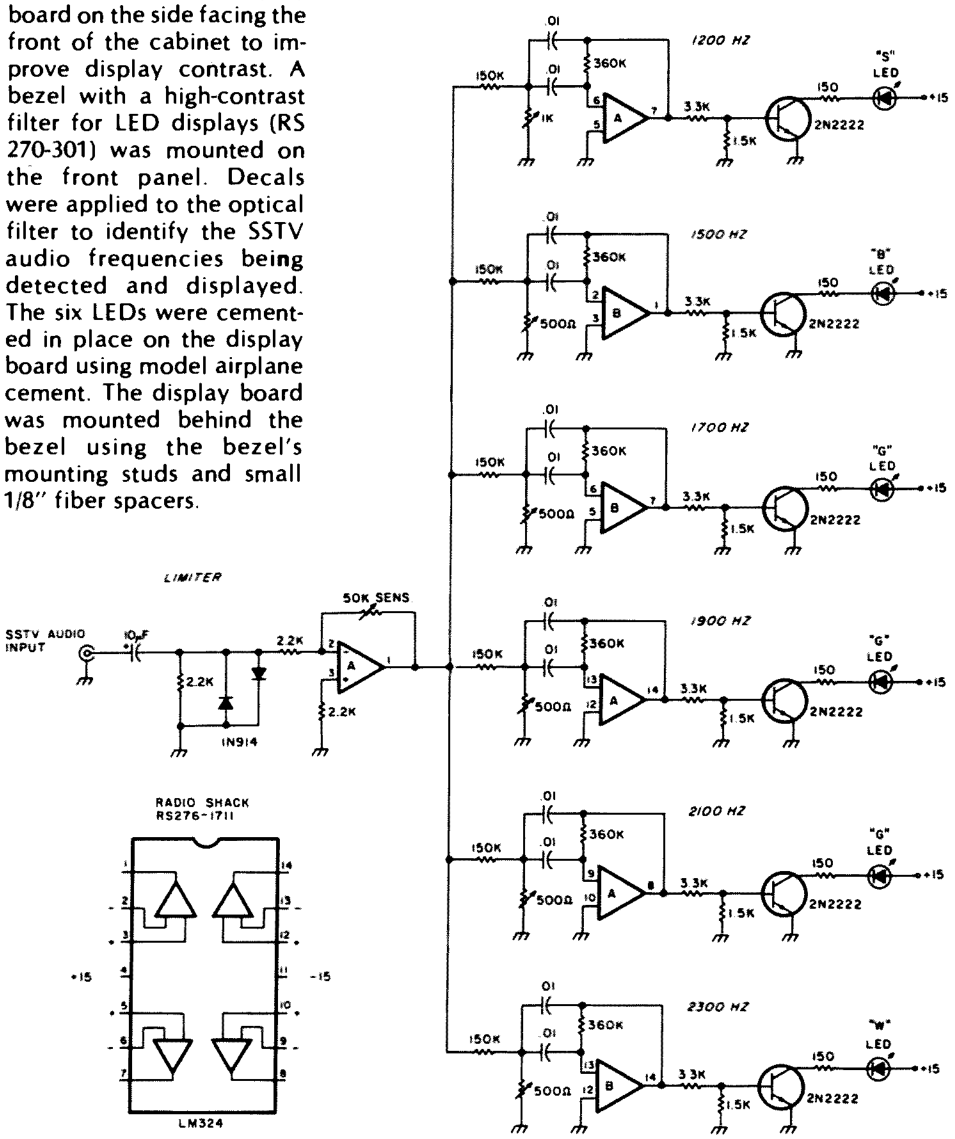
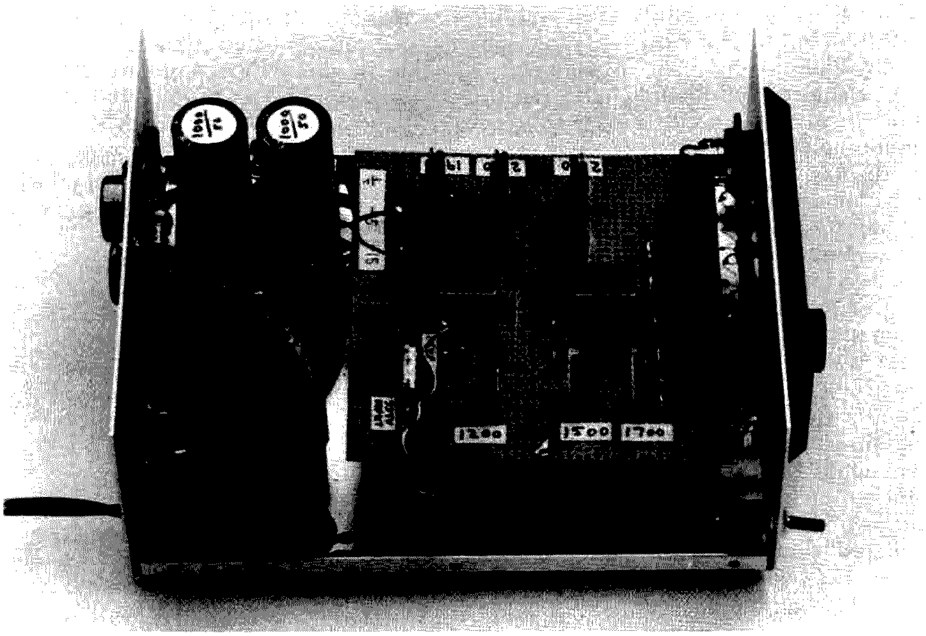


Fig. 1. SSTV audio signal analyzer.

Desired Frequency (Hz)	Computed Frequency (Hz)	−3dB Bandwidth (Hz)	Gain	R1	R2	R3	C1 = C2 (uF)
1200	1200	88.4	1.2	150k	490	360k	.01
1500	1508	88.4	1.2	150k	310	360k	.01
1700	1713	88.4	1.2	150k	240	360k	.01
1900	1900	88.4	1.2	150k	195	360k	.01
2100	2098	88.4	1.2	150k	160	360k	.01
2300	2327	88.4	1.2	150k	130	360k	.01

Table 1. Computer-derived data for SSTV audio signal analyzer bandpass active filters.



Internal layout showing components mounted on perfboard on metal standoffs.

1200 Hz is selected. The trimmer control on the 1200-Hz audio filter is adjusted for maximum brightness from the 1200-Hz LED frequency indicator on the display. The signal generator is now switched to 1500 Hz and the appropriate audio filter trimmer control is adjusted for maximum brightness from the 1500-Hz LED on the display. The same procedure is to be repeated for the remaining four frequencies. (See Fig. 3.)

An audio signal generator is again reset to 1200 Hz and the sensitivity setting is reduced until the 1200-Hz display LED just illuminates. The trimmer control on the 1200-Hz active filter is again adjusted for maximum brightness on the 1200-Hz LED indicator at this reduced input sensitivity. This procedure is then repeated for the remaining five frequencies. The last test is to manually step the audio signal generator through the six frequencies and observe that each LED turns on individually as the signal generator is switched from 1200 Hz to 2300 Hz. The SSTV audio signal analyzer is now ready for use.

Operation

Connect the SSTV audio signal analyzer to the audio output from a receiver that is tuned to an SSTV signal, the output from an active SSTV camera system, or an SSTV tape. Advance the sensitivity control until the LEDs are flickering from the presence of the SSTV audio signal. When the receiver is properly tuned to an SSTV signal, the 1200-Hz sync frequency indicator will flicker at a steady rate of 15 Hz.

The 1500-Hz to 2300-Hz frequency indicators will be illuminated depending upon the picture video content. Fig. 4 shows how the analyzer display will present different SSTV signals. If the sensitivity control is set too high, all LEDs will be driven on.

Conclusions

This little unit should be of considerable help in enabling the SSTV experimenter to send pictures of improved quality and to act as an aid in receiving pictures.

I would like to hear from those who build this unit as to how it performed for them. Questions regarding the unit are welcome but please enclose an SASE. ■

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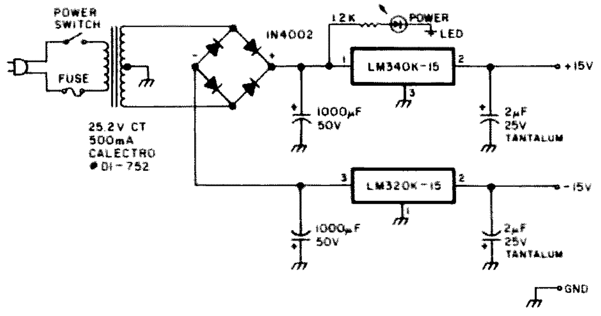

Fig. 2. Power supply.

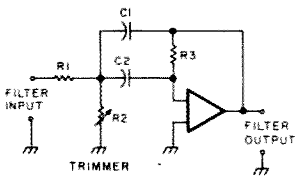

Fig. 3. Typical filter alignment.

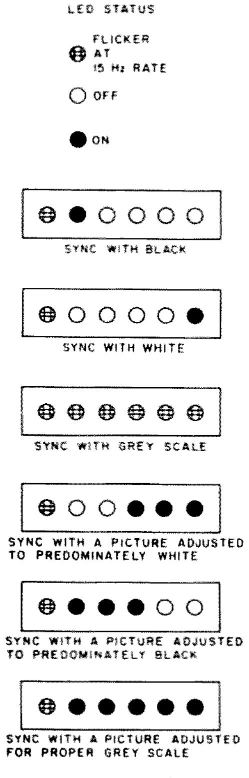

Fig. 4. SSTV audio signal analyzer displays.

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More for Less

—this tune-up procedure gives more RTTY output, less heat to dissipate

Using an SSB rig for RTTY can be hard on tubes, depending on how you tune up your rig. Many hams, I have found, tune their rigs the same as they would for CW or SSB, then reduce the drive to about half power or half the plate current. This is a poor method to use as you are operating on a very low part of the efficiency curve (power input versus power output) of your final tubes. Try the above method into a dummy load, reducing your drive after tuning for CW to half the plate current and note the power on a power meter. Now, figure your input power (Ep × Ip) and subtract the output power from the input power. The result is the amount of power (heat) your final tubes must dissipate.

Now retune, using the same amount of drive you used when tuning up for CW, but instead of loading for maximum output power, reduce your loading to about ten mils over one-half the plate current you were loaded to for CW, retuning the plate for a dip as you reload. Now, for RTTY operation, adjust the drive to the point where your plate current (half the CW current) just begins to drop. This value should be one-half the current you normally load to for CW. Your plate input power should be the same now as before, but check the output power meter reading and you will find about twice the power output as before. And, again, subtract the output power from the input power, and you will find your tubes now have less than half the power (heat) to dissipate as before. Adding a muffin fan to draw the warm air out of the final compartment will be an even greater tube saver.

If you're using a linear, it should be tuned after your exciter and should be tuned for maximum output with the available drive you now have from your exciter tuned for RTTY. If you wish to run less than the maximum your linear will put out, reduce the loading on the linear, retuning the plate for the desired power output. Do not reduce power by reducing the drive on the exciter as this puts your tubes in the low efficiency part of the power curve.

Don't take my word for this method—try it! Your tubes will love it. Test this method and prove to yourself it works, and save on those tubes.■

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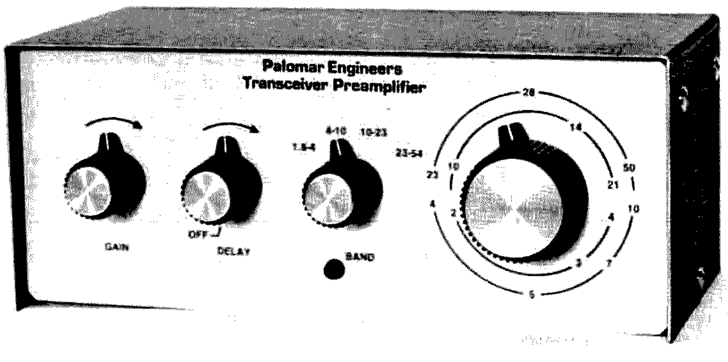
Inside the Palomar Preamp

—big ears for your receiver

Regardless of the sophistication, cost, or complexity of one's amateur radio equipment, there always seems to be room for adding a few custom accessories to round out the station's inventory. One of the most common accessories is the receiving preamplifier. Most of the best-designed (and costly) transceivers and receivers sold today have enough sensitivity and front-end rf selectivity to make the purchase of a preamplifier of questionable usefulness—though this "armchair speculation" does not always hold water. Older and especially vacuum-tube era and SWL-oriented equipment can almost always profit from the installation of a preamp. Thus I looked forward with anticipation to trying out one of the new Palomar Engineers P-310X transceiver preamps. I obtained one at the 1981 ARRL National Convention at Orlando, to try out with some 1980s vintage gear.

The new Palomar unit is the successor to an earlier model, introduced about three years ago, that was styled along the lines of most Palomar accessories: die-cast aluminum cabinet with a bright red-orange cover. The older unit covered the 1.8-54-MHz range and featured circuitry and gain comparable to the newer version, but it had a transmit-receive (T/R) relay that occasionally gave trouble. The new bi-linear P-310X is actually one of a line of four similar preamps offered by Palomar. Its closest cousin is the P-312X, which is similar but is designed for 12-V dc operation. The P-308 is a receiver-only ac-powered preamp, while the P-305 is the same receiver-only unit but intended for 9-V dc operation using a standard transistor radio battery. Though all models are similar, the P-310X is the top of the line; its bi-linear circuitry features T/R sensing for automatic cutout of the preamp while transmitting and the built-in power supply allows convenient hookup to an ac outlet by means of the six-foot three-conductor power cord.

The preamp uses a tuned rf amplifier which covers all of the ham bands from 160 through 6 meters (1.8 to 54 MHz) and all radio services in between. The continuous coverage feature also makes it suitable for general-coverage and SWL purposes. At the heart of the unit is a low noise dual-gate FET transistor amp which affords a 1.5- to 3.5-dB noise figure. Input and output im-



Palomar Engineers P-310X transceiver preamplifier (Photo courtesy of Palomar Engineers)

Continued on page 180

Tim Daniel N8RK
73 Magazine Staff

Four New Books for the Experimenter

Imagine that it is a rainy Saturday afternoon. Sol has gone on a rampage, leaving your favorite DX band in disarray. Instead of searching for a new country to work, you decide to warm up the soldering iron and build a simple yet useful project. Next you turn to the bookshelf to find a source for your rainy day fun.

Beginner's Handbook Of IC Projects

The lucky experimenter will find a copy of the *Beginner's Handbook of IC Projects* by David Heiserman. This 216-page Prentice-Hall publication covers building, troubleshooting, understanding, and testing elementary integrated circuit projects. The emphasis is on construction. Each of the 84 projects has a schematic diagram accompanied by a parts list and brief description of circuit operation. The author encourages the builder to use a solderless breadboard to debug and experiment with the circuits; they can later be built in a more permanent fashion.

The circuits in the *Beginner's Handbook of IC Projects* range from a "Simple Light Flasher" to a "15-Channel Rf Synthesizer." The parts required to build the projects include garden variety TTL chips as well as more exotic linear ICs. If your junk box is not up to snuff, then you can get most of the components from Radio Shack or one of the mail-order houses. Detailed pinout and function information for the ICs is given in an appendix.

The projects in this handbook are not earth-shattering achievements that will change your life, but they are certainly fun and educational. If you are a hands-on type who enjoys simple yet state-of-the-art projects, then consider adding *Beginner's Handbook of IC Projects* to your library. Both hardbound and paperback editions are available from Prentice-Hall, Englewood Cliffs NJ 07632.

Ed Noll's Solid State Circuit Files, Volumes I and II

Have you ever wondered just what a common collector amplifier does or how a counter circuit works? Your search for this kind of information might lead you to *Ed Noll's Solid State Circuit Files*. This two-volume set is published by Howard W. Sams and Company. Each book is designed to give electronics buffs practical experience with the circuits that form the building blocks for our modern-day technological wonders.

Volume I of *Solid State Circuit Files* covers bipolar transistor, FET, and linear IC circuits. There are more than 60 circuits, starting with simple transistor amplifiers and progressing to the popular linear IC devices. Each file includes a circuit diagram, a detailed technical description, and a suggested procedure for experimentation. Digital circuits are featured in Volume II. The 61 files are evenly split between CMOS and TTL applications that range from basic gate functions to multichip counter-display designs.

The student or serious experimenter who is armed with *Solid State Circuit Files*, a breadboard, and a handful of parts can obtain a good understanding of what makes a circuit tick. If you have already mastered the basics, then the circuit files can be a helpful reference when you want to refresh your knowledge of a specific circuit: Volumes I and II of *Ed Noll's Solid State Circuit Files* are available from Howard W. Sams and Co., 4300 West 62nd St., PO Box 7092, Indianapolis IN 46206.

Troubleshooting Solid-State Circuits

The third book that you might reach for on a rainy afternoon would be *Troubleshooting Solid-State Circuits* by George Loveday and Arthur Seidman. The core of the text centers on a "concise description of major solid-state devices and their operation in practical circuits . . . followed by a discussion of how these devices and circuits fail and what troubleshooting techniques are employed to isolate and correct the fault in minimum time."

Troubleshooting Solid-State Circuits is written as a study text for a course in electronics troubleshooting. There are exercises for the student to solve and answers to the exercises in the back of the book. This is *not* a how-to-do-it style book. You won't find step-by-step instructions to build a super-duper bang box; instead, you will have a resource for learning how basic circuits operate and how to diagnose their ills.

The first chapter can be particularly helpful to a beginning troubleshooter, since it describes how to use measuring instruments as well as the basic procedures used to diagnose even the most complex electronic equipment. A 106-page softbound edition of *Troubleshooting Solid-State Circuits* is available from John Wiley & Sons, 1 Wiley Dr., Somerset NJ 08873.■

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CB to 10
—part XXXI: simplified offsets

With the growing number of CB-to-10-conversion articles, an urge to do my part and liberate one from 11 meters finally got the best of me. I obtained a Realistic TRC-452 and was then faced with the problem of which of the many band plans to use. A listen on 10 with the FT-101 only served to compound the problem. Then along came the January, 1980, *73* with a CB-to-10 FM conversion, and I was sold!

A Sams for the 452 was obtained and studied at great length. The TRC-452 uses a uDP-585 chip as the heart of the synthesizer. This chip has a BCD programmable divider, so it was decided to use thumbwheel switches for channel selection.

The unit was then placed on 10 FM using the January, 1980, and November, 1978, *73*s as a guide. The coverage using the thumbwheel switches is 29.000 to 29.990 MHz, so care must be used to ensure that all transmissions are in the amateur bands, but no trouble has been experienced with this. If you are nervous, an additional circuit could be added to prevent out-of-band transmission, but that's another project.

The only thing left to do was to find a *simple* circuit to obtain the 100-kHz offset used by repeaters on 10. Another search through back issues of *73* yielded the 600-kHz offset for 2m which became the inspiration for the circuit in the accompanying diagram.

The offset circuit consists of two main portions: the subtraction logic and the switching logic. It is placed between the 100-kHz BCD switch and the programmable divider inputs. Four exclusive NOR gates are used to achieve subtraction in conjunction with two NAND gates used as inverters and four 1N914 diodes wired as OR gates. The 74LS266 was chosen, as were all of the parts used, because it is readily available. Since it uses open collector outputs, resistors R7 through R10 must be used, but if a 74135 exclusive NOR gate package can be located, the four collector resistors can be eliminated, further simplifying construction. Resistors R1 through R6 are all pulldown resistors to ensure that the gates see the correct logic levels.

The 74157 is a quad 2-line-to-1 data selector. A pair of 7400 NAND gates and a 7805 regulator to interface the offset circuit to the radio make up the switching logic. The TRC-452 uses an 8-volt line which goes low on transmit to switch the radio between receive and transmit. This line is brought down to the 5 volts required by the TTL logic by the 7805. A switch on the front panel is used to remove the 8-volt transmit line when no transmit offset is desired.

If you sit down and work out the innards of the subtraction logic, it will become obvious that it is a binary rather than a true BCD subtraction, but this is really only a problem using BCD switches when 1 is subtracted from zero. The answer is 15 instead of the 9 we would get with a BCD subtraction. Rather than add more circuitry to gloss this over, I decided to use a NAND gate left over to sense this invalid code and inhibit the offset. This is the function of U3C and conforms with the main design goal of a simple, easy-to-build circuit.

Hopefully, this 100-kHz offset will be of use to others who are converting this or similar CB units for use on 10-meter FM. Pick up your soldering iron and have at it! I'll see you on 10 FM.■

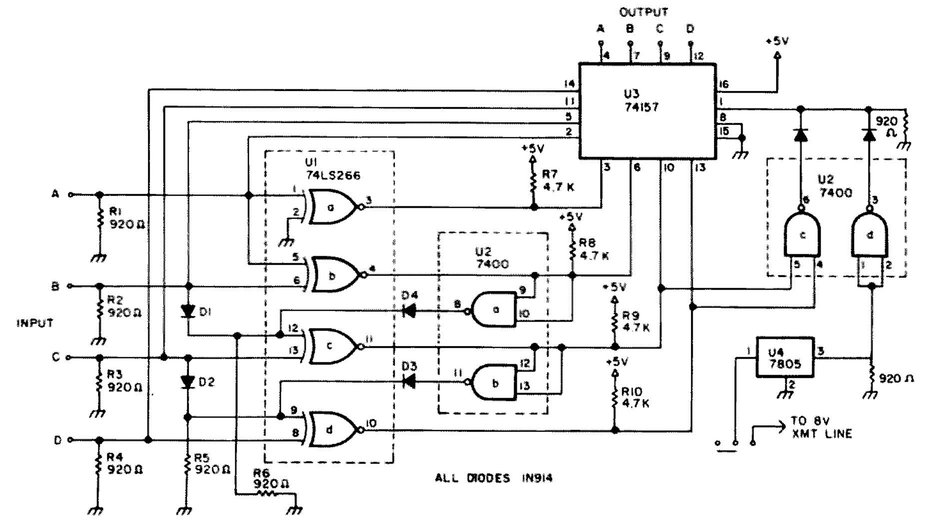

Fig. 1.

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An X-Band Swept-Signal Source

—one for the road

Tuning up a waveguide filter for an X-band requirement can be a tedious job. A swept-frequency oscillator seemed to be in order. The sweep circuit must tune an oscillator across the band of interest. It should provide a voltage ramp which rises in amplitude, abruptly falls to zero, and then repeats itself. The width and amplitude must be adjustable in order to control sweeping in the band of interest. This same sweep voltage could be used to provide the horizontal sweep for an oscilloscope, and when a detected output is applied to the vertical amplifier of the oscilloscope, a visual pattern of the passband of the filter can be observed. This form of presentation also would be helpful when tuning up an X-band horn antenna, although a sensitive receiver would have to provide the vertical sign.

A sweep circuit was designed which was applied to the varactor tuning capacitor of a Gunn diode oscillator. It performed very well for both applications. A waveguide cavity wavemeter then was inserted in the detection waveguide to provide a discontinuity in the trace which could be moved as the cavity wavemeter was adjusted. This provided markers that would assist in indicating passband widths, and when the amplitude was calibrated, also indicated levels of attenuation or gain.

The filter being processed using the above technique is part of the front end of a radar detector which is centered on 10.525 GHz, the X-band police radar assignment. The filter forms a preselector for a varactor-tuned Gunn oscillator transceiver front end manufactured by Microwave Associates. The detected output of the transceiver is fed into a 30-MHz i-f amplifier. The combination makes an extremely sensitive radar detector.

The output of the superheterodyne receiver described above is directed into an alarm system which was tripping on signals from other services which were outside of the police radar band. The receiver also is used on the X-band amateur assignments. When the manual tuning control voltage is replaced with the output of the sweep circuit and the detected output and sweep voltages are applied to an oscilloscope, a panoramic view of the spectrum can be observed.

A second, swept Gunn

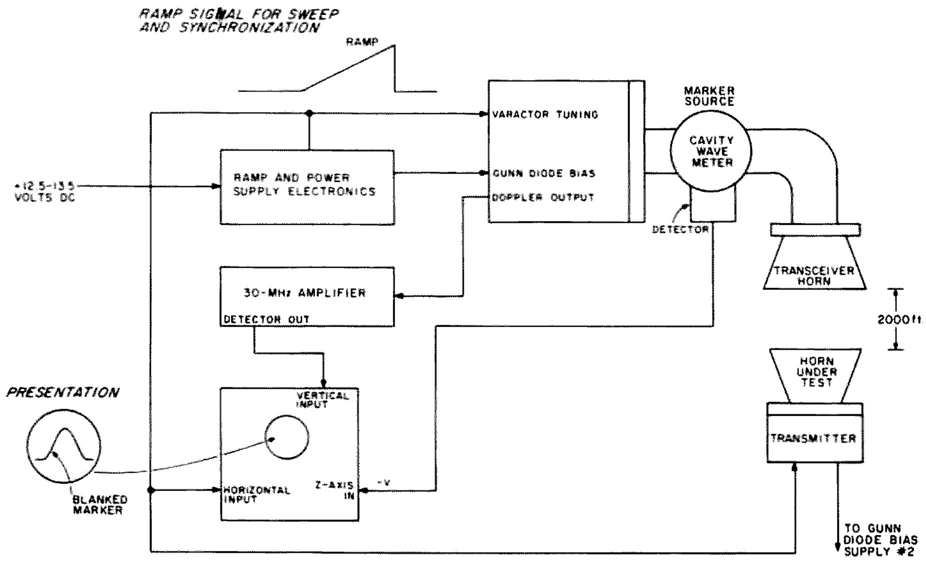

Fig. 1. Block diagram of method of presentation of swept signal.

oscillator is used in the manufacture and tune-up of horn antennas for radar detectors which I manufacture. The receiver described above is located at a considerable distance from the transmitting horn, and the sweep voltage from the transmitting oscillator is applied to the receiver varactor tuning over a long cable. This allows the receiver to be swept in synchronism with the transmitter and the resulting oscilloscope presentation used to assist in making adjustment to the horn antennas.

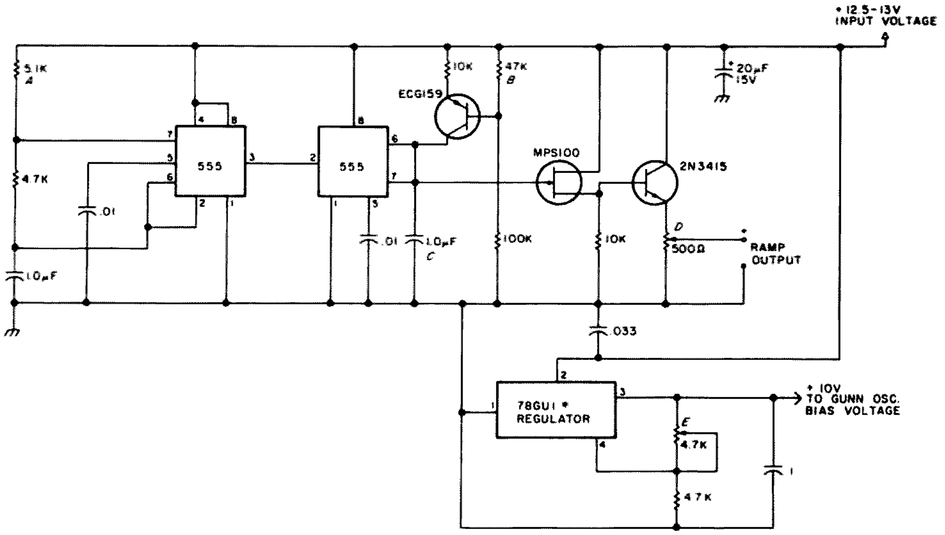

Fig. 2. Sweep circuit and power supply for a swept-frequency Gunn oscillator.

Considerable care in setting up an antenna range as described must be exercised. It must, at my location, be arranged so that the transmitting horn is at right angles to the nearby highway (which is in view) so that jamming will not occur to the Blue Wagons parked along the highway.

A block diagram (Fig. 1) of the test setup will give a good idea of how to apply the sweeper circuit to a similar Gunn diode setup. A Gunnplexer is used in the amateur band receiver, but without the oscilloscope since mountaintopping is hard enough without the weight of my old Tektronix 535. The circuitry shows how it is all done, with emphasis on sweeping the transitting oscillator's 50-milliwatt output. The use of a higher-power Gunn oscillator is anticipated which will increase the transmitting distance.

Let's take a look at the sweeper circuit (Fig. 2). It consists of a pulser keying a monostable oscillator to produce a very linear ramp voltage. This voltage is fed into a source-follower because the output of the ramp is taken from the junction point of the timing capacitor, C, and its switch. This is a fairly high-impedance point and loading can destroy the ramp linearity. The FET source-follower is fed into an emitter-follower which provides the output voltage and current required to drive the varactor tuning over the required voltage excursion.

The two integrated circuits are 555 timers. One is connected as an astable oscillator to produce the trigger pulse for the second 555 which is connected as a monostable circuit. The timing of each of these units can be made adjustable and some further description will assist in deciding how fast it should be made to sweep.

A 50-milliwatt Gunn oscillator swept over a 100-MHz frequency band in 0.8 seconds would cause only small problems to any kind of radar since the time on a particular frequency would be only a very small part of the sweep time. But I needed an oscilloscope presentation and, of course, a faster sweep, at least a 30-Hz rate. A sweep rate at this speed will draw little attention to its originator because it is below the radial velocity of an X-band signal.[1]

This velocity factor, 31.4, multiplied by the desired detection speed of a radar determines the rate which is used for the display system of the radar. Example: 1884 divided by 31.4 Hz equals 60 miles per hour. So, if the swept rate is less than 31.4 Hz, it will not indicate because most police radars are calibrated to plus or minus 1 mph. The radar receiver, of course, will detect the signal, and, in fact, it may just jam it so that it cannot indicate any speed. The best way to use this device is keep it pointed away from roads and highways when tuning up your radar detector.

The circuitry shown uses all fixed values so that the sweep frequency will be below the radial velocity described. The components marked A, B, and C can be changed to suit the needs of the constructor. Resistors A and B can be potentiometers and capacitor C will have to be changed accordingly. Consultation of data sheets[2] for the timing rates for the monostable and astable circuits will save considerable time in choosing the right values.

The MA 87125 varactor-tuned Gunn oscillator transceiver used in the swept-signal source requires 650 milliamperes of current for the Gunn diode bias. A circuit shown as part of the sweeper circuitry, marked bias regulator, will provide ten volts maximum at the desired current for this purpose. If a greater power output Gunn unit is used, a larger regulator will be required. A 78-series regulator will handle currents over 1 Ampere.

The circuitry shown was built as a breadboard on a small piece of perfboard with flea clips serving as solder points for the components. No particular care was given to parts placement and no problems were encountered with the circuit wired in this manner. Several other units were made to be used mobile and were mounted on a printed circuit board manufactured by Peters Publications, PO Box 62, Lincoln MA 01773, and will be available shortly at a moderate cost.

When construction is complete, it is advisable to make the following simple tests without connecting the Gunn system to it. To do this, apply 12.5 to 13.5 volts to the input voltage terminal. This voltage can be supplied from an automo-

bile storage battery or any convenient source. If a vehicle battery source such as a cigarette lighter jack is used, additional filtering is needed to keep out alternator or generator whine. Adjust potentiometer D to provide a reading of 4 volts as indicated on a voltmeter. This will guarantee that the sweeper starts off at the center of the tuning range of the varactor tuning system for the Gunn oscillator. Next, adjust potentiometer E to indicate 10 volts at the point indicated for the Gunn diode bias voltage.

You may now connect the transceiver to the sweep circuit card. Be sure that you remove the dc supply while you are connecting the circuit to the transceiver. This unit costs considerably more than you want to throw away by blowing a Gunn diode or varactor with a spike caused by a soldering iron or some other fluke.

When all connections are completed and you are sure of them, turn on the dc supply. You should be able to detect rf output from the Gunn oscillator with an rf detector. If none is available, connect a voltmeter to the Doppler output solder pin and terminate this point with a 500-Ohm resistor. When the Gunn diode is oscillating, the correct output voltage should be 0.2 volts across this resistor. If it is higher, adjust the screw found in the waveguide flange (just behind where the antenna connects) until the 0.2 volts appears. Make sure the antenna is pointing away from reflecting surfaces when making this adjustment.

Now that these adjustments have been made, you can be certain that the oscillator is sweeping from 10.465 GHz up to 10.525 GHz. With the voltmeter connected across the varactor tuning pin, readjust potentiometer D so that the meter now reads 8 volts. With the voltage set at this point, the ramp will pull the oscillator through its range and sweep approximately ±60 MHz either side of the center frequency according to the manufacturer's specifications.[3] The sweep linearity is considerably better than the tuning linearity of the varactor diode, so bunching up of the swept frequency will exist on the high end. A small jump occurs at the low end which is caused by the breakover point of the same diode, also contributing to a nonlinear start of the ramped frequency.

When using this device outside or in a vehicle, it must be remembered that the oscillator is subject to temperature problems as is any free-running oscillator for which temperature compensation has not been made. The manufacturer states that these units are tuned at the factory to the specified center frequency ±5 MHz with 4 volts on the tuning varactor, and that the electronic tuning stability is −350 kHz per degree C. With this information available, it should be evident that the sweep frequencies available from this unit are seriously affected in the New England weather, so in the winter the antenna range is not in use and 20 meters is again my meat. ■

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3. Microwave Associates Bulletin No. 7618C, MA-87105 series.

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Battery Check!

—do your nicads measure up?

Once upon a time, I was sent two boxes of AA cells for use in a pair of HTs. Both of the HTs received well after the cells had been installed, but only one would transmit. Swapping battery packs revealed that the problem was in the batteries, not in the HTs. The relatively low drain in the receive mode was supportable; the high drain in the transmit mode was not.

The solution was to grade the cells, using the setup shown in Fig. 1(a). This test is similar to the lead-acid cell tester which used to be used before car batteries were sealed. See Fig. 1(b) for this antique device. Caution: Do not test any high capacity cells this way with a VOM. Be sure your VOM will handle the peak currents shown.

Short-circuit currents for three common sizes of carbon-zinc cells are shown in Table 1. These are typical and may vary. Note that extended testing is self-defeating. About 5 seconds should be enough for you to take a reading.

The trouble with cells is that they all have some amount of internal resistance (R_{int}). When this is low in relation to the load resistance (when the HT was in the receive mode, for example), then it may be ignored. When the internal resistance of the cell is high in relation to the load, as with the HT in the transmit mode, then most of the cell voltage will be dropped across R_{int}. The load will receive only a fraction of the total cell voltage and the load current will be limited by R_{int}.

In the case of a battery of several cells, as in the HTs mentioned, one or two bad cells did render an entire pack seemingly useless. "The batteries are dead." Really, it is better to say, "Some or all of the cells may have a high internal resistance." More words, but cheaper than replacing otherwise good cells.

Internal resistance increases with the age of any dry cell. This is why the term "shelf life" is used. Most cells will always measure full *voltage,* even near the ends of their useful lives. Only really fresh cells will deliver full *current.*

Finally: The subject of this article is the testing of carbon-zinc dry cells. Alkaline, nicad, gell, and lead-acid cells should be tested with discretion. For high capacity cells, a circuit similar to Fig. 1(b) with a low value resistor at R1 could be used until you have some idea of what the peak current will be. Be kind to your meter! ■

D	3.3 A
C	3.7 A
AAA	2.7 A

Table 1. Short-circuit currents for three common cell types.

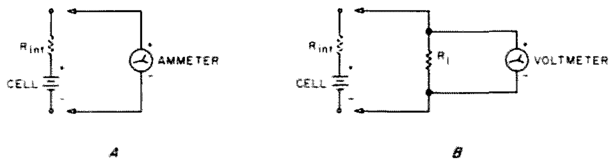


Fig. 1. Cell testing with a VOM (a) and an automotive cell tester (b). R_{int} is shown with dotted lines because it is invisible in most cases. This is discussed in the text. R1 would be perhaps 0.01 Ohm for an automotive cell tester, and from 1 to 10 Ohms for typical amateur applications.

LETTERS

TURKEYS

The article "Wild Turkeys 1, FBI 0" (August) was one of the most informative general interest stories i've ever seen in a ham publication. Mr. Howard seemed dismayed, however, that the individuals suspected of planting the remote jammer were not prosecuted. I would like to offer the following thoughts on the matter:

What if the FBI had already staked out the jamming site when Mr. Howard and his two friends first attempted to locate the transmitter? And what if the club members had found the transmitter, and then were approached and questioned by the FBI agents? Again, here are some licensed hams in the vicinity of an illegal transmitter, only instead of hunting coyotes, they are "trying to find a jammer, so they can put it off the air." No, Mr. Howard, without any more than circumstantial evidence, the Feds were right in refusing to prosecute the suspects.

Bob Morrow WB6GTM
Palo Alto CA

The title you selected for the article on page 12 of the August issue of *73* ("Wild Turkeys 1, FBI 0") reflects your prejudice and shows, I believe, a shameful lack of journalistic integrity.

Anyone reading only the title would have thought that the FBI really goofed up badly. After reading the article, one finds it was not the FBI who goofed up, but the FCC and perhaps the US Attorney.

Being somewhat curious, I contacted the author of the article, who advised me that he thought the FBI did a good job, and that, in fact, he had sent a letter of appreciation to them for their assistance. He also said the title he submitted for the article was "The Wily Coyote Hunters." In his opinion, it was the FCC that was the "paper tiger" in this case.

If we really seek to encourage the FBI in the pursuit of jammers and other illegal radio operations, I think praise and some thanks are in order. Heaping unfounded criticism on them is not likely to help our cause. If you must cast stones, it would appear you could find a more deserving target.

Steve Russell W0OGJ
Freehold NJ

While we appreciate the efforts of the FBI on behalf of the amateur community, we still stand behind the title we chose. The FBI, as our country's most powerful law enforcement agency, must bear the responsibility for educating its agents in the art of gathering evidence for successful prosecution. Considering the FBI's annual budget, we have a right to expect more than good intentions. Should we criticize the FCC for not prosecuting a case in which the only evidence was highly circumstantial? The FCC is to be congratulated for refusing a case that could only have wasted taxpayers' money. Individuals in our society are still innocent until proven guilty. May it always be so.—KA1LR.

NICKEL QSLS

Wow! That's a great idea on QSL cards. I need California on 20m SSB. I think a nickel is about right. Here's my check. Please hurry!

Larry Buhrman WA4GKG
Chattanooga TN

No split orders.—Wayne.

A SIMPLER WAY

In reference to the article titled "Solar-Powered Alignment Tool" in the August *73*, there is a way to determine a north-south or east-west line from the sun without the use of tables, clocks, calculations, etc., as are needed in said article.

The method requires only a small area of relatively level ground and a stick (two or three

feet long) stuck into the ground or other similar device that will cast a shadow so the shadow of its top can be spotted on the ground. One marks the top of the shadow, say with a small rock, at one time and then a couple of hours later marks the top of the shadow. A line through these marks will lie in an east-west direction quite accurately.

If one should wish to determine the time of local noon, he could construct a line perpendicular to the east-west line; that is, a north-south line. Then a stick could have one end stuck into the north-south line and lean over the line by the use of a plumb bob at the top end to align the stick with the line. High noon will be at the time the shadow of the stick exactly falls over the north-south line.

At this time the boom of an antenna can be given a north-south alignment by turning the boom so its shadow and that of the mast line up.

The above method of determining direction was discovered by a very young boy twenty or thirty years ago.

Fredrick Ketterer KA4IYV
Elberta AL

Shades of Stonehenge!—Wayne.

RADAR ROUNDUP

Glad to see that you haven't forgotten about Big Brother's foray into the world of electronic enforcement, and our attempts at passive electronic countermeasures.

I recently had the pleasure (?) of spending a total of 24 hours driving time between Cincinnati and the nation's capital, averaging 55 mph and including a few stops. Aside from sheer distance, the next most irritating factor was the 55-mph speed limit. This time I made the trip in a VW Beetle, so I felt no urge to push it past 55, but we do have faster cars in the garage and 55 in one of those would have been all the more unbearable. In that distance, the difference in time between 55 and 70 mph is approximately 1 hour and 10 minutes on one leg of the trip—a good deal of time that could be spent not trying to stay awake at the wheel (that leg was 10 hrs at 55, the other leg being considerably longer due to a side trip).

If I make any money on that

trip, then I'll consider billing the government at an according hourly rate for those 2 hours and 20 minutes.

I learned a few other things: Radar detectors are not permitted in motor vehicles in Virginia, but at least they warn you of that at the border. Maryland enforces their speed laws. West Virginia apparently doesn't. Pennsylvania certainly does—they had plenty of troopers out taking radar readings, while perhaps one mile down the road (the PA turnpike), some poor motorist was stranded and displaying a white cloth as the little toll ticket instructed him to do. The troopers seemed more interested in making money though, and they must bring in some great sum, for the fine for doing 56 to 60 mph was $45.00! The sign said "Radar for your protection," but it should have read "Radar for our profit." Finally, I learned that two-meter radios can interfere with radar speed devices when, as I drove by one trooper taking readings while I was in conversation on simplex, the trooper threw his arms up in disgust and walked back to his car. This phenomenon happened several times—that's what they deserve for purchasing such shoddy equipment.

It seems that using a device for radio detection and ranging to enforce the speed laws is in poor judgment, due to the nature of the system and possible inconsistencies that might arise from improper use of this system by law enforcement agencies. Let radar be used by the DOD and the FAA, and let the police and Highway Patrol use stopwatches.

Until that day, keep up the fight against government injustice, or this alleged government for the people will become a government against the people. (People in Virginia should keep a Kleenex box on their dashes.) I've done more dangerous things than driving 70 mph. How about you?

Marc A. Boone WD8ROA
Cincinnati OH

You're just baiting me.—Wayne.

REVERSE RADAR RAP

I am an avid reader of your editorial columns and never miss an issue. I am always checking for the latest information that you have about radar. I have some information that I think you should tell your readers about.

First, any crystal-type radar detector will modulate the return radar beam, with a frequency of between 45-55 mph, if the radar detector is within 100 yards of the *police* unit.

I purchased an old "speedalyzer" radar unit at a swapfest and ran some tests with it on my bench. I found out that the microwave diode in the radar detector causes a "chopping" effect and passively chops the return beam up in little pulses. (Signal comes in, diode conducts, shorts out waveguide, no signal. Diode unconducts, signal appears again, starts all over.)

What this will do is that if anyone is driving normally, at a speed below 50 mph, and passes a squad car, it will cause the police radar to read 50 mph regardless of what speed the car is going (provided it is going slower than 50 mph).

The worst part about this is that the units do it even when they are turned off (since the diodes require no power).

Please caution your readers about this problem. I got a speeding ticket because of this problem and it took me 3 years of fighting before I got it dropped. I threatened to go to a jury trial, with all the press, and demanded a test run to show them that I could make their radar read any speed that I wanted to without my car moving an inch.

The court DA said that they couldn't stand the publicity and didn't want the hassle of all the people demanding their money back, so they threw it out of court.

Other people might not be so lucky and have to pay the fine, not realizing that their radar detector was to blame.

Ken Slate W9ITW
Ripon WI

Troublemaker.—Wayne.

MONEY FOR SCHOLARS

The Ed Redington Memorial Scholarship Fund, established last year in honor of W4ZM, has continued to increase. It is

hoped that sufficient funds will be received to establish a perpetual scholarship in Ed's memory.

Many individual and club contributors have indicated that they expect to make annual contributions to the fund in order to spread their tax deduction over a longer period. This is to remind them that it is now time for their 1981 contributions.

With the fund still short of its goal, it is hoped that many others will follow the lead and make additional contributions this year and in coming years to ensure a sustaining fund for this worthy cause.

Won't you help us reach that goal? You may wish to suggest additional contributions at your next club meeting. Everyone who knew Ed appreciates the value of this living memorial to him. Donations in any amount will be most gratefully accepted and acknowledged. Send your contributions to: Foundation for Amateur Radio, Attn: Ed Redington Scholarship Fund, c/o Richard F. Vincent K3AO, RFD #1, Box 230, Bryantown MD 20617.

Bill Miller K4MM
Fairfax Station VA

PARIAH

I read your editorial in the June edition. I wish I could express my thoughts on paper.

I agree with you on the way the ARRL operates. I am a member of ARRL and one of their clubs.

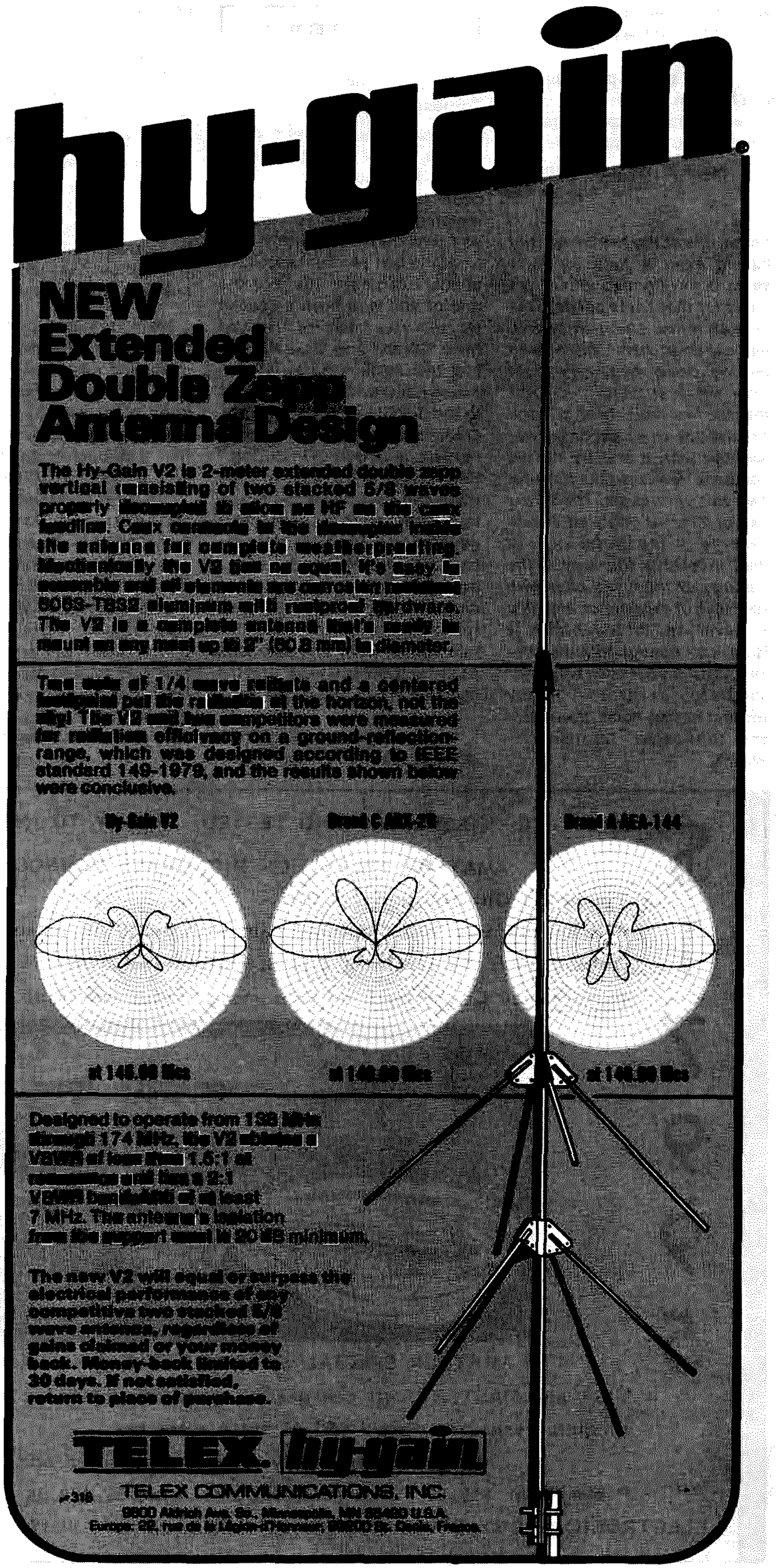
What I want to know is where is the courtesy and good fellowship the hams used to have? The CBer has more fun and courtesy than the hams of today.

If you are a novice you are ignored and can't even get into the clique. The ARRL has a magazine that takes an engineer and a computer to figure out. I thought ham radio was supposed to be fun and a hobby—not engineering.

The lifeblood of any organization is the lowly novice. Where are the "Elmers" they talk about? I need help and have been ignored by the snobs in the club. There isn't too much for the novice in the magazine.

Your magazine is in plain language. Even if you talk about a General class, you name the person and not a lot of numbers.

The hams are getting rude



and discourteous on the air. I was told to get the hell off the air till I learned.

I better shut up because I could go on and on.

I enjoy reading your magazine and hope to continue to do so.

Frank D. Windsor KA6OPZ
Agoura CA

Frank, one of the few benefits of having been a ham for forty years is having read letters like yours for that same period. This may be a new situation to you, but old-timer hams have been putting down beginners right from the first days. I suspect that the first ham sneered at the second one as a newcomer. You just live with it and try to find someone newer to take out your own frustrations on. The bright part of it is that only a small percentage of the hams express their insecurity this way... the majority of them will bear with your lack of experience and help you over the first tough days. It is difficult enough to get on the air and have your mind blank out completely as to what to say without having some clown give you the pariah treatment.—Wayne.

RESURRECT ELMER

(Reprinted from the National Contest Journal.*)*

Elmer is dead. That's right, friends, Elmer and H. Scratchi and L. E. Rapp appear to have gone to the big Wouff Hong meeting in the sky. To those of you who have no earthly idea what the last two sentences are about, I dedicate this. For the rest of you who have a special place in your heart for "The Old Sock," 6L6s, and Blue Racers, bid those days farewell, because ham radio has evolved into the day of the Fox-Tango, the green stamp, the 8877, code readers, and "you're in the log." Before you throw this into the trash can next to the commode, let me tell you that I know every generation in the history of man has criticized the next generation, and the younger group doesn't want to hear any of this rot, but, read on, because this tale comes from one who isn't so old and conservative, and the scenario is sad, to say the least.

Ham radio was born of traditions of fellowship that make it unique to nearly every other form of human endeavor. Those traditions are not being passed along, causing hams to become as selfish and nondescript as the rest of our society. When many of us started in ham radio we had an "Elmer." Typically he was a middle-aged man who talked softly, never worked phone, didn't care much for DX or contests, and encouraged you without ever letting you do anything the "easy way."

He made you study, make mistakes, find your mistakes, fix them, and sweat your tail off to get a two-tube transmitter operating. Along the way, he instilled in you a pride and sense of tradition, a belonging, an obligation, and a respect of ham radio. Night after night you would sit on 7.172 trying to work 200 miles, while he was able to talk clear across the country with his 200 Watts and tribander! When you told him about your first DX contact, both of you lit up with pride. When you worked your first contest and made 62 Qs in 48 hours, you felt like you really did something. You did—you paid your dues!! The privilege of using the airwaves was not taken lightly. That piece of paper you got from the FCC was more sacred than your mother's picture!

For those of you still reading this, it appears that in the late 60s the morality of the world went through a change and, unfortunately, so did ham radio. It wasn't just a normal generational change, but a mutation. The scenario for a new ham now goes something like: from CBer to Illegal CBer, to a collection of books and tapes with other CBers, to a Novice license. No more Elmer! The Novice rig is now a TS-520, a TH6 at 50', and a memory keyer. Then more books, more tapes, six tries, and, voilà, a General license. Once again the VISA card comes out and, in no time, it's a TS-830, a 3K, a 70' tower, and a processor. After three months on 20 sideband, you have the current breed of amateur.

"Hey, this DX station isn't on a list, what am I going to do?" "I paid three grand for this radio station—if I can't work him, nobody will." "You're transmitting on his frequency, you goddam idiot." "This is my frequency." It's sickening. The latest chap-

ter seems to be that since amplifiers are now available commercially that run five to ten kW, it's morally acceptable to use one. Before, you had to covertly build a pair of 4-1000s, and, somehow, that was immoral and unethical.

I sat in a DX forum recently and listened to one of the top DXpeditioners brag about how he lied, cheated, and intimidated people to get to operate from a semi-rare DX spot. Lawsuits are becoming commonplace in ham radio. Two-meter FM is one step from channel 19. I don't have a solution, but I do know that I really don't look forward to turning on the old radio any more. Contests have fallen into the battle of the bucks, the unethical power, the poor operating practice, and the lack of the amateur spirit. I hope that the Commission doesn't get so fed up with our problems that they deregulate us into nonexistence. Pray for the resurrection of Elmer.

Tom Taorimina K5RC
Houston TX

Tom . . . balderdash! One tends to see what one wants to see. And, yes, all of those horrible things you are seeing are there, but they are not as prevalent as you imagine . . . nor are they anything all that different. Tom, twenty years ago . . . before those awful 60s . . . we had Dxers going out and lying up a storm to get into rare countries. Some lied about where they were and the contacts still are all okay for the League awards. We did have a bunch of bad language . . . particularly in southern California . . . but that has died down in most parts of the country. Pileups are the same now as they were twenty years ago . . . filled with silly operators jamming the DX station because they can't hear him . . . fighting with each other . . . and so on. Tom, I've been at this hobby for 44 years now and I honestly see few changes overall. Oh, hams are building a lot more these days and more of them make an effort to keep up with technology than forty years ago, but other than that I can cover every complaint you have with similar beefs forty and fifty years ago . . . back in the "golden ages." All you have to do is read "The Old Man" in those faded pages of QST to know

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Dave Ingram K4TWJ
Eastwood Village, #1201 South
Route 11, Box 499
Birmingham AL 35210

Investigating Icom's 730

—quite a rig

Icom's initial announcement of the IC-730 high-frequency transceiver created a flurry of excitement among many amateurs. Here in an attractive and very small package was a transceiver boasting numerous features previously found only in larger and more expensive units. Could the pint-sized gem truly alter one's thoughts concerning small-sized rigs as "main station" units? Ponder that question while we take a closer look at this feature-stocked unit.

Prior to my acquisition of the 730, I studied the amateur transceiver market quite diligently. I felt that all-solid-state design was paramount yet also desired reserve rf output capability for ease of mind when operating high-duty-cycle modes such as SSTV and RTTY. The ideal transceiver would also have an interface port permitting external microprocessor control. Finally, I wanted a rig equally usable in my main station or in a mobile or portable installation. My inquiries during the 1981 Dayton and Atlanta conventions indicated the Icom 730 could easily handle these prerequisites. During the waiting period for the 730 to become available stateside, I carefully monitored a friend's problem with an IC-720, comparing factory concern and results against previous experiences with other companies. The results were quite impressive: Icom performed repairs within a two-day period and included extensive written reports when they returned the rig. Importantly, telephone conversations with Icom's technicians were always congenial and helpful. The prospect of dependable service was the final nudge to purchase an Icom.

The Receiver

The 730's receiver employs quadruple conversion and a double balanced mixer in its front end. That combination (18-dBm intercept point and .3-microvolt overall sensitivity) produced one of the most enjoyable receivers I've ever used. Since band and power-line noises often play havoc with the supersensitive receiver in my other transceiver, I "tee-connected" both rigs in parallel for comparison. The 730 definitely received weak signals with better clarity and readability than my other unit. Wow!

Three tuning rates are front-panel selectable on the 730. The 1-kHz rate zips from one band edge to the other in three or four dial spins, the 100-Hz rate is approximately equivalent to the Kenwood TS-130's, and the 10-Hz rate (10 times slower!) provides massive bandspread for shaking fingers.

The 730's i-f shift is unique in two respects: It's tuned with a slider pot and *it really works*. I had expected the rig's optional passband tuning to be vital for my personal use, so I was quite surprised and pleased with the i-f shift's ability to dodge adjacent channel interference. It's great, particularly when used in conjunction with the receiver incremental tuning. The optional passband tuning, incidentally, is implemented when the 730's optional narrowband i-f filters are installed.

A dual MOSFET rf preamp which provides approximately 10 dB gain is front-panel selectable. This flexibility, when used in conjunction with the internal noise blanker, allows me to enjoy operating 20, 15, and 10 meters when my other rig is purely overcome with noises. Too much gain can, indeed, be more detrimental than not enough gain—in any rig. The 730's noise blanker, incidentally, can be switched between wideband (line noise and woodpecker) and narrowband (ignition and pulse noises). The fast agc in most transceivers is too quick for my use—they pump and drive the S-meter wild. The 730's agc, conversely, operates smoothly on either slow or fast agc.

All the new WARC bands are, naturally, included in the 730, although 160-meter coverage is omitted. WWV reception is provided in the 10-MHz band.

The Transmitter

Since I'm actively involved in full-duty-cycle modes like SSTV, I'm squeamish of solid-state finals which strain to produce full output. The 730,

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John Ackermann AG9V/1
73 Magazine Staff

The Complete Idiot's Guide to DX

The Complete Idiot's Guide to DX, *by Stuart Gregg NF4Z, Bash Educational Services, Inc., 1981, PO Box 2115, San Leandro CA 94577*

Many hams think of DXing as a part of our hobby that only the elite can enjoy; reading the various DX columns and newsletters leaves the impression that the only way to work the world is to have giant antennas atop gigantic towers and to run the legal limit and then some. And even if the hardware is available, the expertise isn't. DXers keep their secrets to themselves and speak a strange language of their own for which translators are hard to find.

The recent sunspot peak produced a lot of new DXers and reduced the number of people who thought that a monster station was a necessity for successful DXing, but the lack of information for the newcomer still remained. Now that we're on the downhill side of Cycle 21, it's even more important to learn the tricks that let the big guys work the rare stuff when the sunspots aren't helping.

Nowadays, most budding DXers learn by doing, and the process is sometimes a very unpleasant one for the rest of us in the pileup. The *real* lids are enough to keep us busy without having also to worry about ops who simply haven't yet learned any better. It's not the newcomers' fault—the problem is that there just haven't been any good books that provide enough information in one place to allow a beginner to jump into the fracas without fear.

The lack of DX textbooks won't be a problem for long. At least two new books aimed at the fledging DXer have been published recently. One, *The Complete Idiot's Guide to DX*, by Stuart Gregg NF4Z, is quite good if you take the title seriously. It *is* a guide for the total newcomer to DXing. If you've worked 200, or even 100, countries, you won't find much new here, but if you've just stumbled across your first pileup, *The Complete Idiot's Guide to DX* will tell you what's going on and how to make the best of it.

Author Gregg starts from the premise that the reader has never worked a DX station before and goes through a step-by-step description of how to make the contact. He describes both the traditional method of DXing and the more recent innovations of DX nets and lists. He wisely avoids getting involved in the controversy over these methods, and instead limits his comments to the mechanical details of how lists and nets work.

The Idiot's Guide contains a lot of good, solid information for the beginning DXer. It also has some problems, as any first edition of a book covering such a complex subject will.

The book's discussion of station equipment attempts to point out that modest antennas and medium power will do a good job, but some of the anecdotes Gregg tells us leave the distinct impression that it's a lot more fun to have a California kilowatt. Gregg points out the advantages of CW operation but misses the main one—that a "little-gun" station has a much better chance of getting through on CW than of battling through the QRM on phone. Although the book admittedly is not about antennas, it would be nice to see some hard information on simple antennas that will work DX. Such creatures do exist, but the thrust of Gregg's discussion is simply that if you can get away with it, bigger is better. That's not much comfort for those of us who *can't* get away with it!

These are minor, perhaps philosophical, problems. But there are some things that a book on DX must have that this one doesn't. For example, there is no reference to the importance, nay, the absolute necessity, of using GMT (or UTC) time on QSL cards. The sad fact is that if your card doesn't carry the right time, in the right format, you are very unlikely to get one back from a DX station. Anyone who's ever handled cards for a DXpedition or contest can vouch for the pain that it is trying to find a QSO for which the time isn't accurately shown on the card.

The listing of operating events includes several small contests I hadn't heard of before, but misses both the IARU Radiosport

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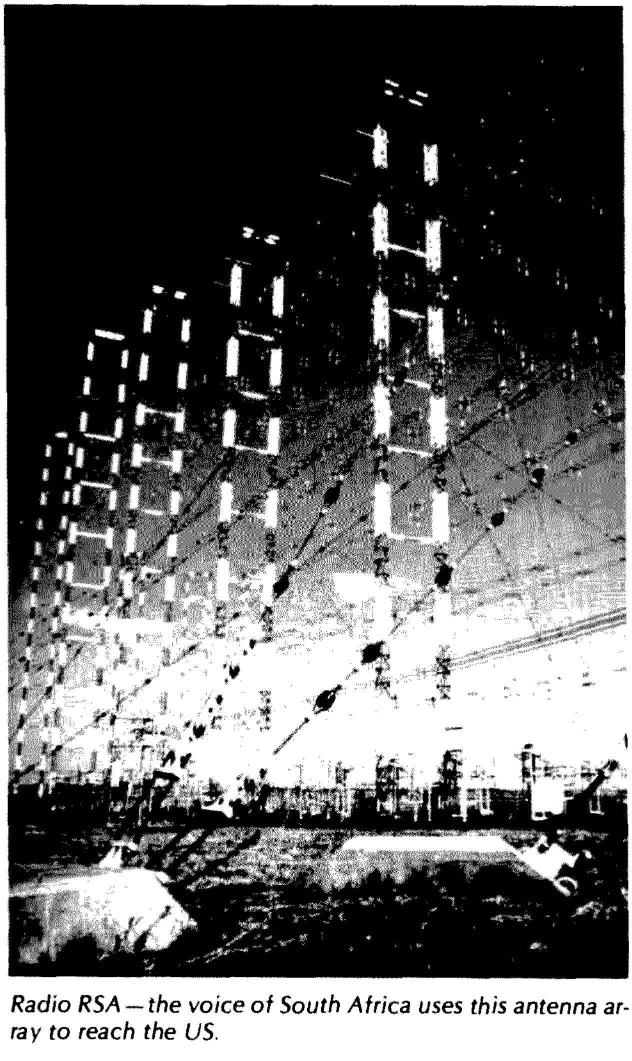
Eyeball QSO with Radio RSA

Roger N. Peterson
25 Orchard Lane
New Canaan CT 06840

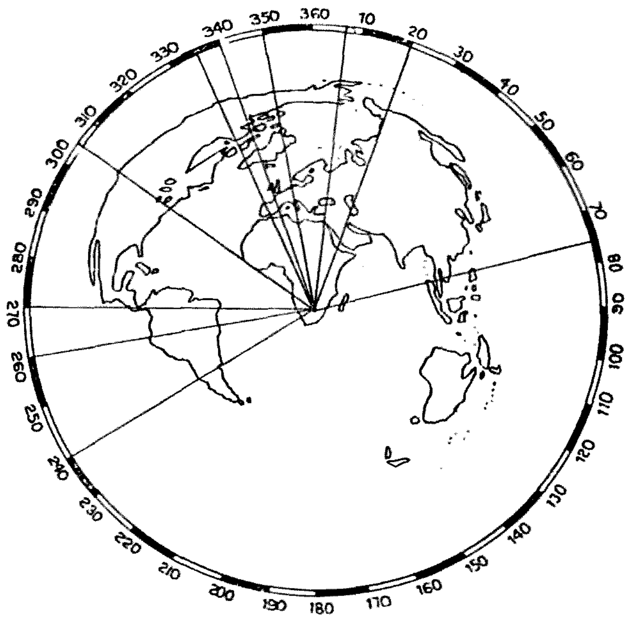
Have you ever dreamed of visiting that faraway, exotic country whose radio station you are listening to on your receiver? I'm sure you have. We all do. This time, however, I did something about it.

I was tuned to Radio RSA—the Voice of South Africa—and was enjoying a program called "Touring Africa." It was all about the famous Krueger National Park there, where visitors drive around in British Land Rovers to view the elephants, lions, rhinos, and other wild animals that roam free and without danger of being shot at by hunters. Listening to this fascinating program got me interested in seeing all this for myself. It would certainly be a switch from the usual Florida or Caribbean island vacation that so many of us from the northeastern part of the US aim for in the winters.

So here I was, a few months later, being driven through the streets of Jo-

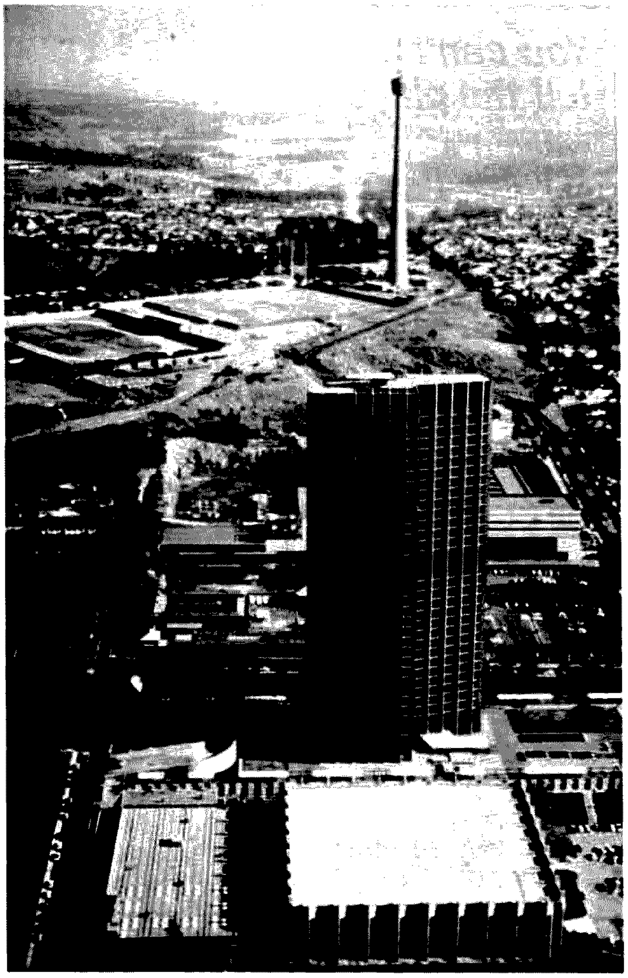


Radio RSA—the voice of South Africa uses this antenna array to reach the US.



This great circle map indicates the general broadcast directions for Radio RSA's Meyerton transmitting station at its center in South Africa.

Antenna side-switching hut showing a portion of antenna routing system. Each "square" is a motor-driven switch.



Broadcasting center of Radio RSA in Johannesburg. Large tower in back holds FM radio antenna.

hannesburg, the largest city in South Africa, by Pieter Martins, the principal engineer of Radio RSA and host of the station's popular DX program.

This had come about simply because when I made my travel arrangements, I also wrote a letter to Pieter to try to arrange a visit to Radio RSA. So on this day, Pieter had picked me up in his car at my hotel and was starting the visit with a trip out to view the transmitters and antenna installation located about thirty miles south of the city.

As we drove out of the city, we passed huge manmade hills, piled up from years of gold mining in the area, and several block houses which dated back to the Boer War. As we got nearer to the installation, I spotted some tall steel masts, and when we entered the village of Meyerton, I saw a multitude of these high masts towering into the blue African sky. Not much like my own antennas, strung between two trees in the backyard of my Connecticut home!

Ultra-Modern Transmitter and Antenna Installation

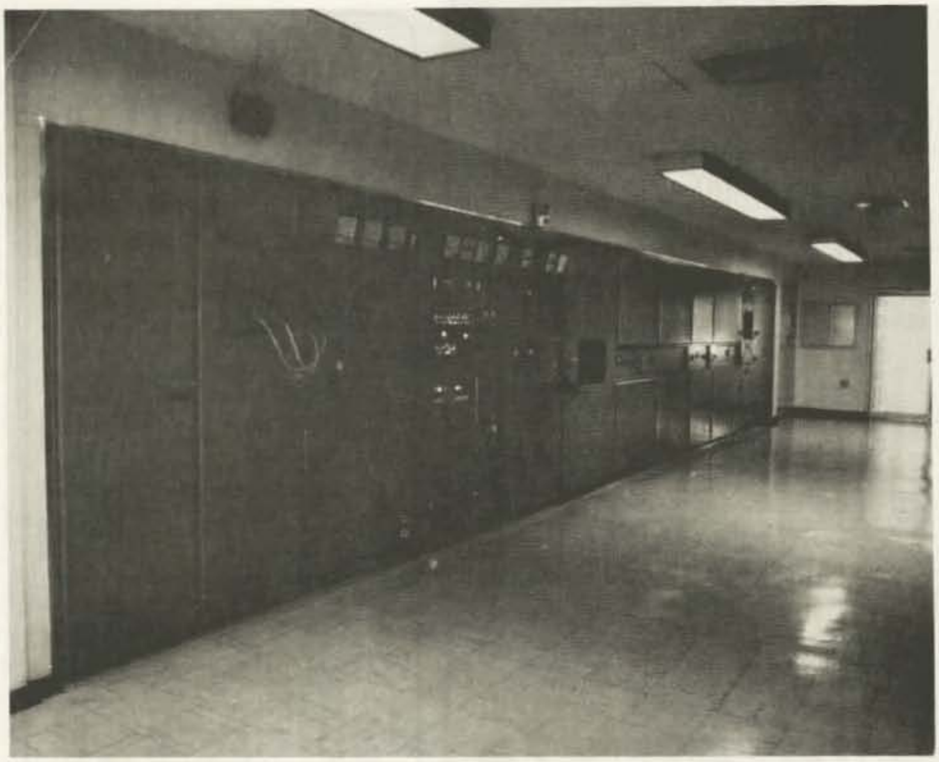
We parked the car and entered the main transmitter building. This structure has an antenna side-switching house and contains the consoles that control the transmitter tuning, antenna selection, and slewing. There are three 500-kW and four 250-kW transmitters. The larger ones had only recently been installed (spring, 1979) and were responsible for booming a big signal into the US in recent months.

Pieter explained how, from the consoles, by the pressing of a single switch, the powerful transmitters could be coupled to any of the station's 34 respective high-gain antenna arrays to cover any of Radio RSA's target areas. These consoles have preselection facilities so that a new frequency and antenna with appropriate orientation may be selected in seconds.

The transmitters have an interesting cooling system. Cooling is by a vapodyne system which utilizes the latent heat of steam. This system uses a small amount of distilled water and eliminates the need for old-fashioned water pumps. The steam is condensed on the mezzanine level of the building by heat exchangers and returns to the transmitter tube anodes as water. From there it is once more circulated in the closed cooling system.

From the top of the large transmitter cabinets, the feeders go by way of crossbar switches in ducts down vertical shafts which connect up with two tunnels and then to the round antenna feeder side-switching house. This unique system of an underground route for the ducted feeders had to be used due to their large surface area. This would have presented a hazard in strong gusts of wind in the case of overhead feeders.

The radio feeders enter the feeder switchhouse along five horizontal rows



One of the 500-kW transmitters.

of switches. These feeders are switched vertically and leave from the top of the building to the appropriate overhead feeder and accompanying antenna.

Each of the directional antenna arrays on the 500-hectare site consists of two curtains spaced a quarter of a wavelength apart. Each curtain is made up of three or five stacks of four half-wave dipole elements in a chain. When power from the transmitter is fed into the front curtain, radiation from the individual dipoles is additive in the direction of the main listening zone, the total power gain achieved in some instances being as much as 20 dB. The antenna arrays have seven general directions (see Fig. 1). By phasing, it is possible to swing the beam electronically 15 or 30 degrees away from its center position to direct a transmission to a different target area. The general directions are 335° and 340° for West Africa and Europe; 76°, 20°, and 7° degrees for East Africa and the Middle East; 305° for North America; 240°, 260°, and 270° for South America, and 350° for Central Africa.

As we left the transmitter and antenna installation and drove back toward the city, Pieter described the South African Broadcasting Corporation organization and headquarters complex. Radio RSA is the External Broadcasting Service of the S.A.B.C. Other services include television and FM radio. Some of you may have DXed Springbok Radio and Radio 5 in past years. These are both part of the S.A.B.C.

This complex is located in the Auckland Park section of Johannesburg, a primarily residential area. It looks like a college campus, with its 40-acre area, two high structures, and a number of two- and three-storied buildings which house studios. The dominant structure is a 55-story tower which houses the FM antenna. Facing this is a large, multi-storied office building. This complex houses facilities and staff to broadcast 16 radio and 2 television program services, totaling 2,317 hours a week in 18 different languages.

The building which houses Radio RSA is very modern and contains all of the latest broadcasting equipment. Because of all the different language broadcasts, the staff personnel that you see in the corridors and studios make you think that you are in the halls of the UN building in New York City. For example, the Lozi language announcers all come from the Caprivi area in southwest Africa. The Swahili and Chichewa announcers hail from Malawi. In other language services, the announcers are either South Africans or people who have been recruited from Europe. Radio RSA also broadcasts programs in Dutch, Portuguese, French, German, Tsonga, Afrikann, and English. Soon, Radio RSA will add Spanish as they step up their broadcasting activities to South America.

Radio RSA Programs

There is much to listen to on Radio RSA. In fact, some people think it is shortwave listening at its best. First is the news. No other shortwave broadcaster covers the African continent like Radio RSA. They send out 42 news broadcasts a day, of which 7 are in English. In addition, they have a number of back-up programs to help the listener understand the situation in different parts of Africa.

News bulletins are written by Radio RSA News Department specialists and they have the resources of five international news agencies, regional news offices, and a network of correspondents in many parts of the world. Recently, a survey was made to find out what shortwave broadcasts African delegates to the United Nations listened to. Some three-fourths of them reported listening regularly to Radio RSA to keep informed of what was going on back home.

News, however, is not the only thing you will want to hear on Radio RSA. The station has many interesting programs throughout the week. I mentioned "Touring Africa"—the program that got me interested in visiting this country in the first place. This program is on once a week and will take you to all the interesting sights in South Africa: Capetown, perhaps the most beautiful city in the world; Durban, which is on the Indian Ocean and has some of the cleanest and whitest beaches I've ever seen; the Cape of Good Hope, where you see the Atlantic Ocean meet the Indian Ocean, and much more. You can hear this program on Saturdays at 2100 GMT and on Sundays (Saturday night in US) at 0200 in English.

Radio RSA broadcasts an excellent program every morning at 1300 GMT and also at 0300 GMT. It is called "Good Morning Africa" and while not directed to North America but to neighboring nations on the African continent, is easily picked up here in the US. It features short commentaries, live interviews, and music. Again, it is in English.

If you are interested in sports, Radio RSA devotes Saturday mornings from 1300 to 1500 GMT to various seasonal athletic games. This might be a professional golf tournament with Gary Player and other international pros. Or, it might be a rugby game or cricket match. As in Australia, South Africa's summer is our winter and vice versa. So don't be surprised to hear a ski meet from the Drakensberg Mountains in July or a surfing contest from a beach on the Indian Ocean in January.

Some of the most interesting programs heard on Radio RSA are interviews with either famous or interesting people. In fact, I feel that Radio RSA has the best interview programs of any of the shortwave broadcasters, including the mighty BBC. Try these on a program called "South African Panorama" on the English broadcasts at 2100 and 0200 GMT on Mondays, Tuesdays, Thursdays, and Fridays.

Just for DXers

If DXing the African continent is of interest, don't miss Radio RSA's "DX Corner" each week. This program is hosted by Pieter Martins, my guide, and he has a good one. From time to time, Pieter has guests who are members of DX clubs, hams, or visiting hobbyists from other parts of the world. If you want to keep up with the frequency and time changes of the African nations' broadcasters, this program is a must. You can hear it on Tuesdays at 1120 GMT, Saturdays at 2140 GMT, and Sundays at 0240 GMT.

Where to Tune In for Radio RSA

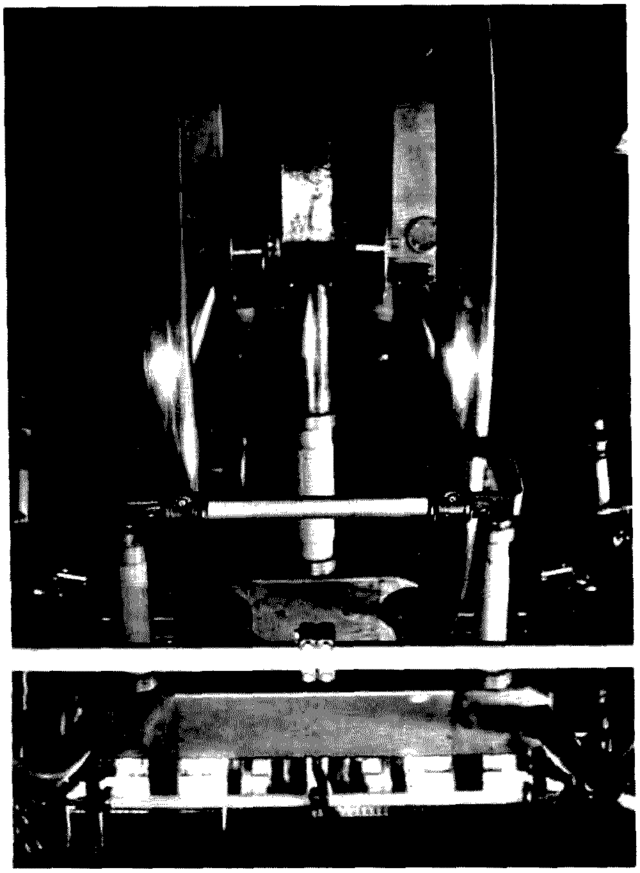
This station is on every day of the week in English. They direct their broadcast to North America at 0200 GMT on 11.900, 9.615, 9.585 and 5.980 MHz. However, their signal is so strong that you can usually receive them when their programs are directed to Europe or other parts of Africa.

In the late evenings here, at 0300 GMT, try Radio RSA on 11.900, 9.585, or 7.720 MHz. It is usually very easy to hear them. When you get up in the mornings, try them at 1100 GMT on 25.790 MHz, also on 21.535 or 15.220 MHz. At 1300 GMT, on the same frequencies, Radio RSA comes in even stronger and you should have no trouble at all in bringing their broadcasts in. Finally, in the afternoons at 2100 GMT, the station comes in loud and clear on 17.780 or 15.155 MHz.

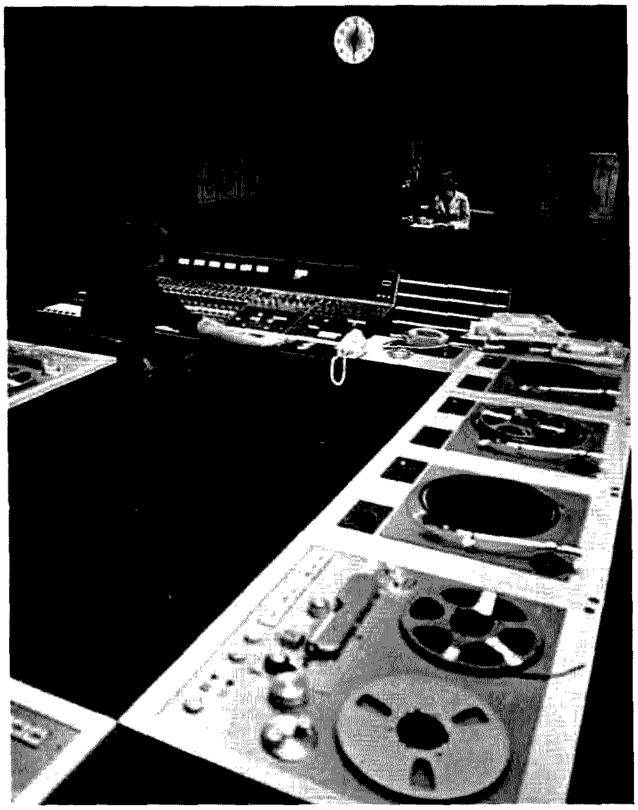
Radio RSA broadcasts every day on the frequencies and times indicated above. You can obtain a program of their broadcasts by writing Radio RSA, PO Box 4559, Johannesburg 2000, South Africa.

Finally, what about the rest of my trip to South Africa. That, of course, is a story in itself. To those of you who have ever thought of going there, I can recommend it highly. In fact, I liked it so much that I hope to go back again for a return visit. That is, if some other exotic shortwave broadcasting location doesn't entice me there first.

I wonder what it's like in New Zealand? ■



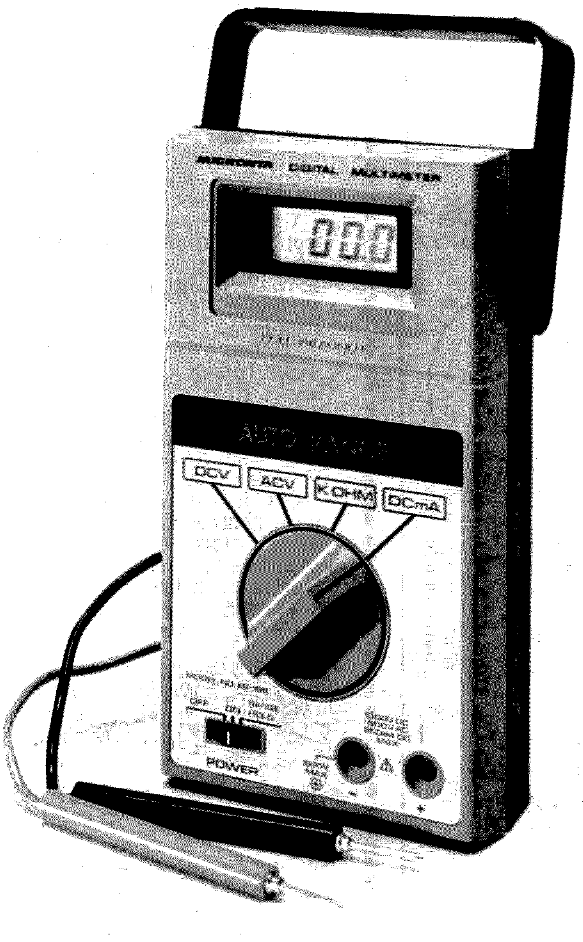
Tuning coils for one 250-kW transmitter.



One modern broadcasting studio at Radio RSA.

Micronta's New Multimeter

—an LCD DMM from T-RS



The Micronta LCD Auto-Range Digital Multimeter. (Photo courtesy of The Tandy Corporation)

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There is little doubt that a multimeter is the most-used item of test equipment among hams, electronics technicians, and hobbyists. A typical multimeter measures current, voltage, or resistance in various ranges, depending on switch setting. Until recently, multimeters used common analog meter readouts—a needle moving along a marked scale. Then, not long ago, digital multimeters appeared. They read the value in LED digits. LEDs consume considerable power, so these instruments usually needed to be plugged into ac power or had short battery life.

With the advancement of technology, the LCD (liquid crystal display) is displacing LED readouts in most instrumentation, and many LCD digital multimeters (DMMs) are now available. Using standard alkaline batteries, many of these DMMs can be used continuously for hundreds of hours before battery replacement. This makes the units truly portable and independent of ac line transients and noise.

The typical LCD DMM uses either a rotary switch or a bank of push-buttons to select range and mode. First you must decide *what*

Continued on page 179

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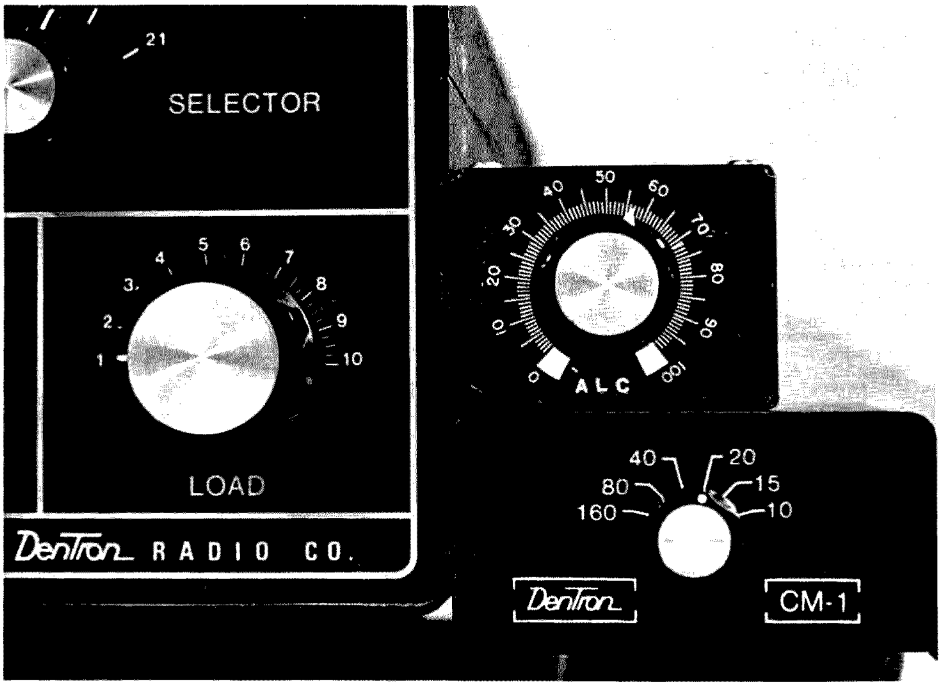
Mods for the Clipperton-L

—smooth sailing ahead

When my trusty old home-brewed linear gave up the ghost, I started to shop around for a replacement. Being a professional loafer, I had to watch the green stamps, so the first requirement was low cost. Since I am partial to 572-Bs (low replacement cost), the DenTron Clipperton-L looked like just what I wanted. After getting it home from the dealer, cutting off the ac plug, and rewiring it for 220 V, I hooked it up to my TS-820S and away we went!



Remote alc pot located on top of CM-1 accessory.

Wow! The pilot lights were *bright*; when you went to transmit mode, it looked like the sign on the local massage parlor! Realizing that this might keep me awake during round tables, I swapped the Power and Transmit bulbs with a type #327, a 28-volt bulb that gives reduced, but adequate, brightness and will last longer than the 14-volt bulbs supplied.

Next, I looked at the output waveform on my monitor scope. Ouch. There was hum on the rf envelope! But, running tests with local hams on both CW and SSB disclosed that the inadequate power supply filtering was no problem. This again proves that the average ham receiver has poor audio frequency response at low frequencies, especially with small speakers in inadequate baffles. So, I left it alone.

I started to compare notes with other Clipperton owners and found that they

had problems similar to those I am about to discuss. These findings are based on five separate amplifiers, so they are not just a fluke with my amplifier.

Of the five amplifiers, three soon developed noisy cooling fans. The objectionable noise changed pitch, indicating the fan was changing speed. This noise was blamed on defective sleeve bearings (a sleeve-bearing fan should be *quieter* than a ball-bearing fan) and replacement fans were requested from DenTron under warranty. They were sent without charge and were noted to be from a different manufacturer. *Warning*—Disconnect the power cord when working on the fan when the amplifier is wired for 220 V because the power switch disconnects only one side of the line.

Some of the fans had a heavy wire grille (to prevent you from sticking your pinkies in the rotating blades), while other fans had a fine-wire mesh grille, evidently intended to provide better rf shielding. The 4-1/2″-diameter hole where the fan is mounted makes an ideal place for rf (and harmonic!) radiation to escape if it's not shielded. So, another letter to DenTron produced a fine-mesh fan grille, which also was sent out without charge.

There are two ways to mount the grille: I scraped the paint off *both* faces of the die-cast fan housing to ensure good electrical contact between the grille and fan housing and also from the fan housing to the chassis.

The alternate method is to place the fine-mesh grille against the chassis and mount the old fan with the protective grille on top of it. You can use four rubber grommets to shock-mount the fan, which cuts down on the noise, but be sure to seal around the edge so the fan is exhausting air from the chassis and not through the open space between the fan and chassis.

Using a GR Strobotac, I found the fan speed dropped only 20 rpm, indicating that air delivery was substantially unchanged. I also added ½″ to the rear feet of the amplifier to increase clearance from the shelf. Be sure you allow enough room behind the amplifier (distance from a wall, drapes, etc.) so airflow is not impeded.

So far, these problems were minor irritations. The real jolt came when a nearby ham came over and said, "You got spurs that jingle-jangle my new TS-120." He brought over an H-P spectrum analyzer he had borrowed from work (every ham shack should have one, if you have 10 kilobucks to spare!) and we hooked it up to my TS-820S/Clipperton-L combination.

Gadzooks! The screen looked like a Christmas tree—spurious emissions and harmonics all over! Well, first, the 820 did need neutralizing (my fault when installing new finals) and then the in-band emissions were gone. After this, we checked the TS-820 into a dummy load, and its harmonics were well below its −40-dB specs. But, when it drove the Clipperton, the harmonic output of the 820 went up. The answer is simple, my friends. The 820 wasn't seeing a 50-Ohm resistive load, but some complex impedance that exceeded its linear operating range.

Examination of the Clipperton's input circuit disclosed that it was untuned and had no swamping resistor. Taking readings of the vswr between the 820's *output* and the Clipperton's *input* showed the lowest vswr to be 1.65:1 and the highest to be over 3:1! (See Table 1.)

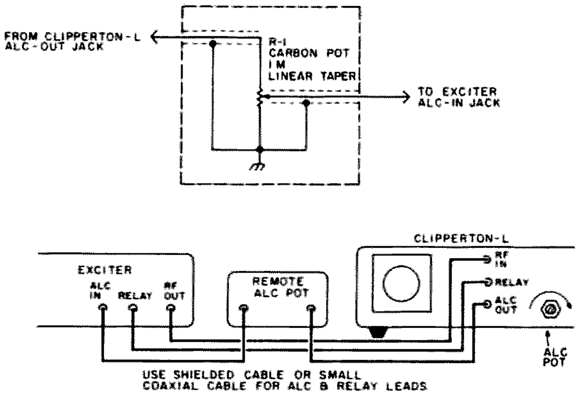


Fig. 1. Remote alc control arrangement.

No wonder that some of the solid-state-output rigs either won't drive the Clipperton or just shut down, depending on their design. By the way, the catalog specs the input at 1.5:1, average.

One solution is to put an antenna tuner between the exciter and the Clipperton—if you don't mind twiddling knobs. Another solution is to put in pi-networks for each band to match the exciter to the Clipperton, but there is no easy way to do this the way the unit is laid out.

The third solution is to buy the outboard attachment that DenTron sells as the CM-1 accessory. This contains pi-networks using toroidal inductors (which cannot be optimized for each band) and caps, as well as a relay to permit straight-through operation when operating barefoot. The CM-1 is touted as a "plug and play" unit, but you have to run a 12-volt lead through the fan lead hole in the Clipperton and solder it to the relay +12-volt lead inside. I found it easier to drill a hole near the internal relay, use RG-174/U, and run it to the CM-1 (be careful not to get metal chips inside!).

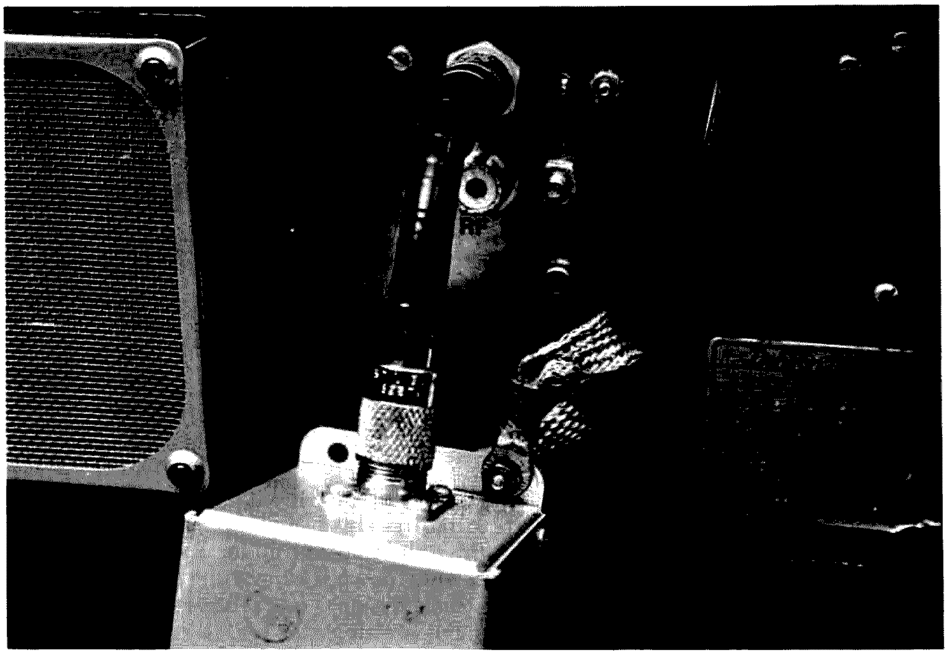
Examining two of the CM-1s showed that they did

Frequency (MHz)	Clipperton-L Power Output (Watts)	Input Vswr
29.0	650	1.75:1
21.225	680	1.65:1
14.20	600	1.97:1
7.15	550	2.15:1
3.75	350	3.11:1
1.90	500	2.56:1

Table 1. Output power of Clipperton into 50-Ohm dummy load without input matching. Alc setting is advanced such that output power of 700 Watts is reduced to 600 Watts.

Band	DenTron Data to FCC Power (Watts)		K4JW Measurements			
			Power (Watts)		Clipperton	CM-1 network
	P_{in}	P_{out}	P_{in}	P_{out}	input vswr	input vswr
160	882	390	1000	460	2.6:1	1.8:1
80	891	440	1000	675	3.1:1	1.5:1
40	819	520	1000	580	2.2:1	1.5:1
20	748	340	1000	600	2.0:1	1.5:1
15	614	340	1000	500	1.7:1	1.3:1
10	na	na	1000	400	2.0:1	2.0:1

Table 2. Type-acceptance data vs. author's measurements before and after input (vswr) matching; na = not applicable.



Low-pass filter with short RG-214 coax lead, ground-braid to chassis. Note the fine-wire mesh fan grille. Lead at upper right is RG-174 carrying 12 V dc for CM-1 relay.

not agree with the schematic supplied. One used a common network for 15 and 20 meters while the other used separate networks, although the one using a single coil seemed to do a good job.

Now for the alc pot located on the *back* of the Clipperton. Nothing in the operating manual mentions its adjustment, so, in response to another request to DenTron I was told to use either sine-wave or trapezoidal scope patterns and to set them for 100% modulation. Lacking a scope, you can adjust the alc pot to produce 1 kW input.

Alc is part of a control loop for the *system* of the exciter and linear; its setting should prevent the exciter from driving the amplifier into a non-linear condition which generates harmonics, spurs, etc. Now, I realize this poses a problem for the designer. If the amplifier is to be used with one particular exciter, he can select fixed values for the alc system (maybe!). But, when the amplifier is to be used with many different exciters, each having its own alc characteristics and voltage requirements, he has to employ an adjustable system. So, it becomes apparent that the alc adjustment pot should be accessible from the *front* of the amplifier. One of the popular amplifiers does have this facility, and its manufacturer tells you to set it on *each band*!

Without poking more holes in the Clipperton, this can be accomplished as shown in Fig. 1. A 1-megohm linear-taper carbon pot is mounted in a small chassis box. Shielded leads are used, one to the exciter, the other to the alc output jack on the Clipperon. Turn the Clipperton pot wide open (clockwise) and use the new alc pot to set the amplifier to 1 kW dc input on each band. This is about 0.580 Amps at 1700 V when in the "CW-X" position.

It is useful to put a scale labeled from 0 to 100 on the front of the box so you can log the approximate readings for each band. The alc pot can be mounted on the CM-1 accessory, or both can be mounted on the side of the Clipperton (don't cover up the screw used to hold the top cover on the amplifier).

Harmonics still plagued me. Why wasn't my good Drake TV-3300 LP filter working to specs? First, there is no easy way to mount it to the back panel of the Clipperton. Second, the 10" piece of old coax I was using between the filter and the Clipperton was leaking like a sieve!

I replaced this with a 4" length of RG-214, which is a silver-plated, double-shielded cable that can be used up into the gigahertz range. You can make a reasonable substitute by taking two lengths of RG-8/U, cutting the outer jacket off one piece and sliding the braid off the other piece. Slide this braid over the first piece of coax, making it a double-shielded cable. After the connectors are attached, cover the outside with PVC tape. Take another piece of RG-8/U and strip the shielding off to make a heavy grounding braid between the case of the low-pass filter and the chassis ground of the Clipperton.

What had been happening was that the shunt caps in the low-pass filter were grounded to its case, and I had a ground loop. Also, "sheet currents" were flowing over the surface of the poorly-grounded filter case allowing harmonics to pass on to the antenna. Now the Drake did the job it was supposed to—greater than −80dB at 40 MHz.

One day I lost bias—so I thought. The output waveform was distorted and the resting plate current was zero. Examination showed no contact through the relay used for transmit-receive. This relay has a 3PDT configuration, one set of contacts being used to switch the bias from cutoff (through R3, 47k) to operating bias (9.1 V from a 1N3308 zener). The contact was pitted. In order to burnish this and the other relay contacts, it is necessary to remove the relay spring, pull the armature back, and burnish all contact surfaces. Insulation barriers prevent inserting the burnishing tool while the relay is in place.

Some instability was noted after the Clipperton had been converted for 10-meter operation. By making sure the Load control on the Clipperton is set at *least* above "3" on 15 meters and above "5" on 10 meters, the instability usually will disappear.

Going around the Clipperton with an rf sniffer and using the spectrum analyzer connected to an antenna approximately 100 yards away, the results showed these fixes did the job. Incidentally, I use an SPC transmatch between the Clipperton/low-pass filter and the antennas, giving me more harmonic attenuation and aiding in the presentation of a 50-Ohm resistive load to the amplifier at the operating frequency.

I use a relay switching system on my tri-band quad, so the 10-meter section is not electrically connected to the feedline when operating 20 meters, thus further reducing the radiated second harmonic. (It's kind of embarrassing to be called on the land-line by a local and told that you are QRMing their 10-meter round table when you are operating on 20!)

Conclusions

1. Whether your exciter is solid-state or vacuum-tube output, use an antenna tuner or CM-1 pi-network between the exciter and the Clipperton.

2. Install a variable alc control pot where you can easily set it for each band.

3. Ground everything—the exciter, the Clipperton, the low-pass filter, transmatch, etc. Use braid as short as possible.

4. Throttle back on the audio gain; 1 kW input is *not* always necessary.

DenTron now has come out with a "new model" of the Clipperton-L. They have put the tuned networks in the input and inside the box. An extra section has been added to the band-selector switch which switches can-type relays mounted on a PC board they put on the left-side wall. These relays switch in the proper input pi-network.

It is understood that older units can be sent back to the factory for modification and/or a kit for field-modification will be available.

My thanks to Walt Kunde K5BVM for consultation and checking my tests, to Mike DeZego WA4RXC for instrumentation and help in running tests, and to W4TL, K4WB, and W4LQS for info on their Clippertons. ■

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The Traveling Ham's Allband Antenna

—is this the ultimate portable system?

This antenna system was designed for travel. It can be assembled and put up by one man in less than 30 minutes, and it packs neatly in a Chevette. Despite the portability, it does an excellent job of radiating. A mast made up of five-foot steel sections supports a 10-meter beam. The guy wires are multiband inverted vees covering 80 through 10, with the traps located near the ends, making the radiating portions several half wavelengths on 20, 15, and 10. This results in some gain and in wide operating bandwidths on all of the bands.

The mast is almost 35 feet high. The five-foot sections of steel TV masting are strong but wobble a bit at the joints. (Aluminum tube of the same size is available but it is not strong enough.) By leaning the mast against two of its guy wires—see Photo B—one man can lift the mast and beam and add a section at the bottom. When raised to full height and the other two guys are tied, the base

Photo A. The portable antenna system has a 10-meter beam atop a pole made from short sections of TV mast, guyed by two inverted vees that give complete coverage, 80 through 10 meters.

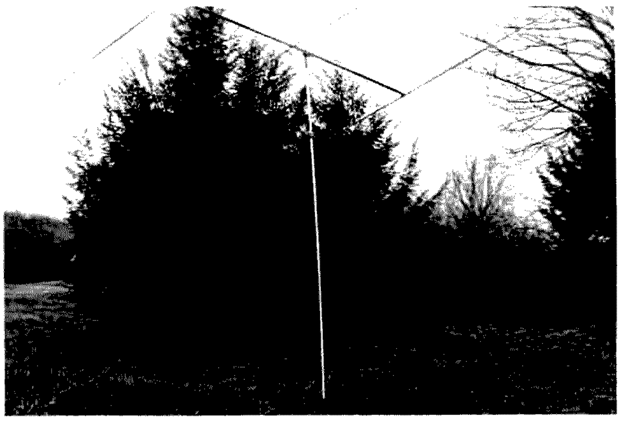

Photo B. By leaning the mast against two of its guys, one man can lift it from the bottom and insert another 5-foot section of the mast. The whole structure is light enough so that this is no problem.

	10m	15m
Reflector	17' 2"	23' 7"
Driven element	16' 6"	22' 4"
Director	15' 9"	21' 8"

Table 1. Element lengths for three-element beams based on driven-element-to-director spacing of 6' 4" and a driven-element-to-reflector spacing of 5' 6". From graphs in ARRL Antenna Book.

of the mast is moved under the top. An extra set of guy strings part way up will keep the mast straight and the beam level, but I don't usually bother.

The whole structure can be put on a rooftop if a fairly flat one is accessible and fewer mast sections are used. A chimney can be a base and so can a vent pipe of the drainage system. A U-bolt on the mast can be bent to hook on the pipe, as shown in Fig. 1.

The beam is the Radio Shack CB beam. Reduce the element lengths to those in Table 1. Notice that the boom length is adequate to make a three-element, 15-meter beam if that is preferred. The ends of the elements will accept 3/8" tubing extensions. The gamma match needs no modification on 10, and there is room enough to extend it to match a 15-meter driven element. If you buy a new CB beam, watch out for the assembly instructions; they have interchanged the reflector and director spacings.

The beam becomes quick-take-apart with a few simple changes during assembly. The boom joint can be loosened on one side only, and that half of the boom slid out of the joint. Each element-to-boom clamp is modified as shown in Fig. 2. One half of the element stays with the U-bolt and clamp and the other half slides out after the hose clamp is loosened. Cut off the end of this half-element right at the middle of the hole for the U-bolt, and don't use a bolt through the clamp and element as is done on the other side. During assembly, that half-element is pushed right up against the U-bolt as a stop, and then you know it is located correctly. The outer tube needs to be slotted under the hose clamp.

I color-coded the elements and boom to simplify layout of the parts on the ground before assembly. Red and green spray paint for the reflector and director are appropriate! Spray after the beam is assembled so that the paint doesn't interfere with electrical connections.

A short length of steel masting is attached to the boom joint. This is visible in Photo B. A tapered end of one of the mast sections is inserted in it to mount the beam on the mast. This leaves enough slip to rotate the beam around the mast. No rotor is used. I tied string to the ends of the boom and rotate it and secure it with the string. The mechanical and electrical complexity of a rotor in the system isn't warranted.

The two multiband vees are fed by the same 52-Ohm coaxial cable. Guy rings, one insulated from the mast by several layers of tape, support the center of the vees—see Fig. 3. Hose clamps under the rings prevent them from sliding down. A chassis coax connector was soldered to the lower galvanized ring with the inner conductor connection passing through one of the holes in the ring. A short wire connects this to the upper ring. The two halves on each vee are joined to these two rings so

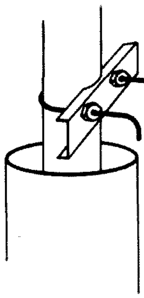

Fig. 1. A vent pipe makes a secure base for the antenna mast. With the U-bolt bent to hook on the edge, the pipe will support a short length of mast upright until the guys are tied.

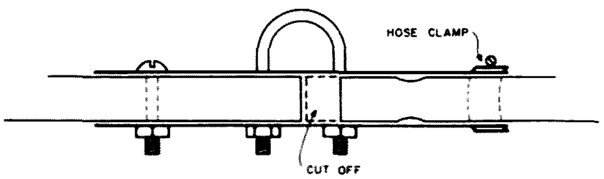

Fig. 2. The boom-to-element clamp modifications. The half-element on the right is held in place by the hose clamp. Its end has been cut off at the hole for the U-bolt. The U-bolt nuts are loosened to remove the element from the boom, and the hose clamp loosened to separate the two halves of the element.

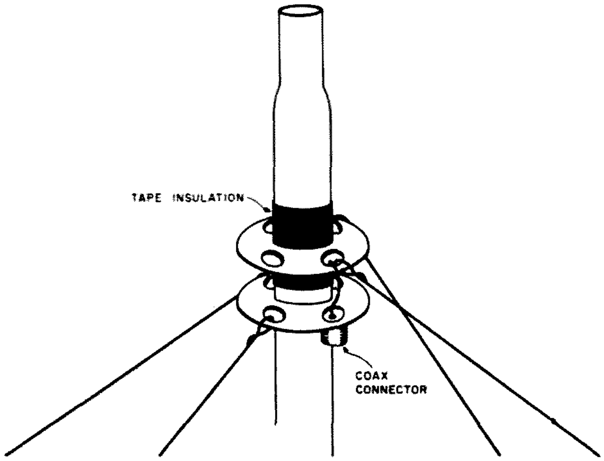

Fig. 3. Two guy rings are used to support the center of the inverted vees. The top one is insulated from the mast by electrical tape, and a hose clamp beneath it prevents it from slipping down. A chassis coax connector is soldered to the lower ring and its center conductor is connected to the upper ring.

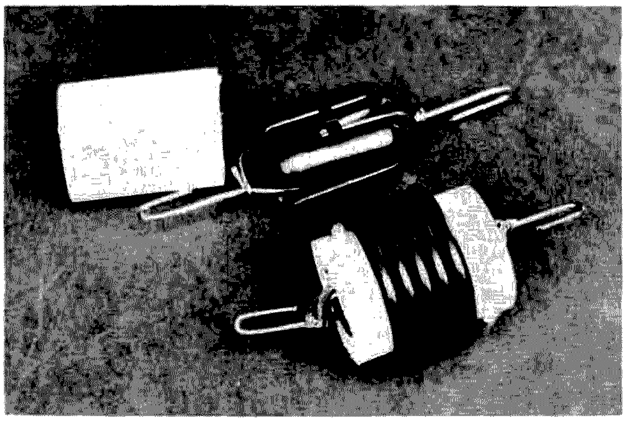

Photo C. One of the traps made from coaxial cable. The white polyethylene tube is a tight fit over the plastic egg insulator and serves as a coil form.

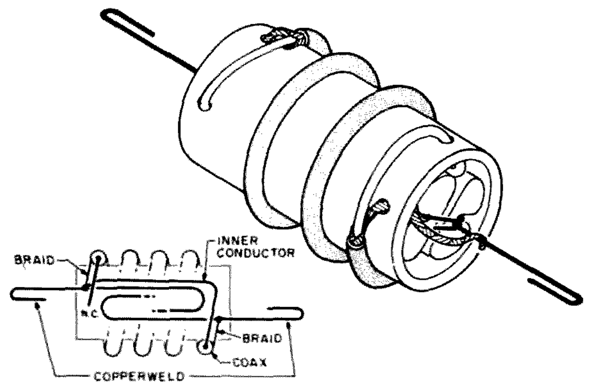

Fig. 4. Showing the connections so that a single length of coaxial cable becomes both coil and capacitor for a trap. The braid connects to the copperweld wire which will join the trap to the antenna. The inner conductor separates from the braid, passes through a hole 90° from the braid hole, and is routed through the egg insulator to be soldered to the braid and copperweld at the other end of the coil. The inner conductor at the upper end of the coil does not connect to anything. To hold it in place and insulate it, it is tucked into a shallow diagonal hole in the polyethylene coil form.

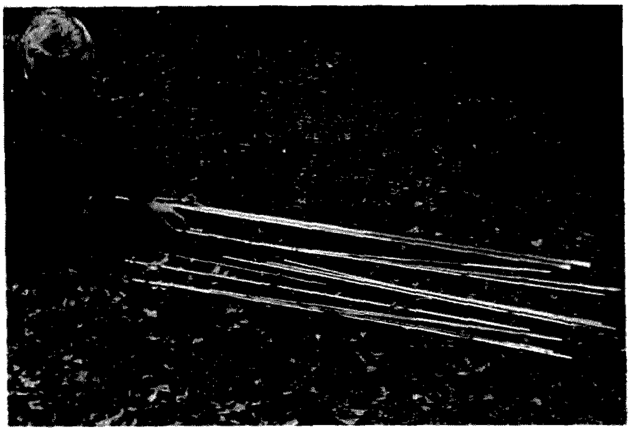

Photo D. There isn't much there after the beam and its boom are disassembled.

that the wires at one ring go off at right angles to each other. During travel, the guy rings and vees all stay connected to their mast section.

The vee for 40, 15, and 10 meters is a bit unusual. The 10-meter trap isolates three half waves in the middle and acts as a loading coil on 15 and 40. This is critical since harmonic antennas, such as a half wave on 7 MHz working as three half waves on 21 MHz, do not work out exactly. A half-wave dipole is too short to be three half waves on its third harmonic because of the lack of end capacity for the middle wavelength at the higher frequency. In this antenna, the loading coil effect of the 10-meter trap compensates for this; the trap is near a current loop for 15 meters and loads it more than it does 40 meters, bringing both bands into resonance with low swr on the same length of wire.

The long inverted vee works on 20 and 80 meters, with the traps cutting off three half waves on 14 MHz. The traps are near the ends of both vees, out of the high-current parts of the antennas, which makes for good radiating efficiency. Another advantage of this layout is the wide bandwidths on most of the bands. Many trap antennas have very narrow operating bandwidths because of the heavy loading.

Automotive primary wire was used for the vees. The stranded copper is flexible, coils nicely, and doesn't kink. It also has a thick vinyl insulation which is a help when the antenna must pass through trees or against buildings. Vacation sites are seldom ideal.

Photo C and Fig. 4 show the construction of the traps. Each trap is made from a length of RG-58 coaxial cable connected so that the braid is the coil and the capacitance between the inner conductor and the braid becomes the trap capacitor. In brief, the coax braid makes excellent trap coil with very high Q, and the distributed capacitance of the cable is a high voltage, stable capacitor. Notice the cross-connection of the inner conductor from the right end of the coil (Fig. 4) to connect to the left end of the coil. There would be no capacitor formed if it were simply joined to the outer braid at the right end of the coil.

The trap is built up on a plastic egg insulator and a two-inch length of 1½" polyethylene tubing as a coil form. This tubing, with a 1/8" thick wall, is a tight fit over the insulator and also helps to protect the free end of the inner conductor. This point, at the left end of the coil in Fig. 4, has high voltage with respect to surrounding parts of the trap and needs protection. Drill a diagonal hole into but not through the wall of the polyethylene and put that free end in it.

Start building a trap by forcing an egg into the polyethylene tube and attaching short lengths of wire, preferably copperweld, around the egg as is normally done with an antenna insulator. These wires inside the coil will have some capacity and so will be part of the trap circuit. Don't attach the antenna wire yet, since this adds extra capacity and prevents finding the correct trap resonant frequency. Remove about three inches of outer jacket from the end of the coax and push the braid back and loosen it. Work a hole in the braid, fold the cable, and feed the inner conductor and its insulation through the braid. The two are now separated as shown in Fig. 4.

The braid goes through a

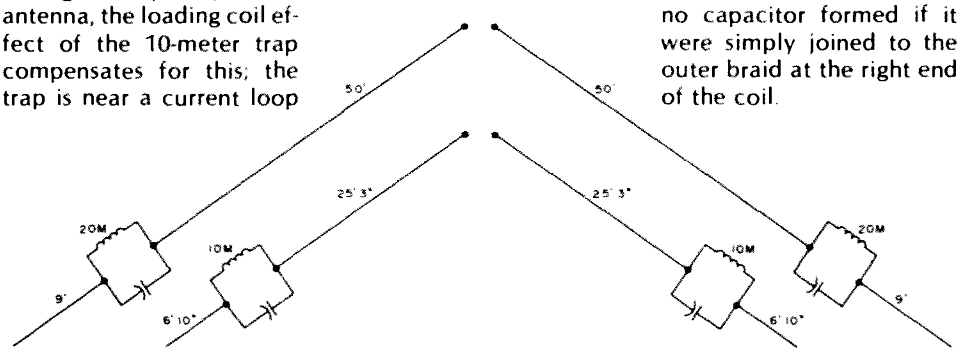

Fig. 5. Dimensions of the inverted vees. The long one is three half waves on 20 meters and a half wave on 80. The shorter one below is three half waves on 10 meters with the ten-meter trap slightly loading the entire length so that both 15 meters and 40 meters are resonant.

hole in the coil form and is soldered to the copperweld wire. the inner conductor goes through a hole a quarter turn away from the braid, passes through the egg beside the copperweld, and is soldered to it at the other end. Wind 3¾ turns of coax onto the polyethylene form for a 10-meter trap— 6¾ turns for a 20-meter trap. The holes should be drilled near the ends of the form so that the turns can be spaced out for tuning. A dip meter checked against a calibrated receiver is needed. Tune each trap for the middle of its band. After it is installed in the antenna, it will dip lower in frequency by about 1 MHz for the 10-meter trap and about .5 MHz for the 20-meter one.

All the electrical connections are soldered, and corrosion should not be a problem. The coils need to be secured in place after tuning, and the coax should have some weatherproofing so that water does not get inside. Silicone rubber is an excellent insulator. If it is in a tube, it is sticky and smelly as it comes out, but Dow-Corning sells a silicone rubber roofing material that will brush on. It comes only in quarts—about $7 in the discount stores. The trap could also simply be wrapped with electrical tape.

This antenna system has been up and down countless times in its development and tuning, and it also has been to the mountains and to the shore several times. It really is portable. The compromises (no rotor, wobbly mast, lightweight guys) are all mechanical; electrically it works very well.

Either the vees or the beam could be beefed up for a permanent installation, of course. Parts will function alone, too. I have not taken the beam to the shore where the houses are so close together. Also, if there isn't enough room to stretch out the 80-meter leg, I just use part of it as a guy wire and still have a good performer on 40, 15, and 10 from the other half. The tuning can be affected by nearby objects or the ends coming down close to the ground. It is best to tune it at home under conditions similar to those it will meet on vacation and accept the inevitable variations under field conditions.

Readers are encouraged to build the traps described here for their own use, but manufacturers are cautioned that a patent application has been filed on them and all rights under the Patent Code will be strictly enforced. ■

Photo E. *The beam can be disassembled and repacked in its original carton for travel. It extends up between the front seats of my subcompact.*

Note: A kit of parts to aid in making traps is available from R. H. Johns—Scientific Instruments, 3379 Papermill Road, Huntingdon Valley PA 19006, for $4.50 plus $1.00 postage. Each kit contains parts for four traps, egg insulators, polyethylene coil forms, and #14 copperweld wire. Coaxial cable, RG-58A/U, with stranded inner conductor to facilitate separating the inner and outer conductors from each other, is available at $.25 a foot. About 15 feet is needed for the four traps.

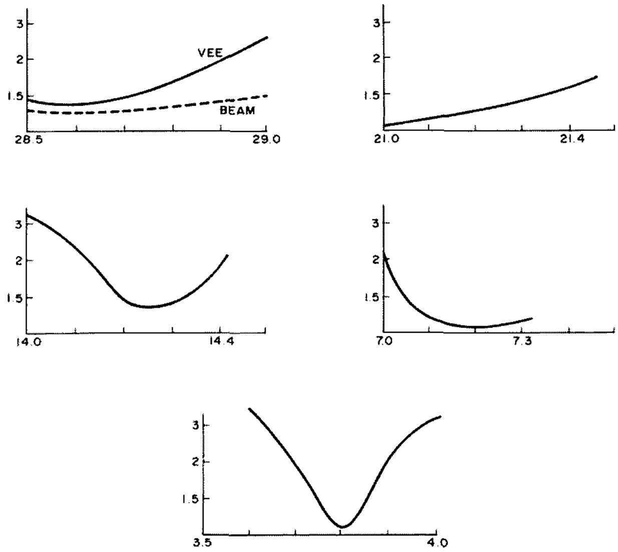

Fig. 6. Swr plots for the family of inverted vees.

See List of Advertisers on page 130

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KIM's Magic Fingers

—RTTY transmit program

Author's Note: A substantial period of time has elapsed since the following program was first written. Since then, many things have elapsed. Although the following program is a working version, there have been many improvements in radioteletype algorithms for the 6502. Therefore, the article should be looked upon as a basis for the "first-time user" to get some ideas to start from. Some of the subroutines may be valuable in the creation of a sophisticated system.

There have been numerous articles on the KIM-1, and many of those available are right up the ham's alley. Among those offered have been CW receive and transmit programs and RTTY receive programs, but I have yet to see a RTTY transmit scheme published. For all you fellow KIM-1 owners who are RTTY fanatics, this article will be just what you are looking for.

The old mechanical monsters have their good points, e.g., hard copy, and the 28 is quieter than most others. The 28 ASR is even like a regular typewriter to the touch, but nothing is like an all-electronic keyboard. If you are among those who type faster than 60 wpm, then even the "ole 28" is a bit of a pain, especially when you go too fast, lock up the keyboard, and characters are missed in your frenzy.

Having had a KIM-1 for about six months along with an SWTP ASCII keyboard, I proceeded to arrange a method of transmitting 5-level Baudot with this combination. I had several standards which had to be met:

- No limitations on typing speed.
- Automatic case shift for FIGS and LTRS.
- Automatic CR/LF/LTRS on receipt of a CR from the keyboard or after 65 characters and the end of a line.
- No splitting up of a word at the end of a line.
- Practicality: a system that would not give more trouble than it saved.

This whole project was tackled in several steps. Initially, I had to come up with a good routine to convert the ASCII character into a Baudot character and send it serially out of one pin on the PIA. This was not too terribly difficult.

(I must give credit at this time to someone whose article provided me with many ideas. The January, 1977, issue of *73 Magazine* contained an article on using the KIM-1 as a CW keyboard. I used James Pollock WB2DFA's ideas for the interface of the ASCII keyboard and the usage of the 256-character buffer. Both of his schemes worked smoothly on the Baudot program.)

At this point, we are able to transmit Baudot and type as fast as we want, but still have to put in the case shift manually. This was the next thing tackled. Once solved, the end-of-line (EOL) sequence, along with the character counting and space detection for the auto EOL sequence, was added. Finally, the whole thing was starting to look up!

Being (admittedly) the proud type, I wanted my print to be somehow distinguishable from "ordinary" print. This was added in the EOL sequence and appears as a colon neatly down the left margin. That will make people say "Ah ha, there is

Address	Function
0000	Baudot character currently being output.
0001	Baudot character currently being output.
0002	ASL counter in actual output subroutine.
0003	Character counter (number of chracters in the line currently being written).
0004	Contains the original ASCII character received from the FIFO buffer.
0005	LTRS/FIGS flag position. This will be a 00_h when in lowercase (LTRS) and will be a 20_h when in uppercase (FIGS).
17BF	Contains the value of the FIFO pointer.

Fig. 1. Buffers.

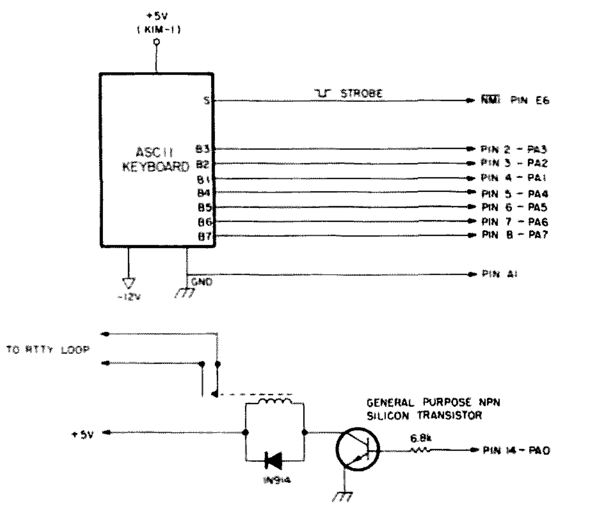

Fig. 2. KIM-1 interface circuitry.

ENTRY POINT

```
0200 A9 01        INIT    LDA imm.01     PA1-PA7 are inputs
0202 8D 01 17             STA abs 1701   PAØ is output
0205 8D 00 17             STA abs 1700   initiate at mark ( high )
0208 A9 00        CLEAR   LDA imm 00
020A AA                   TAX            clear X register
020B A8                   TAY            clear Y register
020C 8D BF 17             STA abs 17BF   clear FIFO pointer
020F 85 05                STA abs,z      clear " case " flag
0211 A9 BC        INTER   LDA imm BC     set NMI interupt vector
0213 8D FA 17             STA abs 17FA
0216 A9 02                LDA imm 02
0218 8D FB 17             STA abs 17FB
021B D8                   CLD
021C 4C D0 02             JMP abs 02D0 go to FIFO fetch routine
```

INTERUPT ROUTINE

```
02BC AD 00 17     GET     LDA abs 1700  Get character from keyboard
02BF 99 00 03             STA abs,y 0300 Save in FIFO buffer
02C2 C8                   INY
02C3 40                   RTI
```

FIFO ROUTINE

```
02D0 CC BF 17     FIFO    CPY abs 17BF  caught up yet ?
02D3 F0 0D                BEQ DIDDLES  yes? well go to diddles
02D5 AD BF 17             LDA abs 17BF offset into buffer
02D8 AA                   TAX
02D9 EE BF 17             INC abs 17BF increment pointer
02DC 20 20 02             JSR FETCH 0220
02DF 4C D0 02             JMP FIFO 02D0
02E2 A9 7F        DIDDLES LDA imm 7F    load LTRS for diddles
02E4 85 01                STA abs,z 0001
02E6 C6 03                DEC abs,z 0003 Decrement char. counter
02E8 20 60 00             JSR OUTPUT 0060
02EB A9 00                LDA imm 00 set Case flag to Lower
02ED 85 05                STA abs,z 0005
02EF 4C D0 02             JMP FIFO 02D0
```

OUTPUT SUBROUTINE

```
0060 18           OUTPUT  CLC
0061 A9 07                LDA imm 07
0063 85 02                STA abs,z 0002
0065 06 01                ASL abs,z 0001
0067 B0 03                BCS MARK 006C
0069 4C 7E 00             JMP SPACE 007E
006C A9 14        MARK    LDA imm 14 set timer for 22 ms.
006E 8D 07 17             STA abs 1707
0071 A9 01                LDA imm 01
0073 8D 00 17             STA abs 1700 Set pin to MARK
0076 2C 07 17             BIT abs 1707   time finished ?
0079 10 F6                BPL            for more time
007B 4C 8D 00             JMP 008D to skip SPACE routine
007E A9 14        SPACE   LDA imm 14     set timer for 22 ms.
0080 8D 07 17             STA abs 1707
0083 A9 00                LDA imm 00
0085 8D 00 17             STA abs 1700  Set pin to SPACE
0088 2C 07 17             BIT abs 1707  time finished ?
008B 10 F6                BPL           for more time
008D C6 02        FINSH   DEC abs,z 0002
008F 24 02                BIT abs,z 0002 is whole char. finished?
0091 30 03                BMI           branch if finished 0096
0093 4C 65 00             JMP 0065 to ASL again
0096 E6 03        COUNT   INC abs,z 0003 increment char. counter
0098 A9 41                LDA imm 41 ( 65 decimal )
009A C5 03                CMP abs,z 0003 65 characters yet ?
009C F0 01                BEQ 009F      branch if yes
009E 60                   RTS
009F A9 20                LDA imm 20 ( ASCII for space code )
00A1 C5 04                CMP abs,z 0004 is last char. a space ?
00A3 F0 03                BEQ 00A8 branch if it was a space
00A5 C6 03                DEC abs,z 0003 decrement counter
00A7 60                   RTS
00A8 A9 00        EOL     LDA imm 00
00AA 85 03                STA abs,z 0003 reset char. counter
00AC A9 0B                LDA imm 0B    carriage return code
00AE 85 01                STA abs,z 0001
00B0 20 60 00             JSR OUTPUT 0060
00B3 A9 23                LDA imm 23 line feed code
00B5 85 01                STA abs,z 0001
00B7 20 60 00             JSR OUTPUT 0060
00BA A9 6F                LDA imm 6F    code for FIGS.
00BC 85 01                STA abs,z 0001
00BE 20 60 00             JSR OUTPUT 0060
00C1 A9 3B                LDA imm 3B    code for : ( colon )
00C3 85 01                STA abs,z 0001
00C5 20 60 00             JSR OUTPUT 0060
00C8 A9 7F                LDA imm 7F    code for LTRS.
00CA 85 01                STA abs,z 0001
00CC 20 60 00             JSR OUTPUT 0060
00CF A9 13                LDA imm 13    code for SPACE
00D1 85 01                STA abs,z 0001
00D3 20 60 00             JSR OUTPUT 0060
00D6 A5 00                LDA abs,z 0000
00D8 85 01                STA abs,z 0001 Restore previous character
00DA A9 00                LDA imm 00
00DC 85 05                STA abs,z 0005 Set case flag to LTRS
00DE 60                   RTS
```

FETCH ROUTINE

```
0220 BD 00 03     FETCH   LDA abs,x     fetch character from buffer
0223 4A                   LSR acc.      shift to preserve identity
0224 AA                   TAX
0225 86 04                STX abs,z 0004 original ASCII character
0227 B5 00                LDA abs,z,x   Look it up !
0229 85 00                STA abs,z 0000 baudot character
022B 85 01                STA abs,z 0001 baudot character
022D A5 04                LDA abs,z 0004  load ASCII character
022F C9 20                CMP imm 20    is it a SPACE ?
0231 F0 39                BEQ 026C      Branch if it is a SPACE
0233 C9 0D                CMP imm 0D    is it a Carriage Return ?
0235 F0 3B                BEQ 0272
0237 EA EA                NOP
0239 EA EA                NOP
023B EA EA                NOP  Reserved for future expansion
023D EA EA                NOP
023F 29 20                AND acc.imm.20  mask off case bit
0241 C5 05                CMP abs,z 0005  is case same as previous ?
0243 F0 27                BEQ 026C
0245 A9 00                LDA imm 00  is it not LTRS ?
0247 C5 05                CMP abs,z 0005
0249 F0 12                BEQ 025D  FIGS load routine
024B A9 00        LTRS    LDA imm 00
024D 85 05                STA abs,z 0005 set case flag to LTRS
024F A9 7F                LDA imm 7F    LTRS character
0251 85 01                STA abs,z 0001
0253 20 60 00             JSR OUTPUT 0060
0256 A5 00                LDA abs,z 0000 get previous character
0258 85 01                STA abs,z 0001  Restore!
025A 4C 6C 02             JMP 026C      to skip FIGS routine
025D A9 20        FIGS    LDA imm 20
025F 85 05                STA abs,z 0005 set case flag to FIGS
0261 A9 6F                LDA imm 6F    FIGS character
0263 85 01                STA abs,z 0001
0265 20 60 00             JSR OUTPUT 0060
0268 A5 00                LDA abs,z 0000 load previous char.
026A 85 01                STA abs,z 0001 restore previous char.
026C 20 60 00             JSR OUTPUT - now send that char. -
026F 60                   RTS
0270 EA EA                NOP
0272 20 A8 00             JSR EOL
0275 60                   RTS
```

Program listing.

Zero page address	contents	Baudot Char.
000A	23	LF (line feed)
000D	0B	CR (carriage return)
0020	13	SP (space)
0021	5B	!
0022	47	"
0023	17	#
0024	4B	$
0025	7F	% (not available)
0026	2F	&
0027	6B	' (apostrophy)
0028	7B	(
0029	27	)
002A	7F	* (not available)
002B	7F	+ (not available)
002C	1B	, (comma)
002D	63	-
002E	1F	.
002F	5F	/
0030	37	Ø
0031	77	1
0032	67	2
0033	43	3
0034	2B	4
0035	07	5
0036	57	6
0037	73	7
0038	33	8
0039	0F	9
003A	3B	:
003B	3F	;
003C	7F	(not available)
003D	7F	(not available)
003E	7F	(not available)
003F	4F	?
0040	6F	FIGS
0041	63	A
0042	4F	B
0043	3B	C
0044	4B	D
0045	43	E
0046	5B	F
0047	2F	G
0048	17	H
0049	33	I
004A	6B	J
004B	7B	K
004C	27	L
004D	1F	M
004E	1B	N
004F	oF	O
0050	37	P
0051	77	Q
0052	2B	R
0053	53	S
0054	07	T
0055	73	U
0056	3F	V
0057	67	W
0058	5F	X
0059	57	Y
005A	47	Z
005B	7F	LTRS

Look-up table.

one of them computer freaks," for sure!

We now will step through the various routines and see how this thing works. Have a look at Fig. 2. (This is from the article by Pollock and is presented here for those who might not have that issue of *73*.) Notice that the ASCII data is presented to KIM offset one place to the left. This is so that we have PA0 as our output pin. This "ASL" is made up for in the coding and is offset by an "LSR." Also, be sure the strobe on your keyboard is normally high, going low whenever data is available. This is required for compatibility with the NMI input on KIM.

Next, we look at Fig. 1, where we see all the buffers or temporary storage and flag locations involved in the program. Address 0000_h and 0001_h both will contain the Baudot value of the ASCII character that is to be transmitted. The reason for this will be explained later in the "Fetch" routine. Address 0002_h is the ASL counter. This ensures that we get the one start bit, five data bits, and our stop bits. Note that we are using 2 stop bits in this program, but this slows the rate so little that the extra coding could not be justified.

Address 0003_h is the counter that senses how far across the page we are. If we reach 65 characters, KIM will look for the next space and then put in the EOL routine. This assures us that we will not split up the last word on the line. Address 0004_h contains the ASCII equivalent of the Baudot character currently being processed for output. Address 0005_h is the Baudot case flag. If this contains 00_h, we are currently in lowercase Baudot. If this is 20_h, we are in uppercase Baudot. Address $17BF_h$ is the value of the FIFO pointer. If this location is not equal to the value of the Y register, another character will be fetched from the FIFO buffer and be transmitted. So on it goes until it catches up to the Y register.

You will find the entry point at the standard 0200_h. Here, the parallel interface is programmed as inputs and output, corresponding to what we require. The vital places are initialized at 00_h, and the NMI vector at $17FA_h/17FB_h$ is set to point to the interrupt routine. From here, the program jumps to the FIFO fetch routine where it will look at the pointer to see if there is something to transmit (see explanation of address 17BF). If the output routine has caught up to the input rate, the KIM will transmit "diddles" which are composed of LTRS functions. This may be deleted by changing address $02D4_h$ to FB_h.

Now a word about the interrupt routine. This simply looks at the keyboard inputs when an NMI is received and stores the ASCII character in the buffer at location 0300_h plus the value of the Y register; it then increments the Y register to point to the next empty spot.

We will now look at the output routine. It boils down to the fact that whatever is in address 0001_h is chosen so that when it is shifted to the left, each bit which is shifted into the carry position will correspond to the Baudot code. Take the code for the letter "A". In ASCII, this is 41. So, when an "A" is typed on the keyboard, it will enter a 41 into the buffer (after LSR to preserve identity). This 41 is used as an index for the look-up table and is transferred to the X register. The accumulator is loaded with the contents of address 000_h + X, which will be 41. The look-up table shows us that address 0000_h plus 41_h (0041_h) is the place for the letter A. Here the accumulator is loaded with the value 63_h. This is then stored at addresses 0000_h and 0001_h.

Then the accumulator is reloaded with the original ASCII value—in this case, 41_h. If it is a space code, the LTRS/FIGS detection and shift is avoided because every time a space code would be received, the machine would be shifted to uppercase. A look at an ASCII code table will show you why. Next, it is checked for a CR code. If it is pres-

ent, the KIM will jump to the EOL routine, send out the CR/LF/FIGS/:/LTRS/SPACE codes, and set the line counter to 00_h and the case flag to LTRS. If none of the above has happened, then the character is checked for its case, i.e., upper or lower. If it is the same case as the previous character, the case shift routines are skipped, the character is output, and the program returns to the FIFO fetch routine. If the case is different, location 0005_h is checked to see what the last character's case was.

If it was LTRS case, and since we have already established it is a different case from the current character, we will jump to a FIGS load routine, which will be output. Here is where the purpose of storing the Baudot-encoded byte in two locations comes into play. After transmitting the FIGS command, we then have to transmit that uppercase character. Since 0001_h has been destroyed, the contents of 0000 is transferred to 0001 and then the shifted character is put out.

The EOL sequence is very simple. Each part of the EOL is consecutively loaded into 0001, and then we just JSR OUTPUT. When the EOL is finished, the counters are reinitiated at 00_h, the case flag is set to LTRS, and the contents of 000_h is transferred to 0001_h.

The output subroutine is actually very simple, also. Let's look at our ASCII "A". When this was looked up, the value of 63_h was stored at 0001_h. This 63_h breaks down to binary 01100011. Looking from left to right, we will always see a 0_2, and the last two on the right will always be 11_2. This corresponds to our one start bit and our two stop bits. The five in between will correspond to our Baudot code desired. A look at a Baudot code table shows us that "A" (Baudot) is actually 11000. Each time function is set for 22 ms, which occurs immediately before we set the output pin high or low, corresponding to the 1 or 0 of the carry position after the ASL. If 0002_h, our ASL counter, is minus, the character has been fully transmitted and the KIM checks how far it is along the line. If it has reached 65 characters and the current ASCII character being transmitted is a space, it will jump to the EOL routine. If not, it will just jump back from whence the JSR occurred.

Now you can see how easy it is to get your KIM doing wonderful things on RTTY. I have used this basic output routine in a great many things. One of the neatest ones was linking it to Tiny BASIC. This was a great addition to Tiny because it gave me a hard copy of the program, etc., but, boy, did it slow things down!

I hope this article has helped out those who would like to have their KIMs on RTTY but did not have the time to write the program, or whatever. It was a great educational experience for me, and a great deal of enjoyment was derived. KIM-1 has to be one of the best little rigs for this type of application, and many, many things can come to my mind when I start thinking about them.

Give me a call on 14.082500, for I am always on that frequency, autostart. You will find many other fellas with computers on that "computer autostart net." You will be amazed at some of the things happening in this field. ■

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AX-190 Upgrade

—Collins components can make the difference

A few months ago, I completed modifications to my AX-190 as suggested in 73 Magazine.[1] This made a great improvement in the front-end response of the receiver and, although I decided to stop with the additions in the first part of the article and leave out the preamp, signals that were hard to hear on 10 meters are now S9. I highly recommend this easy modification.

There is another area where the AX-190 falls short of being a good amateur receiver, however, and that is in the area of selectivity. The AX-190 in stock form shares its circuit with the SX-190, which is a shortwave listening receiver offering good performance on AM but rather poor selectivity for use on crowded ham bands. The receiver second i-f operates at 455 kHz and utilizes two transformer-filters with a rated bandpass of 4.1 kHz at 6 dB down. After thinking about outboard filters and even of building a passive audio bandpass filter into the speaker box, I finally decided to go the proper route and install a Collins mechanical filter in the i-f circuit. The price of new filters of this type is rather high, and if you are on a budget such as mine, I advise shopping for one that is surplus.

After looking over the schematic[2] and then opening up the receiver, I made the happy discovery that the second mixer (Q8) is mounted on the vfo board and is, of course, enclosed by the vfo box. Its output is fed to the input of the i-f board by a shielded cable soldered to pin 13. This point is an ideal place in which to insert a filter. Also, as I looked at the bottom of the receiver, I noted that the vfo enclosure edges are extended to the bottom of the chassis, forming a perfectly located shielded box with ready-made holes for connections. This means that a new circuit board can be inserted into the existing circuit with excellent isolation and no modifications to existing boards.

Before any work starts, it would be advisable to tune the calibrator signal in at a high frequency and peak all controls for maximum. If the S-meter reading is noted, the crystal calibrator then can be used to adjust the circuit on the new filter board for unity gain after installation. Capacitors C4 and C5 are adjusted for a peak, and then R2 is adjusted until the same S-meter reading is obtained.

The filter used is a surplus Collins 455-FA-21 with a bandpass of 2.1 kHz and it is mounted on an etched circuit board along with resonating capacitors and an amplifier using an MPF102. This board is etched with a

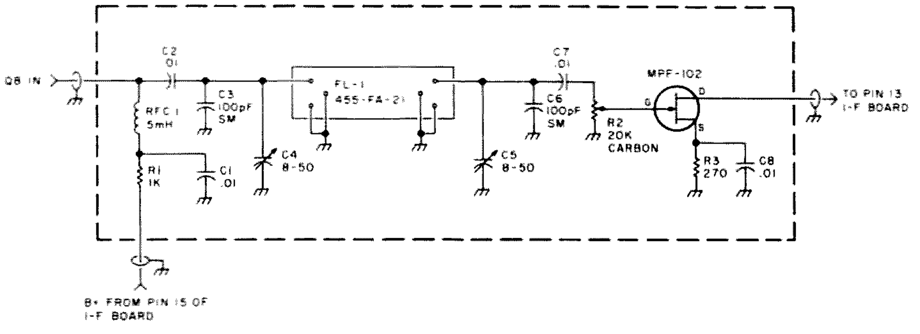

Fig. 1. A Collins filter for the AX-190. All connections to the circuit board are by shielded wire. See text for R2 adjustment. R2 is a surplus 10-turn, 20k carbon trimmer. R1, R2, and R3 are ¼ Watt.

maximum amount of ground plane remaining to provide isolation. I also added a shield on the foil side of the board between the input and output of the filter. The shield is simply a piece of circuit board material about ½-inch wide running the width of the board and attached with solder. I'm not sure it's necessary, but it is easy to do and certainly won't hurt.

The original shielded cable coming from Q8 to the i-f board is unsoldered from pin 13 and rerouted to the filter board which is mounted on the bottom panel of the vfo box. It may be necessary to splice on a small piece of cable, depending on how you mount the board. On the new board, the mixer product is coupled to the mechanical filter through a 0.01-uF ceramic capacitor (C2). A 100-pF silver mica capacitor (C3) with a paralleled 8-50-pF ceramic trimmer (C4) are used to resonate the input of the filter. The output of the filter is treated in the same way with C5 and C6 and is then fed to the gate of the MPF102 through a 0.01-uF ceramic (C7) and a miniature 20k ten-turn carbon pot. The output of the new filter is now simply a matter of attaching the drain of the MPF102 directly to pin 13 on the i-f board by a shielded cable. This also supplies B+ to the MPF102 as it did originally to Q8.

Of course, by this process Q8 no longer has B+, and this is restored by running another shielded cable from the power supply bus on the i-f board (pin 15) through a capacitor-resistor decoupling network on the new filter board. Just to be sure, I threw in an additional 5-mH choke. These components are labeled R1, C1, and RFC1 on the diagram, Fig. 1.

These modifications have resulted in a very satisfying receiver as far as SSB and CW are concerned, and comparisons with other highly-rated receivers are favorable. AM reception is no longer possible, but I'll accept that loss in the light of better performance in the other modes.

Many thanks are due to Dave Carlson VE7AQE who provided the circuit and the technical advice along with enough verbal abuse to get me going on this project! ■

References

1. "Improve the AX-190 Receiver," Paul J. Dujmich, *73 Magazine*, January, 1978, page 106.
2. Allied AX-190 Instructional Manual, page 23, "Schematic Diagram of I-f Section," Copyright 1971, Allied Radio Shack.

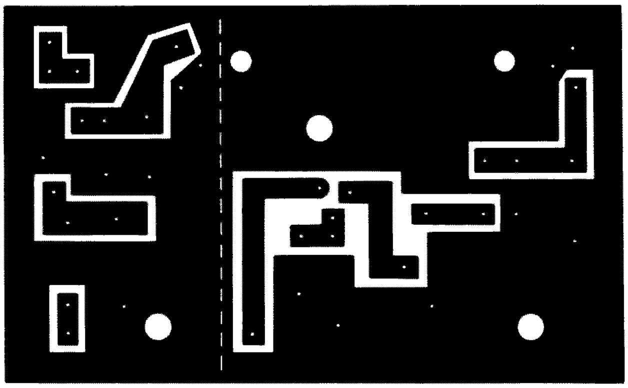

Fig. 2. PC board, foil side.

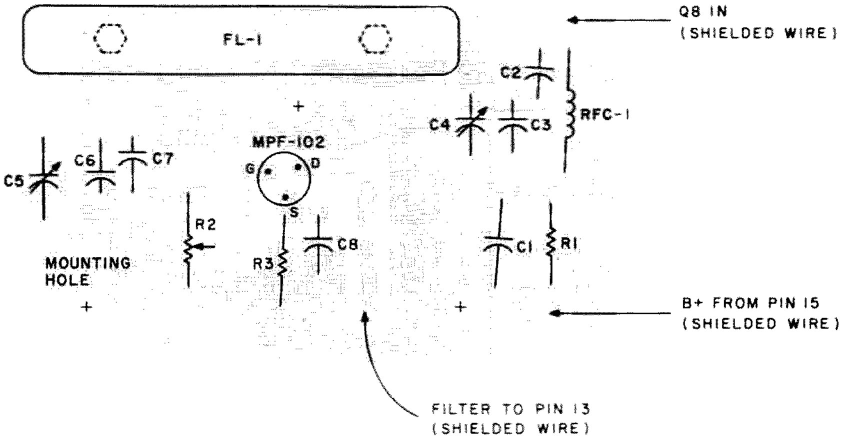

Fig. 3. PC board, component location.

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Extra Accuracy for Heathkit Clocks

—a synchronous solution

Many amateurs have bought Heathkit® digital clocks for their stations. The clock kits are easy to build, can be wired for Zulu (GMT) time, and are a necessary piece of equipment for amateurs who participate in traffic nets or MARS operations.

Older models of the digital clocks were six-digit versions displaying hours, minutes, and seconds. Later versions are four-digit types which normally display only hours and minutes. These can be set to WWV time, after a fashion, by advancing the clock to the next minute, stopping the clock, and releasing it on the minute signal.

A much more accurate method of setting the model GS-1107 clock is to modify the clock for a seconds display. This allows the clock to be set exactly with the WWV signal. The seconds display is handy also for timing. The modification is relatively simple, consisting of cutting a trace on the PC board, wiring in a jumper wire, and replacing the snooze switch. An additional switch can be added to give a seconds display if the snooze feature must be retained. A similar modification can be done to any digital clock using the National MM5316 clock chip.

Perform the following modifications:

1. Cut the printed-circuit trace to pin 24, IC1 (clock IC) (see Fig. 1).
2. Add a strap from pin 32, IC1 to the PC trace previously connected to pin 24 (see Fig. 1).
3. Replace the spring-return snooze slide switch with a regular one-pole/two-position switch (Radio Shack 275-430). Wire the new switch the same as

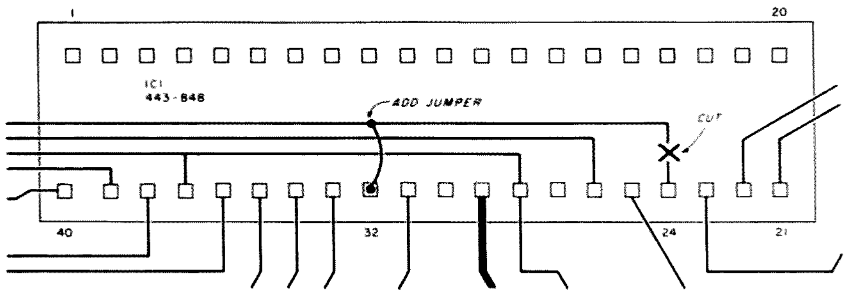


Fig. 1. Clock IC—printed circuit side.

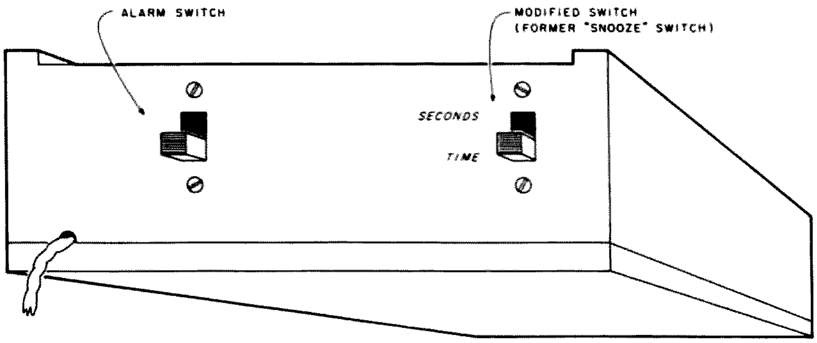


Fig. 2. GC-1107 clock—rear view.

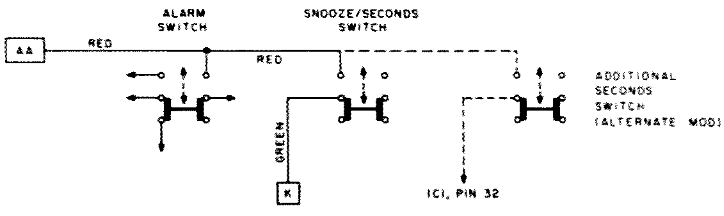


Fig. 3. Clock switch wiring.

the original switch (see Fig. 3).

● Snooze switch will now provide two displays:

a) "Time" display: normal 24-hour format.

b) "Seconds" display: digit 4 = blanked, digit 3 = minutes (units), digit 2 = 10s of seconds, digit 1 = seconds.

● When used in "seconds" display mode:

a) Slow switch: Will inhibit 60-cps input to the clock IC and prevent time from advancing.

b) Fast switch: Will reset seconds to zero without changing the minutes count.

c) Both switches at once: Will reset time to 12:00:00 am in 12-hour format; to 00:00:00 in 24-hour format.

● To set the clock to synchronize with WWV:

a) With former snooze switch in "time" display mode, set clock to current time plus one minute.

b) Switch to "seconds" display.

c) Depress fast switch (resets to X:00), release fast switch, and immediately depress slow switch (stops clock and holds time).

d) Upon receipt of the WWV tone (on the minute), release the slow switch.

e) Verify that the display changes from X:59 to Y:00 at the next WWV tone pulse (on the minute).

f) Set former snooze switch to "time" display mode.

If an additional switch is added for the "seconds" function, connect the center contact of the switch to pin 32 of IC1 (clock chip). Connect the normally-open contact of the switch to the wire which is common to the snooze and alarm switches (+22 V from power supply terminals AA, AB, AD, and AG)—see Fig. 3.■

✓See List of Advertisers on page 130

The 160 Winners!

—W8LRL and W4CN take top honors

Bill Gosney KE7C
2665 Busby Road
Oak Harbor WA 98277

"The biggest and best ever held"—those were the words uttered by nearly everyone who participated in the 1981 160-Meter Phone Contest sponsored by *73*. Most contestants expressed their surprise at the enormous turnout of active stations on the bands. Many old-timers indicated it was the first time in their lives they've seen so many phone-band operators on 160 at one time! They weren't joking, either; the statistics tallied after the contest showed nearly 1,000 stations participated in the weekend extravaganza. Look at the results compared to last year for example:

	Entries	Participants
1980	74	569
1981	117	917
% Increase	58.1%	61.2%

Greater scores were witnessed, bigger signals were apparent, certainly more stations were on the air than ever before, and the propagation seemed to favor most everyone's fancy. I said "most," fellas! As well-known top-band operator Paul Engle K9QLL stated, "Last year's winner wouldn't have even made honorable mention this year!" If you weren't there to see it for yourself, let us tell you, the competition was extremely fierce. The contest results pretty well sum it up.

Wally Eckles W8LRL from West Virginia took first-place honors in the single-operator category with a remarkable score of 383,625 points. Of particular interest is the fact that the DX countries worked by Wally made the difference in the outcome of the event. Wally's fifteen-country total could not be matched by the nine countries of second-place finisher and well-known HF contest station KØRF. Though KØRF had the most QSOs in the contest (804), nearly twice that of last year's winner, the three multiplier credits earned for each DX country worked allowed W8LRL to pull out into the lead when the final scores were tabulated.

John Vaughn and company (AC4A, WD4ARQ, N4DUH, KA4DWX, KA4FJJ, WD4OSN, WA4QWJ, NF4R, K4TXJ, KD4U, and N4XM), representing the Amateur Radio Transmitting Society, Inc., of Louisville, Ken-

ZF2DX in Grand Cayman Island operated by KØGVB and WAØDXZ (wearing glasses). KØGVB was 2nd in the world last year.

CONTEST FEEDBACK

"This was my first 160 contest; in fact, at contest time I had only been on 160 meters about two weeks total. Had a really super time and you can be sure I will be back next year with bigger and better things."—K1LPS.

"The 160 contest again turned out to be a great success! Congrats on a job well done. The new rules worked out just fine and I wouldn't change a thing for next year. My biggest thrill was working W1BB, W2FJ, and W2EQS all the same weekend. I guess there is a first for everything?"—WA9EYY.

"Thanks for a most enjoyable contest and thanks to everyone for the contacts. I had to miss most of the first night and half of the second. I am already looking forward to next year's event."—KC8P.

"Suggest you make the contest mixed SSB/CW."—AA1K.

"No W5s or W7s; where were they? A great contest, though."—K1NBN.

"Competition is getting heavier (and much, much louder). I guess it is time for a new antenna system. The band opened up nicely Sunday morning. Thanks for a fun contest."—WB1HIH.

"The word got out about the best 160-meter contest and I wish I could have worked the thousands of stations I could hear. Hope we have the entire 160-meter band next year and we can spread out a little."—K2DWI.

"All set for the contest, then 2 days before I got the flu. I was left with little energy. My coughing kept tripping the VOX. See everyone in the 3rd annual event, I am sure."—K3IXD.

"Found the conditions here on the east coast good to zero-land; not much heard to 5-, 6-, or 7-land, however; did hear HP3, KP2, and a VK6 at about 0100Z on the 18th. Certainly looking forward to next year."—K2SJB.

"Biggest thrills were working Hawaii and Nova Scotia answering my CQ."—W5LKP.

"Lots of fun and good turnout for the 2nd annual event. Only wish the DX conditions were better for some of us."—W3BGN.

"This is my very first 160-meter contest and only my second contest of any kind. I enjoyed it very much. I wish time would have allowed me to work longer."—K4ZGA.

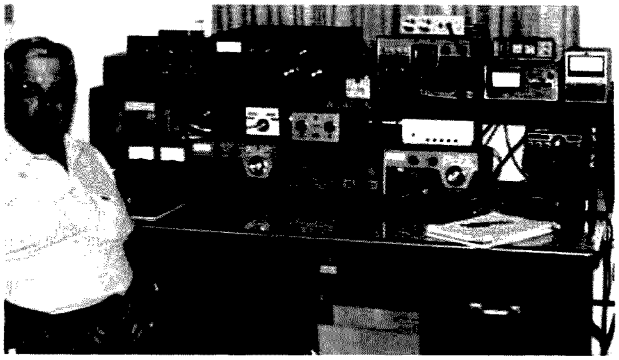
"Contest rules as of now make no incentive to work more than one DX station in each country. I feel the rules should give extra points for each DX station worked."—W4PZV.

"Good contest! Unfortunately, I could only operate one night."—AE6U.

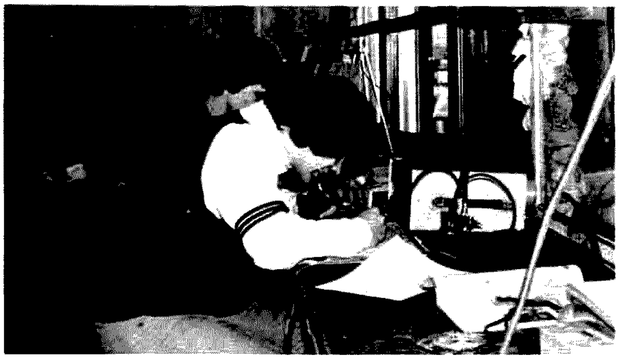
"Hadn't been on 160 since 1954 until the weekend of the contest. I strung up a new antenna and jumped in with both feet (until the rig blew up Friday night). This put me out of action until the following evening. I had a ball anyway! See you next year for sure."—N4ARO.

"Forty minutes late starting due to finishing the beverage antenna in the moonlight. It helped me work two European countries, however."—N4IN.

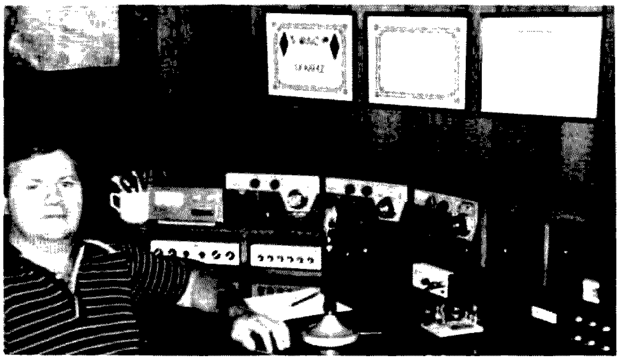
"My first 160-meter contest. Not a good score, but wanted to show my support. Enjoyed it nonetheless. Hope to improve



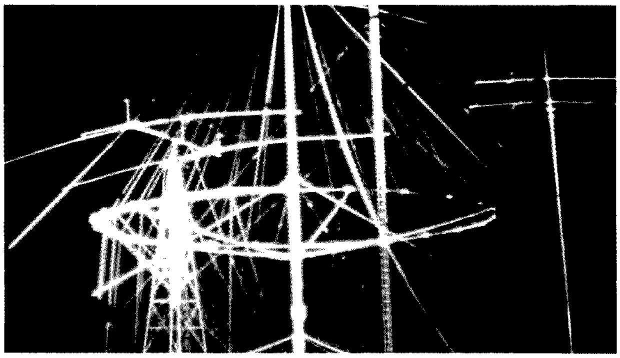
WD4OSN pictured here at his station after all the dust cleared. This station took top multi honors under the call W4CN.



KA9F manned by WD9IHI in the foreground and station owner Neil in the back as they operate from the high school press box high above the football stadium where dipoles are strung across the field.



W8LRL, overall 160-meter champion! An unbelievable score of 383,625 points, 775 QSOs, 47 states, 7 provinces, and 15 DX countries on single sideband. Need we say more about this popular contester, "Mr. Gentleman" of the "Gentleman's Band."



N7DF, top 7-land station for the second year in a row. Look at the spider-web. Could this be why?

my antenna system to be more competitive. Thanks to 73 Magazine for the sponsorship. See you again next year."—W5SOD.

"As always, it was again proven that 160 is the 'Gentleman's Band.' My thanks to the fellows who really tried to get me through to the east coast, even though I didn't make it (sob!)."—W6WBY.

"Lots of bug signals and weak ears. Big and little guns calling the coast to no avail! All in all, it was lots of fun. Sunday participation dropped off drastically it seemed."—KK6C.

"Heard many stations that couldn't hear me—HP1XRK, AH6BK, KC4OV, etc. My noise level was 59+. A fun contest, though, and there sure was a noticeable lot of activity."—AK7F.

"Never heard so much activity on 160 before! Worked more states in 4 hours than in the rest of my not-too-active 22 years. Used a 330-foot AM broadcast tower after sign-off. Having a 5/8-wave vertical sure was nice (hi). Next year we may even match the impedance."—K8EXF.

"Never has 160 sounded so continuous QRM."—W8IM.

"Sure was fun. Only wish I could have worked the second night."—K8CFU.

"Had a lot more fun than last year. Did a little better also (hi). Missed some prime time operating hours due to company. Sure looking forward to next year, though."—W8QBF.

"Really enjoyed the contest. A lot more activity than I expected to find. The event seems to be a great success. Thanks to 73 Magazine!"—W8LRL.

"Where were Wyoming and New Mexico? Missed several other multipliers, too. Enjoyed the contest again this year. Seemed to be much more activity and I was at least able to beat last year's score in spite of the limited operating time."—N9GT.

"Conditions were excellent. Local competition was very, very stiff!"—WBØCMM.

"Again I enjoyed the contest. Conditions were less favorable, though. Higher noise, weaker propagation. Pleased to note the higher turnout, especially VEs. Acquired 1 more state and 3 more provinces thanks to the contest."—VE4WR.

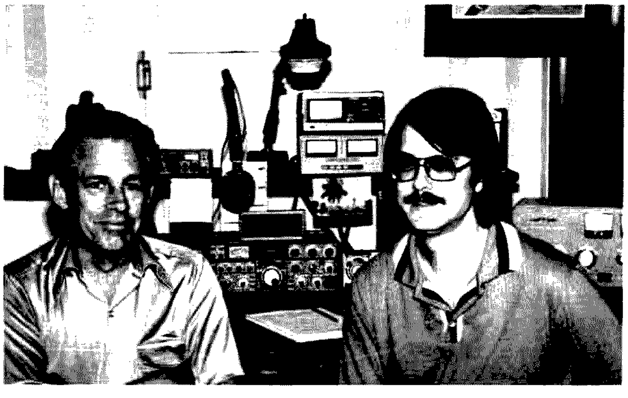
"Back to the drawing boards for the 160 antenna. I heard at least 25 stations from the US calling me, but they didn't hear my return signal evidently. Planning a sloper for future 160 work. Couldn't hear W1-land at all."—HP1XRK.

"This was my first effort in a contest since I got my license last April. I really had fun. Wish my antennas were a few feet higher (hi). All in all, had a great time."—VE1BWW.

"This was quite a contest. Last year's score would hardly be an honorable mention this year. Murphy got me and I missed some of the best hours of the contest due to a blown switchbox and preamp. Never heard so many signals on 160 before. There must have been over 1,000 stations on there! Sure hope the test continues every year!"—K9QLL.

"Wish I had submitted my records last year. I enjoyed the contest a great deal. One of the best, I think! Certainly more contesters this year. Hopefully, it will grow in popularity while not challenging in simplicity and good operators. It was zero degrees or less and had about 16" of snow. Made my new 160 antenna plans impossible."—N8AKY.

WA9EYY achieved 2nd highest multi-op score in the world assisted by K9ZDN.



Multi-op station WDØBNC was top zero-land station and third in the world. WDØBNC (left) and WAØTKJ (right).

W3YOZ preparing for the big event. Photo represents only one of three verticals mounted in the river with extensive radial systems. This station was 5th in the world and high scorer in the 3rd call district.

tucky, had a clear-cut victory in the multi-operator category with a score of 226,525 points. This team was followed by second-place finisher WA9EYY and his multi-operator assistant K9ZDN with 193,475 points. Unlike the race in the single-operator category, the difference in this heat was obviously the QSO count. A margin of 152 QSOs separated the first- and second-place stations, while the second-place station led in provinces and countries worked.

This year's multi-op effort was a surprise to us all. We hope this success will be incentive enough for more stations to come out of the woodwork, join the fun, and challenge the competition on 160!

John Summach VE3MFA from Burlington, Ontario, Canada, was high scorer for all of Canada with 444 QSOs and 142,080 points. Leading the single-operator category for DX stations was C6ADV with 171 QSOs and 49,590 points. ZF2DX and multi-op crew KØGVB and WAØDXZ led in their category for DX stations with 241 contacts and 73,505 points total.

Evidently propagation to North America was not in the Europeans' favor, as DF2LM and SP5IXI both reported making contacts only within the Eastern Hemisphere. We're as optimistic as they are, however; they'll be back next year to try again as conditions *will* improve, won't they?

Sorting through all the statistics by computer, we found KØRF leading the pack with the most QSOs (804), followed by W8LRL with 775 stations worked. Other entries with 300 or more contacts included: W4CN (697); WBØCMM (676); W9RE (592); W3YOZ (580); WA9EYY (545); WDØBNC (513); AA1K (488); WDØBRD (485); N4KG (483); KC8P (457); VE3MFA (444);

CONTEST SUMMARY

The Top Six on 160

SINGLE OPERATOR

Call	State	Score	QSOs	Points	States	Provinces	Countries
W8LRL*	WV	383,625	775	3875	48	7	15
KØRF	CO	333,660	804	4020	48	8	9
WBØCMM	CO	256,880	676	3380	47	8	7
W9RE	IN	224,960	592	2960	46	6	8
W3YOZ	MD	217,500	580	2900	45	6	8
AA1K	CT	202,520	488	2440	43	7	11

MULTI-OPERATOR

Call	State	Score	QSOs	Points	States	Provinces	Countries
W4CN*	KY	226,525	697	3485	47	6	4
WA9EYY	IL	193,475	545	2725	46	7	6
WDØBNC	KS	176,985	513	2565	47	7	5
WDØBRD	NE	169,750	485	2425	47	8	5
W9ZX	IL	120,725	439	2195	44	5	2
KA9F	IL	120,000	375	1875	42	4	6

*World high score

FINAL RESULTS

SECOND ANNUAL 160-METER PHONE CONTEST

Final results are listed in order by callsign, state, province or country, score, QSO points, QSOs, states, provinces, countries worked. (*) = State/province/country winners; (**) = District winner.

SINGLE-OPERATOR CLASS

Call	State/Province/ Country	Score	QSOs	QSO Points	States	Provinces	Countries
AA1K	CT**	202,520	488	2440	43	7	11
WB1GQR	VT*	70,560	294	1470	37	5	2
W1WCR	NH*	51,230	218	1090	36	5	2
K1NBN	ME*	36,075	189	925	31	5	1
WB1HIH	MA*	34,020	185	945	31	5	-
K1LPS	VT	22,100	130	650	26	5	1
K1KNQ	MA	21,930	102	510	35	2	2
W1BB	MA	13,950	90	450	24	4	1
K2DWI	NY**	17,255	119	595	26	3	-
K2SJB	NY*	13,485	87	435	29	2	-
W2CC	NJ*	20	2	10	2	-	-
W3YOZ	MD**	217,500	580	2900	45	6	8
W3BGN	PA*	72,675	255	1275	38	4	5
W3DHM	PA	61,425	195	975	41	4	6
AE3T	PA	53,200	190	950	42	5	3
K3LGC	DE*	48,760	184	920	36	5	4
KB3MI	PA	24,320	128	640	31	4	1
W3AJS	PA	9,100	65	325	21	4	1
K3IXD	MD*	3,840	32	160	21	-	-
W3ICM	MD	270	9	45	6	-	-
WB3GCG	MD	disqualified (excessive power)					
N4KG	AL**	185,955	483	2415	46	7	8
W4PZV	FL*	122,055	309	1545	42	4	11
N4IN	FL	113,620	299	1495	45	4	9
WB4OSS	KY*	100,005	339	1695	45	5	3
W4WWQ	VA*	73,810	242	1210	41	5	5
N4UU	VA	72,135	229	1145	42	3	6
W4VKK	GA*	61,800	206	1030	42	3	5
N4ARO	TN*	46,200	210	1050	35	3	2
N4CMJ	VA	39,560	184	920	37	4	2
N4CJ	VA	34,010	179	895	28	4	2
WB4ZPF	VA	26,000	130	650	31	3	2
N4MM	VA	23,500	100	500	38	3	3
W4TWW	SC*	16,660	98	490	26	2	2
N4DMS	GA	13,050	90	450	28	1	-
WD4RCO	GA	10,695	69	345	30	1	-
N4WZ	GA	10,350	69	345	30	-	-
K4ZGA	TN	3,220	28	140	22	1	-

W5LKP	TX**	101,520	282	1410	42	6	8
AE5H	MS*	100,345	329	1645	44	5	4
WD5DVD	LA*	24,990	119	595	33	-	3
W5VGC	NM*	16,660	98	490	33	1	-
W5GWD	MS	5,750	50	250	23	-	-
W5SOD	TX*	2,700	30	150	18	-	-
K6SE	CA**	113,520	344	1720	46	5	5
AE6U	CA*	102,480	336	1680	42	7	4
KK6C	CA	49,720	226	1130	32	4	2
W6WBY	CA	6,480	81	405	16	-	-
W6TYR	CA	2,310	33	165	10	1	1
WA9WAC/6	CA	1,350	27	135	8	2	-
N7DF	UT**	135,600	412	2060	42	6	4
WB7FDQ	AZ*	105,385	347	1735	43	6	4
K7VIC	MT*	74,715	293	1465	41	4	2
N7AM	WA*	68,850	270	1350	34	5	4
KA7BTQ	ID*	68,080	296	1480	39	4	1
W7ULC	OR*	43,460	212	1060	34	4	1
N7AKU	NV*	9,620	74	370	23	3	-
AK7H	WA	7,280	56	280	19	4	1
AK7F	WA	4,770	53	265	15	3	-
W7TO	WY*	30	3	15	2	-	-
W8LRL	WV**	383,625	775	3875	47	7	15
W8XV	OH*	135,680	424	2120	44	5	5
KC8P	MI*	134,015	457	2285	45	5	3
KB8AC	OH	110,745	321	1605	45	6	6
W8GIO	WV*	110,400	366	1830	43	5	4
W8QBF	OH	58,800	245	1225	38	4	2
KB8HW	MI	41,830	178	890	36	5	2
K8IP	OH	26,320	112	560	34	4	3
N8BJQ	OH	25,215	123	615	37	1	1
K8EXF	MI	11,220	68	340	31	2	-
N8BJU	OH	10,230	62	310	28	2	1
K8CU	MI	9,000	60	300	29	1	-
W8IM	OH	7,150	65	325	21	1	-
WB8AYW	MI	3,300	30	150	20	2	-
W9RE	IN**	224,960	592	2960	46	6	8
K9QLL	IL*	138,040	406	2030	47	6	5
WAØAVL/9	IL	123,690	399	1995	47	6	3
W9UP	WI*	99,125	325	1625	44	4	5
N9GT	IN*	87,450	330	1650	43	4	2
WD9IIX	IL	59,565	209	1045	39	3	5
K9BG	IL	35,500	142	710	41	3	2
WA9FTU	IL	23,110	126	630	34	3	-
WA9RHU	IL	13,860	99	495	25	3	-
K9GDF	WI	50	5	25	2	-	-
KØRF	CO**	333,660	804	4020	48	8	9
WBØCMM	CO*	256,880	676	3380	47	8	7
KAØY	IA*	92,055	323	1615	46	5	2
KAØM	MN*	30,995	151	755	39	2	-
WBØUFL	IA	11,745	81	405	29	-	-

CANADIAN STATIONS (SINGLE-OP)

VE3MFA	Ont*	142,080	444	2220	43	6	5
VE1BNN	NScot*	94,140	284	1420	36	7	8
VE1BWW	NBrun*	36,355	169	845	31	6	2
VE4WR	Man*	35,690	166	830	36	7	-
VE7FAO	BC*	19,845	147	735	17	4	2
VE5XU	Sask*	18,135	117	585	27	4	-
VE1BPY	PEI*	3,515	37	185	13	6	-
VE2DZE	Que*	3,400	40	200	13	4	-
VE7FBS	BC	1,450	29	145	9	1	-

W9ZX (439); W8VX (424); N7DF (412); K9QLL (406); WAØAVL/9 (399); KA9F (375); W8GIO (366); WB7FDQ (347); K6SE (344); AE6U (336); N9GT (330); AE5H (329); W9UP (325); KAØY (323); KB8AC (321); W4PZV (309); K9ZUH (300).

Our only disappointment (other than a disqualification which was made) was the representation from some of the Canadian provinces. With the rules changed to their favor from last year, we were expecting a greater turnout in this part of the continent. Out of a maximum of twelve provinces and territories possible, only nine were ever heard on the band, eight of which were logged by the three zero-land stations—KØRF, WBØCMM, and WDØBRD.

Speaking of multipliers, all fifty (50) states were heard on the band at one time or another. Yes, contrary to the belief of some east coasters, Hawaii was on there in full force (why no entries, though, fellas?), as was the state of Alaska. Of course, for the sake of the contest, Hawaii and Alaska counted as DX multipliers!

For the most states worked, KØRF's call pops up again, leading all other contestants with 48 states worked—a clean sweep! Others recording forty (40) or more states were: W4CN, W9LRL, WAØAVL/9, K9QLL, WDØBRD, WDØBNC, WBØCMM (47); N4KG, K6SE, WA9EYY, W9RE, KAØY (46); W3YOZ, N4CQ, N4IN, KB8AC, KC8P (45); AE5H, W8VX, K9ZUH, W9UP, W9ZX (44); AA1K, WB7FDQ, N9GT, VE3FMA (43); AE3T, W4VKK, N4UU, W4PZV, W5LKP, AE6U, N7DF, N8AKY, WD9GGY, KA9F (42); W3DHM, W4WWQ, K7VIC, K9BG (41); and ZF2DF (40).

With fifteen (15) countries to his credit, W8LRL was clearly the DX king as

Quad (1)
3-Element Vertical (1)
Discage (1)
Hytower Vertical (3)
Miscellaneous Verticals (21)
Inverted-L (11)
Tee Vertical (3)
Delta Loop (1)
Shunt-Fed Tower (3)
Receiver Loop & Preamp (5)
Inverted Vee (20)
80-Meter Vee w/tuner (3)
2-Element Phased Verticals (3)
Beverage (19)
2-Element Quad (1)
Zepp (2)
Longwire (12)
Sloper (12)
Dipole (12)
Marconi (2)

Table 1. Antennas used in the 160-Meter Phone Contest.

DX STATIONS (SINGLE-OP)

C6ADV	Bermuda*	49,590	171	855	33	4	7
DF2LM	West Germany*	11,700	78	390	-	-	10
HP1XRK	Panama*	6,460	34	170	17	-	7
SP5IXI	Poland*	360	8	40	-	-	3

MULTI-OPERATOR STATION RESULTS

W4CN	KY*	226,525	697	3485	47	6	4
WA9EYY	IL*	193,475	545	2725	46	7	6
WDØBNC	KS*	176,985	513	2565	47	7	5
WDØBRD	NE*	169,750	485	2425	47	8	5
W9ZX	IL	120,725	439	2195	44	5	2
KA9F	IL	120,000	375	1875	42	4	6
N4CQ	NC*	90,750	275	1375	45	3	6
K9ZUH	IN*	90,000	300	1500	44	4	4
ZF2DX	Grand Cayman*	73,505	241	1205	40	3	6
WD9GGY	IL	70,250	281	1405	42	5	1
N8AKY	MI*	63,700	260	1300	42	4	1
K8CFU/4	NC	60,090	238	1190	34	4	4
WA2GZB	NJ*	56,925	207	1035	39	7	3
N9AW	WI*	48,840	222	1110	37	4	1
VE6ANC	ALB	7,650	85	425	11	4	1

MULTI-OPERATOR PARTICIPANTS

WA2GZB and WB2QLO
W4CN, AC4A, WD4ARQ, N4DUH, KA4DWX, KA4FJJ, WD4OSN, WA4QEJ, NF4R, K4TXJ, KD4U, N4XM
N4CQ and WA4UNZ
VE6ANC and VE6BMW
N8AKY and WD8NLE, KA8LDO
K8CFU/4 and WA8VDC/4
N9AW and WA9TZE, K9BED, KA9GAZ, KA9FZI
KA9F and WD9IHI, KB9JT, KA9GGM, KA9GGL, KA9ICT, WA9NXM
WA9EYY and K9ZDN
WD9GGY and WD9BHK
K9ZUH and WB9PXR
W9ZX and W9MWK
WDØBNC and WAØTKJ
WDØBRD and WBØIBT, WBØIJL
ZF2DX and KØGVB, WAØDXZ/5

well as being the overall winner of the contest. Other DX accomplishments with 5 or more countries: AA1K and W4PZV (11 countries total); DF2LM (10); N4IN, KØRF (9); VE1BNN, W3YOZ, N4KG, W5LKP, W9RE (8); C6ADV, HP1XRX, WBØCMM (7); W3DHM, N4UU, N4CQ, KB8AC, KA9F, WA9EYY ZF2DX (6); W3BGN, W4VKK, W4WWQ, K6SE, W8VX, W9UP, K9QLL, WDØBRD, WDØBNC, VE3MFA (5). An additional 33 entries managed to verify four or less countries each.

This year 21 countries were represented during the contest, another great surprise we never expected. Contestants logged such countries as San Andreas, Grand Cayman Islands, Bahamas, Puerto Rico, Bermuda, Panama, Dominican Republic, Netherlands Antilles, Venezuela, Hawaii, Alaska, England, Isle of Man, Northern Ireland, Netherlands, Australia, West Germany, Poland, Mexico, Peru, and, of course, the United States and Canada. All we need to do now is convince these top-band DX stations to join us again next year and hopefully this time we can talk them all into submitting an entry. Just think, each of them could have won an award to hang on the wall and boast about!

After the big event is all

Atlas 350-XL (1)
Collins 75A3 (1); 75A4 (1); KWM-2 (1)
Drake T4X (2); T4XC (10); T4XB (10); TR7 (7); R4A (1); R4B (10); R4C (8)
Heathkit HW-12A (1)
Icom 701 (1)
Kenwood TS-180S (4); TS-830S (4); TS-520S (9); TS-820S (4); TS-820 (1); TS-520SE (1)
Signal One CX7A (1); CX11A (1)
Yaesu FT-101ZD (4); FT-901DM (7); FT-101E (4); FT-101EE (3); FT-101EX (1); FT-101D (1); FT-107M (1); FT-301S (1); FT-301SD (1); FL-101 (1)

Table 2. Equipment used in the 160-Meter Phone Contest.

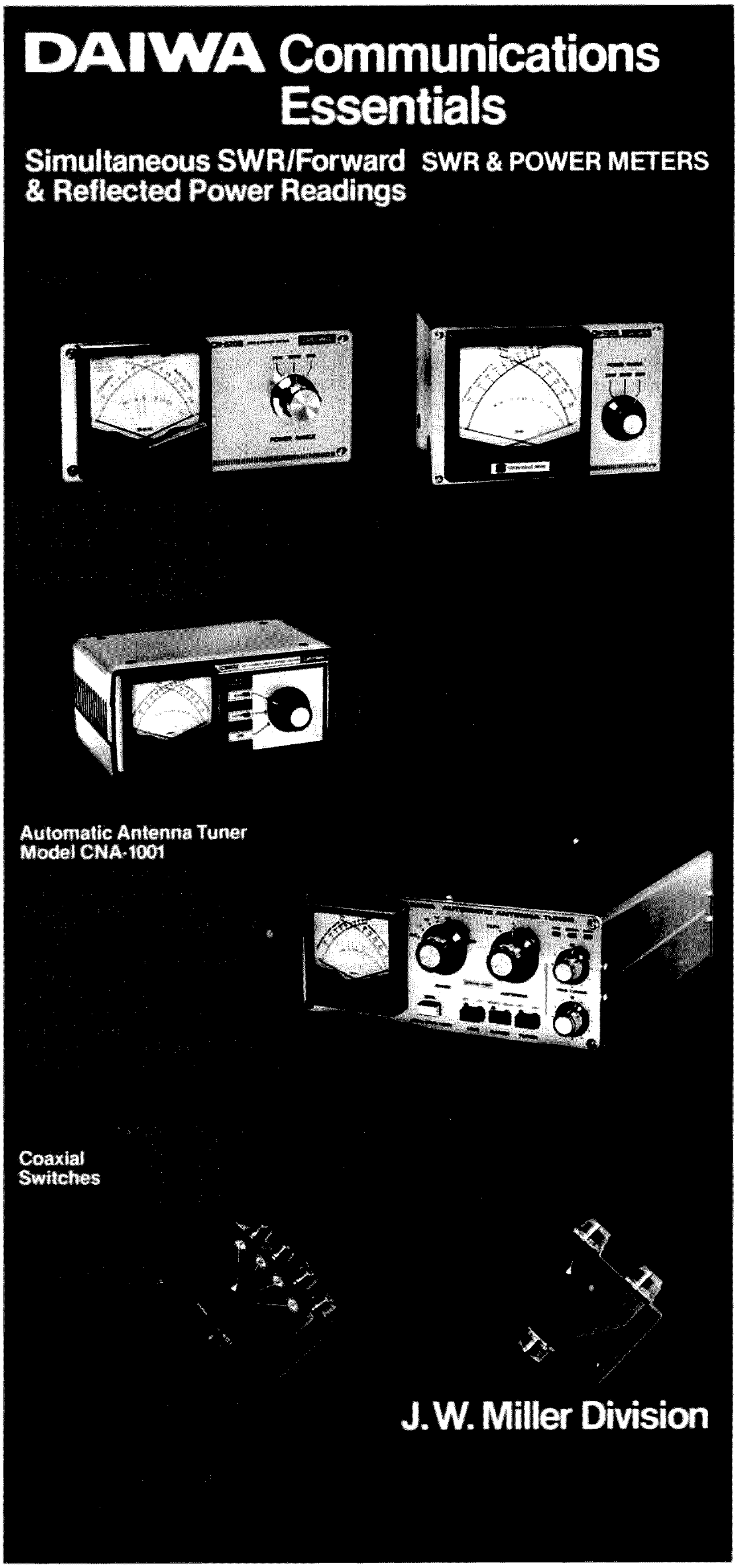
W9ZX was among the top five multi-op stations. Achieved 439 contacts and 120,725 points with the dedicated assistance of W9MWK.

over and everyone has submitted his entry, one of the most interesting parts of the contest committee's job is to tally all the equipment and antennas used by the contestants. We get the biggest kick out of the lame duck excuses some people will use for not getting on 160—for years hams have been saying it required too much real estate or it required a special home-brew rig of some fashion. Well, for the second year in a row, we have the results to prove all that is a bunch of hogwash. Look at the stats for yourself. Most of the antennas you see listed in Table 1 were erected on small city lots.

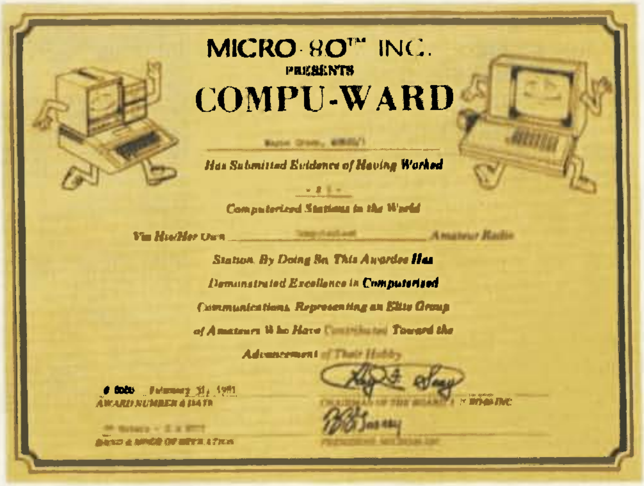
Now take a look at the equipment in Table 2. It's an old wives' tale; I don't see a home-brew rig in the bunch (I take that back—a modified Heathkit HW-12A).

It's been a great contest; we have Dan WA2CZB and Ed K3IXD, both members of our contest committee, to thank for that. This dedicated pair has been with the contest from the very start. Both were instrumental in assisting me back in early 1979 when we burnt the midnight oil trying to establish the rules for the event we've all experienced here. Both have agreed to be with us again next year for the third annual event, which I must remind you is just around the corner.

Help us pass the word for our next big event in January! Will W8LRL win again? Will KØRF take it all or will W7RM, W7WA, and W2PV come out of the woodwork and surprise us all? We hope that whatever happens, it will be a fun time for us all as the FCC has just announced the relaxation of rules governing 160 operation. Who knows, we may see DXCC in a weekend before it is all over! I'll be pruning and tuning; how 'bout you? ■



AWARDS



Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

FREE OPERATING AWARD

Not many things in life are free these days. Boy, isn't that the truth! The expense of administering an awards program is no exception. The sponsor of this next award, however, is about to change all that.

Read the rules very carefully. All amateurs are eligible and can easily qualify with the station they now have! Though the awards program focuses on computer operation in the amateur bands, the applicant *does not* have to own a computer to qualify! Confused?

The sponsor recognizes the fact not all amateurs own a microcomputer (recent surveys indicate only 20% do). All of us have been exposed to one on the air several times the past couple years, probably without even knowing it. The emphasis of this award, therefore, is to work other stations who are computerized, whether your station is or not.

Still confused? Perhaps the rules of the award program will clarify any areas of uncertainty.

As publicized in over 25 individual amateur radio publications throughout the world, the COMPU-WARD is sponsored by Micro-80 Incorporated (all employees are licensed amateurs). COMPU-WARD is available *free* to all licensed amateurs and shortwave listeners thoughout the world. Emphasis of this award is focused on the advancement of both the amateur radio and computer hobbies through demonstrated excellence in the art of computerized communications.

Stations applying for the COMPU-WARD *may or may not have* a computerized station of his or her own; however, it must be emphasized that all stations contacted *must* be computerized! The *contacted station* must have his transmitter interfaced with a computer such as a TRS-80, Apple, Pet, Heathkit, Atari, etc.

You might ask how to know if the stations are computerized or not. The first answer is obvious—ask! More routinely, however, you will be able to easily identify a computerized transmission. The CW sent will be absolutely flawless—perfect weighting of the characters and everything. The only thing that may throw you will be memory keyers. Most generally a station will mention the fact that he or she is computerized when he tells you the equipment he is using. On RTTY, the copy will be just like a newspaper column, most of the time with justified margins and lines.

To be valid, all contacts must be made on or after January 1, 1980. Two awards are being offered *free*: (1) HF Bands—29.7 MHz and below; (2) VHF/UHF—50.0 MHz and above.

All contacts must be made on one or any combination of the following modes (including any modes authorized by the FCC since the release of this announcement): RTTY, CW, SSTV, and ASCII. Crossmode communications will not be recognized for this award program.

Single-band and mixed-band endorsements will be given in each band segment (HF, VHF, UHF, etc.). Cross-band operation will only be accepted for OSCAR contacts. OSCAR contacts will be recognized as a VHF/UHF accomplishment even though some downlink signals are heard on 10 meters. Contacts through repeaters are also acceptable.

To qualify for either COMPU-WARD: Applicants *with* a computerized station of his or her own must contact a minimum of 15 other computerized stations; applicants *without* a computerized station of his or her own must contact a minimum of 25 computerized stations.

To apply for COMPU-WARD, prepare a list of contacts in prefix order. List each call worked, mode utilized, frequency or band of operation, and state whether you do or do not have a computer which you used to make these contacts. *Do not send QSL cards*! Have your list of contacts verified by a local amateur or radio club official.

Forward your list of contacts along with a large self-addressed stamped envelope (3½" × 9") to the following address. Foreign stations must provide 2 IRCs to substitute the need for a stamp for overseas mailing: COMPU-WARD Program, 2665 North Busby Road, Oak Harbor WA 98277.

QRP AMATEUR RADIO CLUB INTERNATIONAL, INC.: A HISTORY AND ITS AWARDS PROGRAM

QRP Amateur Radio Club International, Inc., was founded in 1961 by K6JSS as an organization for the growing segment of amateurs which enjoys the challenge of running low power.

The club's principle of helping reduce interference on crowded bands is reflected in its motto: Power is no substitute for skill. QRP ARCI's power limits are 50 Watts output on CW and 100 Watts PEP output on sideband, although its officially recognized definition of low-power operation is the internationally used five Watts output on CW and ten Watts output PEP on sideband. The club does not advocate the reduction of power limits authorized by any nation, however.

QRP ARCI has a comprehensive awards program, holds informal monthly QSO parties the first Sunday, sponsors two formal QSO parties (one in the spring and one each fall), sponsors weekly national and regional phone and CW nets, joins with other QRP groups in activities, and publishes *QRP Quarterly*, a newsletter rich in technical articles and news of QRP-related events and activities.

73 MAGAZINE AWARDS PROGRAM

Ten-Meter DX Decade Award

9 WB8LSV — 10 WB9WFZ — 11 W8AKS/6

DX Capitals of the World

12 WA2SRM
13 WA2YEX
14 DF7QD
15 VK6YL
16 OE8MOK
17 8P6OV

Specialty Communications DX Award

1 W2ODA (RTTY)
2 WB0QCD (SSTV)
3 WB7BFK (RTTY)
4 WB0QCD (RTTY)
5 WD9GRI (RTTY)
6 WB6CDM (RTTY)
7 N3AKO (RTTY)
8 DU1EFZ (RTTY)

District Endurance Award
(Times In Minutes)

1 AJ8L (50)
2 WL7ACY (55)
3 WB6CDM/7 (12)
4 WA3PMI/7 (36)
5 WA4ZLZ (54)
6 GI4KCE (8.3)
7 WA2MCE (54)

Additional information on the extensive awards program can be had by sending a large SASE to: Doug Crittendon WB1ESN, 33 Taylor Street, Pittsfield MA 01201.

Full information on club membership, which is available to domestic and foreign amateurs at a moderate, one-time initiation fee and an even more reasonable annual renewal thereafter, can be had by sending an SASE to the secretary-treasurer, Edwin R. Lappi WD4LOO, 203 Lynn Drive, Carrboro NC 27510.

Traditional QRP frequencies are: CW—1810, 3560, 7040, 14060, 21060, 28060, 50360; phone—1810, 3985, 7285, 14385, 21385, 28885, 50385; Novice—3710, 7110, 21110, 28110.

QRP Amateur Radio Club International officers as of April 15, 1981, were as follows: Thomas W. Davis K8IF, President, 11729 Merriman Road, Livonia MI 48150; Robert L. Jenks K7ZVA, Vice President, 11714 Masonic Road, Tacoma WA 98498; Edwin R. Lappi WD4LOO, Secretary-Treasurer, 203 Lynn Drive, Carrboro NC 27510; Frederick W. Bonavita W5QJM, Publicity, Box 12072, Capital Station, Austin TX 78711; William Dickerson WA2JOC, Contest Chair, 352 Crampton Drive, Monroe MI 48161; Doug Crittenden WB1ESN, Awards Chair, 33 Taylor Street, Pittsfield MA 01201; Peter N. Spotts N1ABS, Editor, *QRP Quarterly*, 140 Warren Street, Needham MA 02192; Richard A. Crowell W4WQW, Legal Officer, 803 Oak Plaza Road, Kingston TN 37763.

QRP Amateur Radio Club International has revamped its awards program to reflect internationally recognized low-power levels and has named a new awards manager and secretary-treasurer.

"We are going to can all 100-Watt awards," said Thom Davis K8IF, president of the club which celebrates its 20th anniversary this year.

With one exception, QRP ARCI's board of directors has approved changes effective June 1, 1981, requiring awards to be based on a power *output* of not more than five Watts CW or ten Watts PEP on sideband. The organization previously offered awards with an optional power limit of up to 100 Watts input for CW or 200 Watts PEP for sideband.

The restructuring is in keeping with the club's main objective of showing how the use of limited power permits maximum enjoyment of amateur radio, minimizes interference on crowded bands, and offers operators a genuine challenge. As QRP ARCI's motto says: "Power is no substitute for skill."

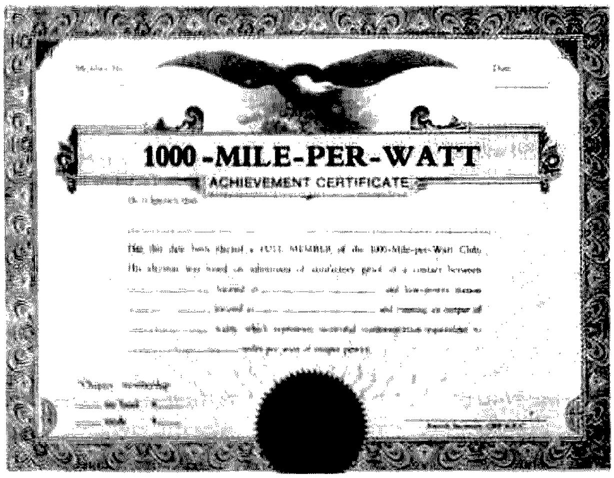
Leading QRP ARCI's awards is the popular KW/M Award, or the thousand-miles-per-Watt certificate, as it is known. It is available to any amateur transmitting from or receiving the signals of a low-power station such that the Great Circle distance between the two ends, when divided by the power output, equals or exceeds 1,000 miles per Watt. Additional certificates may be earned on different bands and with different modes.

DXCC-QRP, as its name implies, is awarded to any amateur station for confirmed contacts with stations in 100 of the ARRL's approved countries. QRP-WAS is available to any amateur for confirmed contacts in each of the 50 United States, and QRP-WAC goes to any amateur for confirmed contacts with a station in each of the six continents.

For each of the above awards, the following rules apply:

1) Power *output* may not exceed five Watts CW or ten Watts PEP on sideband.

2) Since members' QRP numbers are not made available by the club, it will accept as proof for any club award a QSO with a club member giving his/her QRP number and power level in the log data. Otherwise, a QSL card



is needed for confirmation. Copies of cards or a General Certificate Rule list are acceptable.

3) Special endorsement seals are available on awards for which power output on both ends of the contact was within the QRP limits set forth in #1 above.

4) An all-one-band or -mode (AOBM) endorsement also is available on request and if supported by log data, QSLs, or GCR list.

5) All awards are endorsed for power used and whether "one-way" or "two-way."

6) Under the General Certificate Rule, award sponsors will accept as proof of confirmed contacts and that claimed QSLs are on hand if the list is (a) signed by a radio club official, (b) signed by two amateur radio operators of General class or higher, or (c) signed by the applicant with his/her signature notarized and attesting that the QSLs are as claimed. If QSLs are sent as proof and are to be returned, they must be accompanied by sufficient postage.

The only club award to be "grandfathered" in during the restructuring of the program is the QRP-25 Award. It is issued to any amateur who works 25 QRP ARCI members, and endorsements are available for 50, 100, 200, and so on in multiples of 100. Associate members must have been running 50 Watts output or less on CW (or 100 Watts PEP on SSB) to qualify.

To apply for any of the club's awards, send copies of log data, QSLs, or a GCR list plus power and mode used by all stations together with two dollars or ten IRCs to the new awards chairman: Doug Crittenden WB1ESN, 33 Taylor Street, Pittsfield MA 01201.

QRP ARCI's secretary-treasurer, who has additional information on membership, is Edwin R. Lappi WD4LOO, 203 Lynn Drive, Carrboro NC 27510.

For additional information, the club's public relations officer is: Fred Bonavita W5QJM, PO Box 12072, Capital Station, Austin TX 78711.

LAKE SHORE ARA AWARDS

The Lake Shore Amateur Radio Association has informed us of two very unique awards being made available through their organization. Let's look at both the Lake Erie and the Pennsylvania series awards respectively.

The Lake Erie Award

This award is issued for working counties bordering the shores of Lake Erie. There are thirteen (13) counties involved in the four (4) states of New York, Pennsylvania, Ohio, and Michigan. They are Monroe and Wayne counties in Michigan, Chautauqua and Erie counties in New York, Erie county in Pennsylvania, and Ashtabula, Lake, Cuyahoga, Lorian, Erie, Sandusky, Ottawa, and Lucas counties in the state of Ohio.

Amateurs in either of the above four states must work all four states and 10 of the 13 counties to be eligible for this award. The rest of the US, and including those stations within Canada, must work 6 of the 13 counties in only 3 of the 4 represented states.

There is no starting time nor are there any endorsements for this awards program. SWL stations may also apply for this award on a heard basis.

Send no QSL cards; merely have your list of contacts verified by at least a couple amateurs and forward it with an awards fee of $1.00 in US funds or 5 IRCs. Mail your application to: David Maynard WA3EZN, 304 Barker Street, Girard PA 16417.

The Pennsylvania Award Series

The Pennsylvania Award is a series of five awards being offered by the Lake Shore Amateur Radio Association:

The Pennsylvania Cities Award is issued for working 10 cities in Pennsylvania. Of course the cities must be those which are the largest: Philadelphia, Pittsburgh, Erie, Scranton, Allentown, Reading, Harrisburg, Bethlehem, Altoona, and Chester. DX stations need only work 8 of the cities and may substitute Wilkes-Barre, Lancaster, York, and Johnstown.

The VHF Award requires six (6) contacts with any Pennsylvania station on six meters and above. Pennsylvania stations must work 25 stations in 15 counties. The rest of the US and Canada must work 20 stations in 10 counties, while DX stations must work at least 10 stations in 5 counties.

The Novice Award requires amateurs of the state to work a minimum of 25 other Novices in 15 counties; the balance of the US and Canada must work 20 Novices in 10 counties and DX stations must work 10 Novices in 15 counties.

The YL Award requires 25 Pennsylvania YLs be worked in 15 counties for those living in Pennsylvania. All others in the US and Canada must work 20 YLs in 10 counties, while all DX stations, including Alaska and Hawaii, must work a minimum of 10 YLs in Pennsylvania in a minimum of 5 Pennsylvania counties.

The Mobile Award requires those amateurs in Pennsylvania to work a minimum of 25 fellow Pennsylvania mobiles in 15 counties. The balance of the US

and Canada must work 20 mobile stations in 10 counties, while DX stations have to work only 10 mobile stations in 5 counties.

There are no endorsements issued for any of the five Pennsylvania series awards. There is no time limit. To qualify for the award, have your list of contacts verified by at least two amateurs and forward it to the awards manager along with an award fee for each award in the amount of $1.00 to defray cost of administering the program. Mail your applications to: David Maynard WA3EZN, 304 Barker Street, Girard PA 16417.

PEARL HARBOR STATION

The Pearl Harbor Submarine Base Amateur Radio Station, KH6SP, will operate the weekend of 4 December 1981 in recognition of the fortieth anniversary of the Japanese attack on Pearl Harbor on 7 December 1941. Operation will be on twenty and fifteen meters SSB approximately 20 kHz inside the General phone band and on CW about 40 kHz up from the band edge. A certificate QSL will be provided for amateur contacts and an SWL certificate for SWL reports. QSL to KH6SP or KH6BD, the station custodian.

SPECIAL EVENTS STATION PLANNED AT PLIMOTH PLANTATION, THANKSGIVING DAY

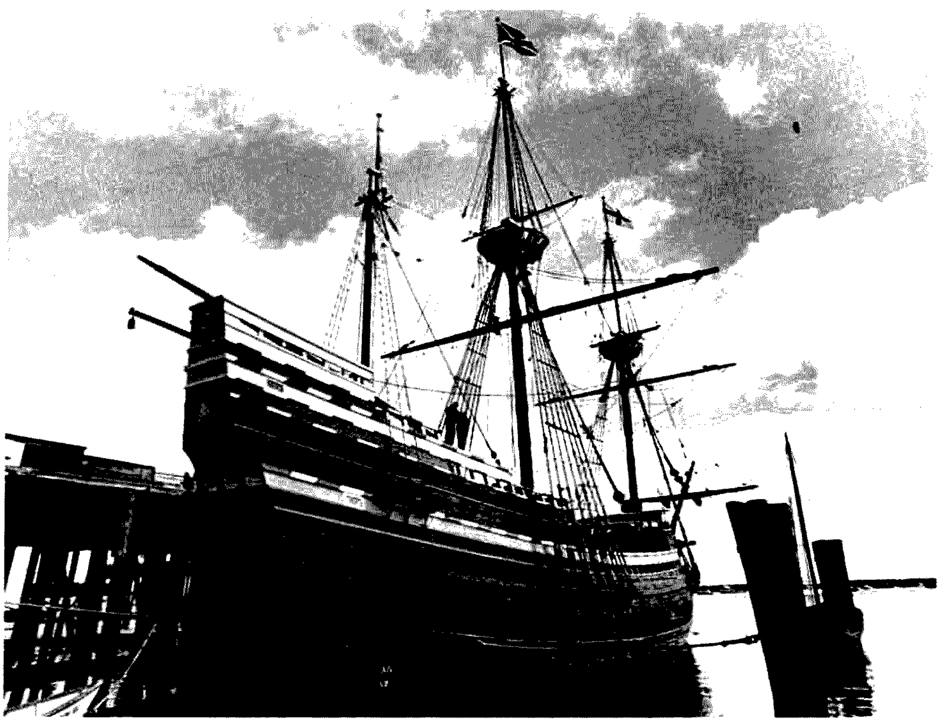
A special events station from Plymouth, Massachusetts (America's Hometown) will be sponsored by the Whitman Amateur Radio Club and Plimoth Plantation on Thanksgiving Day, November 26, 1981.

An attractive certificate suitable for framing will be issued to any (foreign or domestic) amateur who makes contact with this station, which will operate from 9:00 am until 3:00 pm. Depending on weather conditions, members of the Whitman club will operate the station from a dockside location near *Mayflower II* on the Plymouth waterfront, or from an indoor site near the museum's 1627 Pilgrim Village.

Plimoth Plantation is an unusual living history museum which depicts life in 17th century Plimoth Colony. Its sites include the 1627 Pilgrim Village and Wampanoag Summer Settlement, and *Mayflower II*, a replica of the type of ship that brought the Pilgrims to the New World in 1620.The Whitman Amateur Radio Club was established in 1965. Club officers hope the Thanksgiving Day special events station will become a regular part of the community's holiday celebration.

To receive a certificate, send proof of contact and a large (9 × 12) self-addressed stamped envelope or $1.00 to Whitman Amateur Radio Club, Box 48, Whitman MA 02382. Hours for this event will be 1400 to 2000 UTC. Frequencies to be used: 1400 to 1500 UTC, 21.260 (England only); 1500 to 1700 UTC, 7.280 ± QRM; 1700 to 2000 UTC, 21.385 ± QRM.

For additional information, contact Ed Hommel KA1CZS, Whitman Amateur Radio Club, Box 48, Whitman MA 02382 or Rosemary Carrol, Plimoth Plantation, Box 1620, Plymouth MA 02360, (617)-746-1622.



The Mayflower II.

SUBMARINE EXPEDITION

The Choctaw/Muskogee Amateur Radio Clubs are planning an expedition to the submarine *USS Batfish*. Using the callsign W5FX, they will operate on November 13 from 8 to 12 pm and November 14 from 8 am to 4 pm. CW operation will take place 22 kHz above the Extra class band on 80, 40, 20, and 15 meters. Phone frequencies are 3805, 7168, 14230, and 21268 kHz. Send an SASE to Calvin G. Ladd W5FX, 109 E. Myrtle Dr., Midwest City OK 73110, for a QSL card.

RADIO VATICANA AWARD

The Radio Vaticana on the occasion of the 50th anniversary of its foundation issues an award available to licensed amateurs anywhere in the world under the following rules:

Contacts with stations in the Vatican State must be made during the period starting from October 1, 1981 on any amateur band from 315 MHz to 144 MHz and any mode (AM, SSB, CW, RTTY) including cross-band relay and mixed. This period ends on February 1, 1982.

Stations in Europe (including the USSR in the European territory) and the USA (except Alaska and Hawaii) must work (or listen to) at least 2 different stations operating from the Vatican State. At present there are only three licensed stations: HV1CN, HV2VO, and HV3SJ.

Stations outside the above-mentioned countries must work (or hear) at least one HV station.

The applicant must prove the required contact(s) by sending a photocopy of the QSLs received from the HV stations during this period.

The application must be sent before December 31, 1983. This must be addressed with the above-mentioned documents to: Radio Vaticana HV1CN, Citta Del Vaticana, Europa.

FUN!

John Edwards KI2U
78-56 86th Street
Glendale NY 11385

ANTENNAS

Antennas have always been a sore spot with me. I mean, you probably think that someone who writes a monthly column for *73* has some sort of fancy array on 10, 15, and 20, and nothing less than full rhombics for 40 and 80. Not quite.

My DX antenna is a TA-33 Jr. with a reflector element that refuses to remain horizontal. I should fix it, but three families (two of the bird variety, one spider) would suddenly be rendered nestless. Foreclosing on somebody's home is not my forte.

My 40-80 meter antenna system is even funnier. Actually, it's a system in the truest sense of the word. You see, it starts in the front of my attic, runs through the house to the back attic window, across my backyard where it swings around an abandoned telephone pole, traverses the backyard once again, and terminates along the eaves of my fair abode. On the air, I call it a "doublet," since the lead-in joins this contrivance somewhere near the middle of its journey, but "unusual" may be a more apt description. As far as the radiation pattern goes, let's just say that on a good day I can actually hear stations on eastern Long Island. Once, I even got a 57 from a guy in Hicksville.

From time to time, whenever I say or write something a particular person finds objectionable, he'll threaten to "pin" my coax. "Fine business," I say, "A dead short may just improve my signal." Faced with this unexpected reaction, I'm usually left unmolested.

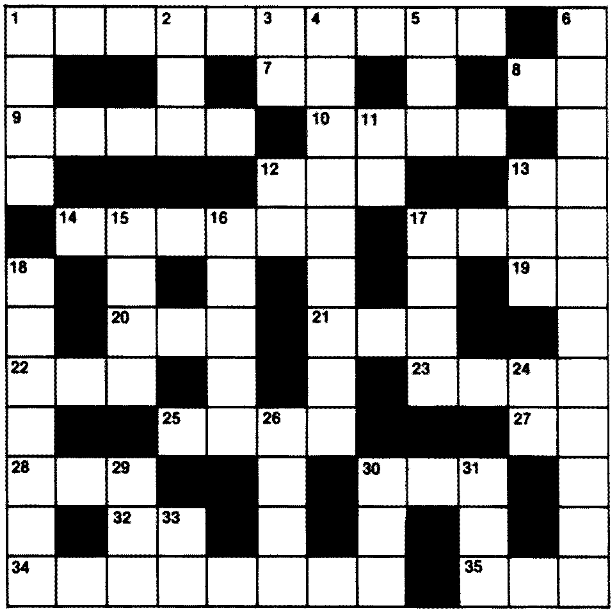


Illustration 1.

ELEMENT 1—CROSSWORD PUZZLE
(Illustration 1)

Across

1) Often confused with long-wire (2 words)
7) Russian "yes"
8) TV villain
9) Amplification plural
10) Antenna perpendicular to horizon (abbr.)
12) Old professional organization (abbr.)
13) A junction
14) Antenna cylinder system
17) Splices
19) Ham appellation (abbr.)
20) Antenna deterioration
21) Morse question mark
22) Dah's partner
23) Signal attenuation along feedline
25) Movable switch part
27) America (abbr.)
28) Some regard antennas as a work of this
30) 540-1600 kHz (abbr.)
32) 14 across measurement
34) Tower and mast
35) Big ______

Down

1) HT and mobile
2) Great noise
3) WA3AJR's sheepskin
4) SHF feed
5) Received (abbr.)
6) ______ line
11) Professional person (abbr.)
12) Opposite of out
13) Oscillator type (abbr.)
15) RTTY circuit (abbr.)
16) A preliminary treatise (abbr.)
17) Many mobile whips use a loading one
18) Antenna spokes
24) Egypt prefix
26) A ham's den
29) 160 meters: ______ band
30) Connection point
31) 80-meter rhombic, for instance
33) Differential of power (abbr.)

ELEMENT 2—ALPHABET GAME

Complete the nine words below by placing letters of the alphabet on every dash. Use each letter only once. The letter "K" is not used.

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z

1) _ A _ E _
2) _ P _ L E
3) A _ R A _
4) _ U A _
5) _ A _ _ N
6) _ E _ P
7) _ _ T C _
8) H E L _ _
9) R E _ L _ _ _ O R
10) _ R O U _ D

ELEMENT 3—SCRAMBLED WORDS

Unscramble these words associated with antennas.

dictroer
pictrosoi
rotwe
moob
loarabap
bleca
gaiy
nidmow
gainpsc
zolatipanori

ELEMENT 4—MATCHING

Match the definition to the antenna.

Column A

1) Voltage-fed Hertz antenna using a two-wire tuned feeder attached to one end of the radiator.
2) Directional antenna made up of several parallel tubes or wires. One element is a driven radiator, another a parasitic reflector, and the remaining element(s) are parasitic directors.
3) Omnidirectional antenna consisting of a metal disk attached to a metal cone.
4) Diamond-shaped, non-resonant antenna with directional characteristics. Uses a non-inductive resistor at its far end.

5) Center-fed single wire that's one-half the operating wavelength.
6) An elongated cone-like antenna, composed of parallel elements attached to cylindrical supports, center-fed.
7) Broad-spectrum antenna with element spacing and lengths that increase logarithmically from one antenna end to the other.
8) Large number of vertical radiators fixed in a plane.
9) A number of connected parallel wires arranged around a circular spreader.
10) Antenna composed of a coil wound around an element.

Column B

A) Discone
B) Sausage
C) Log indent
D) Zepp
E) Cage
F) Ferrite rod
G) Yagi or beam
H) Beverage
I) Curtain
J) Log periodic
K) Dipole

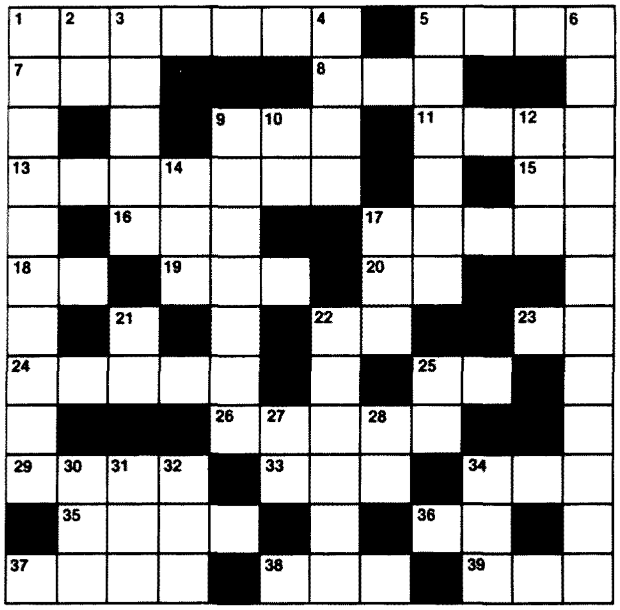


Illustration 2.

ELEMENT 5—CRYPTIC CROSSWORD (Illustration 2)

Think our usual monthly crossword is too easy? Try this one on for size. We call it a cryptic crossword because of the clues we give you: very vague, extremely ambiguous. Think you can handle it? Well, you better have a superb background in antennas, ham radio, electronics, and life.

Across

1) 3-D antenna
2) Slashing skyhook
3) Angry old society (abbr.)
8) Alphabet: 15, 14, and 9
9) OSCAR farewell (abbr.)
11) Zilch
13) Join
15) UA assent
16) TA-33's junior
17) Antenna soar
18) Extended λ
19) Don Ameche's unit
20) Metal-oxide, reverse (abbr.)
22) SW-BC system (abbr.)
23) Barry's locale (abbr.)
24) Detection and ranging
25) Bangkok beginning
26) Pardon
29) Antenna inventor
33) Struck
34) Lotsa (abbr.)
35) The DX hunt
36) Burning trap description
37) Straight up skyhook
38) Fundamental beam substance (abbr.)
39) Here

Down

1) Radius vector-ly
2) Relating to U on CW
3) Antenna glows
4) Fail
5) Off-center antenna
6) Line direction
9) Shoes
10) Antenna position to tower
12) Hello? Hello? (abbr.)
14) Up and down baker
17) Hiram (abbr.)
21) Mast girth (abbr.)
22) Topic synonym
25) Before brid
27) Finnish exclamation
28) Wireless speech (abbr.)
30) Golden
31) Air-to-air missile (abbr.)
32) Alphabet: 10 minus 1, 13, and 13 plus 7
34) Top skip

Continued

R	A	N	D	O	M	W	I	R	E		T
I			I		D	A		G		J	R
G	A	I	N	S		V	E	R	T		A
S					I	E	E			P	N
	T	U	B	I	N	G		C	U	T	S
R		A		N		U		O		O	M
A		R	O	T		I	M	I			I
D	I	T		R		D		L	O	S	S
I			P	O	L	E				U	S
A	R	T			A		B	C	B		I
L		O	D		I		U		I		O
S	U	P	P	O	R	T	S		G	U	N

Illustration 1A.

C	U	B	I	C	A	L		W	H	I	P
I	R	E				O	N	I			O
R		A		L	O	S		N	U	L	L
C	O	M	B	I	N	E		D		D	A
U		S	O	N			T	O	W	E	R
L	W		B	E	L		O	M			I
A		O		A		A	M			A	Z
R	A	D	A	R		E		H	S		A
L				S	O	R	R	Y			T
Y	A	G	I		H	I	T		M	N	I
	G	A	M	E		A		P	U		O
V	E	R	T		E	L	E		F	U	N

Illustration 2A.

THE ANSWERS

Element 1:
See Illustration 1A.

Element 2:
1—WAVES, 2—JPOLE, 3—ARRAY, 4—QUAD, 5—BALUN, 6—ZEPP, 7—MATCH, 8—HELIX, 9—REFLECTOR, 10—GROUND.

Element 3:
(Reading from left to right) director, boom, windom; isotropic, parabola, spacing; tower, cable, polarization; yagi.

Element 4:
1—D, 2—G, 3—A, 4—H, 5—K, 6—E, 7—J, 8—I, 9—B, 10—F

Element 5:
See Illustration 2A.

SCORING

Element 1:
Twenty points for the completed puzzle, or ½ point for each question correctly answered.

Element 2:
Two points for each word.

Element 3:
Two points for each word unscrambled.

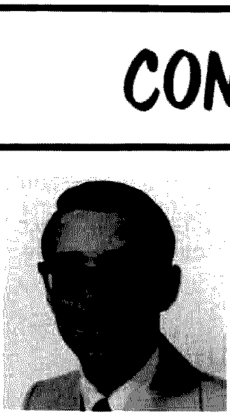
Element 4:
Two points for each definition matched to the correct antenna.

Element 5:
Twenty points for the completed puzzle, or ½ point for each question correctly answered.

Do you know beams from beans?

1-20 points—You'll use a random wire 'til the day you die.
21-40 points—You actually believe that mini-beams get out as good as a monobander.
41-60 points—You'll always be safe and comfortable with your vertical.
61-80 points—You have a 40-foot tower with a tribander.
81-100+ points—"Antenna Farmer."

CONTESTS



Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

IPA CONTEST

Contest periods are:
0000 to 0300, 0700 to 1000, and 1400 to 1800 GMT on both days, November 7 and 8

The International Police Association Radio Club (IPARC) United States Section is sponsoring this year's contest. Participants are eligible to work the Sherlock Holmes Award (SHA) and the contest is open to all radio amateurs and SWLs. Use all bands on CW and SSB. No crossband or crossmode contacts are permitted. For a contact to be valid, one of the two stations must be an IPARC member. Each station can only be worked once per band.

EXCHANGE:

Non-members send RS(T) and serial number. IPA members send "IPA," two-letter state abbreviation, RS(T), and serial number. US stations will also send two-letter state abbreviation.

FREQUENCIES:

CW—3575, 7025, 14075, 21075, 28075.

SSB—3650, 3775-3800 (European DX), 7075, 14295, 21295, 28650.

SCORING:

Every completed QSO counts 2 points on 80 and 40 meters, 8 points if DX on 80 or 40 meters, and 4 points for all contacts on 20/15/10 meters. The multiplier is the total number of IPA countries and states worked per band.

For IPA members only, an IPA country and each US IPA state will be counted for multiplier and QSO only if an IPA station in that country/state has been worked. QSOs with DXCC countries or US states which are not

listed in the IPARC membership list count only 1 point and do not count as a multiplier.

ENTRIES AND AWARDS:

Each IPA member, non-member, and SWL with the highest score will receive a certificate and will be honored in the Award Chronicle of the International Poice Association Radio Club. Entries must be postmarked no later than December 31st and sent to: IPARC, Thomas D. Jenkins WA8VDC, 3327 Cloverdale W.B., Monroe MI 48161 USA.

Copies of the SHA rules, IPARC World Membership List, SHA application sheets, or contest log sheets are also available if you send an SASE to the above address.

ANTIGUA & BARBUDA INDEPENDENCE OSO PARTY

Starts: 0000 GMT November 7
Ends: 2400 GMT November 8

The members of the Antigua Amateur Radio Society are planning a QSL Party to mark Antigua and Barbuda's independence. All amateurs are invited to participate. For an attractive certificate, work four Antigua stations on any band and in any mode during the weekend. Then submit a copy of your log showing the callsign, signal report, time of contact, and band. Include a self-addressed envelope and $1.00 US to cover postage of certificate. The new operating prefix will be V2A.

FREQUENCIES:

SSB—1825, 3790-3840, 7165-7250, 14180-14300, 21150-21300, 28500-28700, 29600 FM.

CW—30 kHz above the bottom of each band.

Send all applications to: Independence QSL Party, Box 550, St. John's, Antigua, WI.

INTERNATIONAL OK DX CONTEST

Starts: 0000 GMT November 8
Ends: 2400 GMT November 8

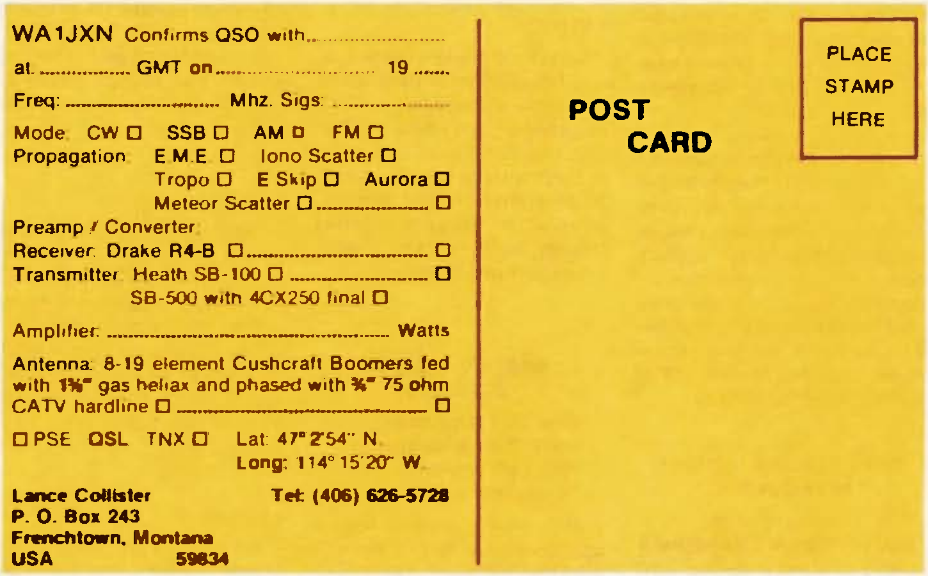
Participating stations work stations of other countries according to the official DXCC country list. Contacts between stations of the same country count only for multipliers, but have no OSO point value. Each station may be worked once on each band. Use all bands, 160 through 10 meters, on phone or CW. Crossband or crossmode contacts are not valid. Operating categories include: A—single operator, all bands; B—single operator, one band; C—multi-operator, all bands. Any station operated by a single person obtaining assistance, such as in keeping the log, monitoring other bands, tuning the transmitter, etc., is considered as a multi-operator station. Club stations may work in category C (multi-op) only.

EXCHANGE:

RS(T) and 2-digit number indicating the ITU zone. Please note the ITU zones are quite different from the ARRL zones! For a list and map of the ITU zones, send 2 IRCs to the entry address listed below.

SCORING:

Each QSO counts one point, or 3 points if with an OK station. Final score is QSO points times



QSL OF THE MONTH: WA1JXN

This distinctive QSL card reflects WA1JXN's enthusiasm for two meters. There are eight 19-element Cushcraft Boomers fed with gas-filled heliax line. Here is how Lance got this dramatic shot: "I shot a photo of my 2-meter antenna at night with floodlights, using high-speed film. After printing it on high-contrast paper (#6), the image was reversed to make it look positive (again on high contrast paper). The result was a ready-for-printing piece of artwork.

Note the detailed information about VHF propagation modes.

If you would like to enter the contest, put your QSL *in an envelope* and mail it along with your choice of a book from *73*'s Radio Bookshop to *73 Magazine*, Pine Street, Peterborough NH 03458, Attention: QSL of the Month. Entries which do not use an envelope (the Postal Service does *occasionally* damage cards) and do not specify book choice will not be considered. Sorry.

the total number of ITU zones worked on each band.

ENTRIES:

A separate log must be kept for each band and must contain the full data. The log must contain in its heading the category of the station (A,B,C), name, callsign, address, and band(s) used. Also show the total number of contacts, QSO points, multipliers, and total score. Each log must be accompanied by the following declaration: "I hereby state that my station was operated in accordance with the rules of the contest as well as all regulations established for amateur radio in my country, and that my report is correct and true to the best of my belief."

A certificate will be awarded to the top-scoring operators in each country and each category. The "100 OK" Award may be issued to stations for contacts with 100 OK stations, and "S 6 S" Awards or endorsements for individual bands may be issued to a station for contacts with all continents. Both awards will be issued upon a written application in the log and no QSLs are required. Logs must be postmarked no later than December 31st and sent to: The Central Radio Club, PO Box 69, 113 27 Praha 1, Czechoslovakia.

DARC CORONA 10-METER RTTY CONTEST

Contest Period:
1100 to 1700 GMT November 8

This is the last of four tests during the year that were sponsored by the DARC eV to promote RTTY activity on the 10-meter band. Use the recommended portions of the 10-meter band.

EXCHANGE:

RST, QSO number, and name.

SCORING:

Each station can be contacted only once. Each completed 2-way RTTY QSO is worth 1 point. Multipliers include the WAE and DXCC lists and each district in W/K, VE/VO, and VK. The final score is the total number of QSOs times the total multiplier.

AWARDS:

Plaques will be awarded to the leading stations in each class with a reasonable score present. Operating classes include: Class A for single or multi-op, and Class B for SWLs.

ENTRIES:

Logs must contain name, call, and full address of participant. Also show class, times in GMT, exchange, and final score. SWLs apply the rules accordingly. Logs must be received within 30 days after the test. Send all entries to: Klaus K. Zielski DF7FB, PO Box 1147, D-6455 Erlensee, West Germany.

NORTH CAROLINA QSO PARTY

1700 GMT November 14 to
0200 GMT November 15
1200 GMT November 15 to
0100 GMT November 16

This year's party is again sponsored by the Alamance ARC and has been expanded to include new categories and awards. The same station can be worked on each band and mode. Crossband and repeater contacts are not permitted. NC stations may work each other for QSO and multiplier credit.

EXCHANGE:

RS(T) and NC county or ARRL section.

FREQUENCIES:

SSB—3980, 7280, 14280, 21380, 28580.
CW—3560, 7060, 14060, 21060, 28060.
Novice/Tech—3720, 7120, 21120, 28120.
VHF—50.050, 50.110, 144.050, 144.200.

SCORING:

NC stations count one point per QSO and multiply total by sum of ARRL sections (73 maximum) and NC counties (100 maximum) worked. DX contacts count only for QSO points.

Others count 2 points per NC contact and multiply total by number of NC counties worked (100 maximum).

AWARDS:

1982 US *Callbook* and certificate to overall top NC and out-of-state single-operator scorer. Certificates to top scorer in CW, SSB, mobile, VHF, and Novice/Technician categories in each ARRL section and NC county. Name of top Alamance ARC member added to perpetual trophy.

ENTRIES:

Send logs and summary sheets showing essential details and certification. Include two 18-cent stamps for results. Mailing deadline is December 12th; send to: Bob Wang KQ4M, PO Box 777, Hillsborough NC 27278.

EUROPEAN DX CONTEST—RTTY

Starts: 0000 GMT November 14
Ends: 2400 GMT November 15

Sponsored by the Deutscher Amateur Radio Club (DARC). Only 36 hours of operations out of the 48-hour period are permitted for single-operator stations. The 12 hours of non-operation may be taken in one but not more than three periods at any time during the contest. Operating classes include: single-operator, all band and multi-operator, single transmitter. Multi-operator, single-transmitter stations are only allowed to change band one time within a 15-minute period, except for making a new multiplier. Use all amateur bands from 3.5 through 28 MHz. A contest QSO can be established between all continents and also one's own continent. However, QSOs and QTC traffic with one's own country is not allowed! Each station can be worked only once per band.

EXCHANGE:

Exchange the usual six-digit number consisting of RST and progressive QSO number starting with 001.

SCORING:

Each QSO counts 1 point. Each QTC (given or received) counts 1 point. Multipliers will be counted according to the European and ARRL countries list. The multiplier on 3.5 MHz may be multiplied by 4, on 7 MHz by 3, and on 14 through 28 MHz by 2. However, contacts within the same continent only count as a multiplier of one per band (including 80 and 40 meters). The final score is the total QSO points plus QTC points multiplied by the sum total multipliers.

QTC TRAFFIC:

Additional point credit can be realized by making use of the QTC traffic feature. A QTC is a report of a confirmed QSO that has taken place earlier in the contest and later sent back to another station. The general idea is that after a number of stations have been worked, a list of these stations can be reported back during a QSO with another station. An additional 1 point credit can be claimed for each station reported.

A QTC contains the time, call, and QSO number of the station being reported, i.e., 1300/DA1AA/134. This means that at 1300 GMT you worked DA1AA and received number 134. A QSO can be reported only once and not back to the originating station. A maximum of 10 QTCs to a station is permitted. You may work the same station several times to complete this quota, but only the original contact has QSO point value. Keep a uniform list of QTCs sent. QTC 3/7 in-

CALENDAR

Nov 7-8	Antigua & Barbuda Independence QSL Party
Nov 7-8	IPA Contest
Nov 8	DARC Corona—10-Meter RTTY
Nov 8	OK DX Contest
Nov 14-15	European DX Contest—RTTY
Nov 14-16	North Carolina QSO Party
Nov 28-29	CQ Worldwide DX Contest—CW
Dec 26-31	G-QRP-Club Winter Sports
Jan 2-4	Zero District QSO Party
Jan 9	*73*'s 40-Meter Phone Contest
Jan 10	*73*'s 80-Meter Phone Contest
Jan 16-17	*73*'s International 160-Meter Phone Contest
Jan 16-17	International SSTV Contest

squelch tale

Published monthly by the CHICAGO FM CLUB Inc a non-profit radio amateur club

NEWSLETTER CONTEST WINNER

The winner for the fourth month of *73 Magazine*'s Club Newsletter Contest is *Squelch Tale*, published by the Chicago FM Club. The judges were impressed by both the informational content and the newsletter's eyecatching appearance. Once a publication's staff has gathered all the club news, technical articles, and advertising, their job has only begun. Creating an appealing look is one way to encourage readers to look at each and every page of the newsletter. Even if your club has a shoestring budget, there are several inexpensive, simple ways to gain that professional look.

The simplest method of generating the first draft for a newsletter is on a typewriter. Obviously, an electric machine with a good ribbon will generate nicer copy than an inexpensive manual typewriter. You can go an extra step and "word process" the contents of your next newsletter. A word processor is a computer-based system that allows a user to organize, edit, and print out the copy in exactly the form you want. Corrections don't require messy correction fluid; you just backspace and retype the correct version. As a bonus, most word-processing systems will allow you to right justify the printout. This means that both the left and right sides of a column will line up, just like the text in this magazine. Word processors are becoming common fixtures in many offices. Perhaps a club member with a microcomputer can help you out. The club should supply its own paper and spring for a new ribbon now and then.

If your club won Field Day, you would want to tell the world—somehow typewriter-sized print wouldn't do the job very well. Headlines that have a bold, yet pleasing appearance can be made from dry transfer lettering. Art supply and stationery stores usually have several sizes and styles to choose from. Each headline and article can be prepared individually. Then the pieces are combined into one-page layouts, much as you would assemble a puzzle. This process, known as paste-up, will have a great influence on the final appearance. The time and money spent here will have a direct reflection on the end result. Your local library should have a book that discusses the details of production, or you can get some advice from the experts at a printer or copy shop.

Newsletters like *Squelch Tale* have a carefully considered layout that is consistent from issue to issue. The material is not crowded, nor is there a lot of white space. Each issue is headed by the newsletter logo; once you get a good logo you can use it again and again. Short filler items can be used to fill those corners that are left over. You can even incorporate some flashy graphics on the part of the newsletter where the address and postage go.

There are several ways that a newsletter can be reproduced. Very small organizations probably can get away with photocopying. The next step up is spirit duplicating and mimeographing. For slightly more money, you can use offset printing. You provide a clean, sharp original for each page in the newsletter. The printer uses these to make inexpensive "plates" that go on the press. The offset method gives you total control over the layout; changes can be made by pasting new material over the old. If your budget permits, offset printing will allow you to incorporate two or even three colors of ink. And, for the special occasions when only photographs will tell the story, you can get crisp black-and-white reproduction.

To produce a top-notch newsletter, the staff needs two kinds of people. Besides the individuals who gather and edit the news, the staff should have artistic types. Hopefully, your club can find a good printer to round out the group. When shopping for a copy service, look at both price and quality. Happy publishing!

dicates that this is the 3rd series of QTCs sent and that 7 QSOs are reported.

AWARDS:

Certificates to the highest scorer in each classification in each country, reasonable score provided. Continental leaders will be honored with plaques. Certificates will also be given stations with at least half the score of the continental leader or with at least 250,000 points. The minimum requirements for a certificate or a trophy are 100 QSOs or 10,000 points.

ENTRIES:

Violation of the rules or unsportsmanlike conduct or taking credit for excessive duplicate contacts will be deemed sufficient cause for disqualification. The decisions of the Contest Committee are final. The use of the log sheets of the DARC or equivalent is suggested. Send a large SASE to get the wanted number of logs and summary sheets (40 QSOs or QTCs per sheet). SWLs apply the rules accordingly. Entries should be sent no later than December 15th. North American residents may send their applications and logs to: Hartwin E. Weiss W3OG, PO Box 440, Halifax PA 17032 USA. Others may address entries to: Klaus K. Zielski DF7FB, PO Box 1147, D-6455 Erlensee, West Germany.

EUROPEAN COUNTRY LIST:

C31, CT1, CT2, DL, DM, EA, EA6, EI, F, FC, G, GC Guer, GC Jer, GD, GI, GM, GM Shetland, GW, HA, HB9, HBØ, HV, I, IS, IT, JW Bear, JW, JX, LA, LX, LZ, M1, OE, OH, OHØ, OJØ, OK, ON, OY, OZ, PA, SM, S, SV, SV Crete, SV Rhodes, SV Athos, TA1, UA1346, UA2, UB5, UC2, UN1, UO5, UP2, UQ2, UR2, UA Franz Josef Land, YO, YU, ZA, AB2, 3A, 4U1, 9H1.

HAM HELP

I would like info on 10m FM conversions (except *73* articles and K9EID's book), especially for Japanese HF rigs; 29-MHz amplifiers; access details for 10 FM repeaters and the use of CTCSS and touchtone. All letters answered.

Ash Nallawalla VK3CIT
53 Chirnside Ave.
Werribee, Vic. 3030
Australia

I need manuals and/or schematics for the following pieces of equipment: Nems Clarke, 250-1000 MHz tuner, type 2501000-1; countermeasures receiver, type 17A4, General Electronics; Servo Corporation of America VHF receiver, Model R5200-A2; and Cohu Electronics, Inc., Kintel Division electronic galvanometer, Model 204A.

Robert Sondack VE2ASL
260 Bellerive
St-Luc, Quebec
Canada J0J 2A0

I wonder if anyone would know where I can obtain a circuit diagram for an Echophone EC-1 which was a popular radio receiver in 1938 to 1943 or so. If not, could anyone supply the address of a radio historical society? Thank you.

Warren Smith KH6AQ
525 Pauku Street
Kailua, Oahu HI 96734

LOOKING WEST

Bill Pasternak WA6ITF
c/o The Westlink Radio Network
Suite 718
7046 Hollywood Blvd.
Hollywood CA 90028

WHAT'S UP, DOC? DEPARTMENT

I can't go into specific details at the moment, but suffice it to say that the long-awaited "clean sweep" of our amateur bands is on to rid them of all sources of willful and malicious interference. Actually, it started to get up a full head of steam last spring, mainly on the west coast, but now reports are coming in that deal with the issuance of warning letters, official citations, and show-cause orders on a rather grandiose scale nationwide. To say that the FCC is on the warpath is definitely an understatement.

Since there will probably be ongoing litigation in regard to many of the show-cause orders, i won't report on any specific case at this time. i can say that the clean-up is not being limited to repeater jammers and users of foul language. Those who interfere with HF nets and other organized amateur operations have also come under the gun of the FCC's enforcement branch. Nor do I foresee any end to these rigorous enforcement policies in the near future. Also, most amateurs I have spoken with are delighted at this turn of events. They feel that it's about time that those who claim to regulate our service show that they have the ability to make their rules stick.

But there is the other side. Some of those the FCC is clamping down on claim that the Commission has no right to regulate what they say over the air, in what way they say it, or who they say it to! In essence, their claim is one of having "the right to yell fire in a crowded theater," and in their minds it becomes your responsibility to ignore what they say. I've heard unconfirmed rumors that a number of those served are banding together, pooling financial resources, and vowing a fight on the matter to the US Supreme Court. Other rumors say that the American Civil Liberties Union has been approached for representation on the basis that the current enforcement action by the FCC violates various aspects of individual civil rights.

And here's the funniest one of all. Again, the rumor mill has it that the majority of those now in trouble with the FCC blame the ARRL for their plight. I consider this ironic in that the only thing the League has done thus far has been to form another *ad hoc* committee. If the League is responsible for the clean-up, it's news to those who are really the responsible parties. Who are they? If you have followed this column for any length of time, I think that names and callsigns like Joe Merdler N6AHU and Ray Frost WA6TEY are familiar. While the ARRL formed committees, these amateurs and others took to the world of politics. They worked through their legislators to make enforcement of the amateur rules a top priority with the FCC. It has now become quite clear that they have been successful.

The end of the fight to combat the problem is not yet in sight. As has been heard on the ham bands many times, by many of you first hand, jammers have openly stated that taking their licenses away won't keep them from jamming. And, as one expert on the subject has said, "Don't be surprised to see things get a lot worse before they get any better. It may take putting one of these jokers behind iron bars for a few years to get the point across that laws were made to be respected and not broken." I don't see things getting very much better in the near future, but we can hope. At least an important first step has been taken, but it's going to be a long time before we really see the light of day.

THE SCRRBA REPORT, PART II

Last month we began what might best be termed a mini-series about the future of UHF voluntary frequency coordination in southern California, and the problems being faced by this area's UHF coordination body, the Southern California Repeater Remote Base Association. As I said last month, this report, compiled by Gordon Schlesinger WA6LBV of the SCRRBA Technical Committee, may be primarily directed at the UHF system operators of this area, but it holds merit for any coordinator or coordination council, especially those in the position of having far more relay systems looking for homes than channel pairs available. Basically, that's the problem facing SCRRBA and many other coordination organizations nationwide.

SCRRBA is not an organization known for chasing its own tail. It is basically a very quiet organization that has historically taken a very methodical approach toward voluntary coordination. I suspect that is the reason for its longevity and its success rate. Everything is carefully researched, and this report is no exception. We continue where we left off last month.

THE VALUE OF A SOUTHERN CALIFORNIA UHF CHANNEL PAIR

A few areas of the country list only one or two UHF channels in use in an entire state. In these areas, coordination of a UHF channel pair may well be as informal as telephoning a frequency coordinator and asking: "Should i use 449.100, .200, .300, or .400?" A decision is quickly made and recorded.

In southern California, those system operators who originally obtained channel pairs for their relay stations from CARC coordinators in the 1960s and early 1970s may remember that at that time our coordination procedures were not much different. While even then there was a significant population of the 440-450 MHz portion of the band, we were not yet near 197 operational systems. At that time the spectrum appeared boundless, and coordination was an easy matter. A telephone call would accomplish the process, and there was little if any paperwork involved; several channel pairs at a time could be requested, received, and "warehoused."

A current problem in frequency coordination arises, however, because some of our system owners have not yet realized that those golden days have ended. With our current massive occupancy of the band, every channel pair is now quite valuable. Every pair is in demand. Every pair has a potential applicant ready to establish a machine upon it. The coordinated use of a UHF channel pair is no longer a casual matter to be ignored or taken for granted.

There are three different groups of mobile relay system operators involved with UHF frequency coordination: operators of presently coordinated systems, applicants for coordination for new UHF systems, and the SCRRBA Technical Committee. Every group views the situation from a different perspective, although all have (or should have) a common interest in seeing the frequency coordination process from the standpoint of each of these groups.

Some of the owners of presently coordinated systems may have the least accurate perception of the current state of our band. In a sense, this is understandable. Many of them undertook coordination some time in the past, perhaps more than 10 years ago. They established their machines, have operated and improved them over the course of the years, and some have not kept in touch with the progress in the development of the band. Consequently, in some cases their notions about band utilization are outdated. Others, by contrast, have a very fine understanding of current trends and problems.

THE APPLICANT FOR NEW FREQUENCY COORDINATION

The availability of programmable scanners means that anyone can develop a list of apparent activity on the 70-cm band. (Ed. note: This holds true for 2 meters, 6 meters with some scanners, and even 220 when a converter is used ahead of the scanner.) New scanner owners often begin keeping "researched lists" showing, as best they can determine, which channels are in use and how they are identified. This information could be used to program scanners to listen to "interesting machines," but it can also be used as a guide to which channel pairs appear to be unused. It's therefore not surprising that the Technical Committee receives requests for exact frequency pairs which are desired. However, the vast majority of these requests cannot be coordinated as requested.

The Technical Committee is

well aware of the existence of scanner-generated research lists. From time to time we receive copies of various editions. The accuracy of these lists is generally, at best, poor. Some of them are correct... as far as they go, which is not very far at all. Others are grossly inaccurate, sometimes to the point of being laughable. A few are badly outdated. All attempt to give the appearance of being "seriously professional." Such researched lists, however, are totally insufficient as bases for reasonable channel selection. Effective data, not obtainable by monitoring, are mandatory for any accurate and effective coordination action.

It must be stated that the chief function of the Technical Committee, as with any frequency coordination body, is to maintain an accurate, complete, and timely record of all UHF relay activity in southern California. The Technical Committee record was initiated by the inclusion of the old CARC UHF coordination files, which themselves were begun nearly 20 years ago. To those records have been added the details of each frequency coordination which the Technical Committee has performed, as *well* as the corrections, deletions, and updates which we have received.

The data base from which the Technical Committee coordinates consists not only of a chart of frequency assignments, but also the complete set of technical and operational data and histories for each relay system. Both parts are necessary for performing accurate frequency coordination; neither part by itself is sufficient.

The data base is not perfect. No tabulation of activity as diverse as UHF mobile relay in southern California can be. But it is a data base which is... and must be far, far more accurate than anything else available. It is, fundamentally, a data base upon which frequency coordination of additional systems into an existing congested environment can be performed, with a considerable degree of confidence that the new station can begin operation without creating or experiencing substantial interference.

The Technical Committee has seen some past instances of new UHF mobile relay station operators, possessing copies of researched lists (or under the counseling of someone who does), merely selecting a "free pair" for themselves and going on the air without consulting the committee. The "self-coordination" obviously looked good, at the time, to the individual who performed it, else why would that particular pair have been chosen? Nevertheless, in an environment as congested as southern California UHF is today (Ed. note: Also 2 meters and 1¼ meters), there are no longer any "free pairs." Inevitably, there is another co-channel machine somewhere else in the region, and eventually the operators of the two machines will discover each other. Problems then ensue, typically resulting in a large expenditure of time and money before a resolution is effected. With over 300 relay stations in operation, an initially small problem in one corner of the region has the potential of becoming a much larger problem affecting a large number of systems and operators throughout all of southern California. Each system owner must realize that he has a personal stake in the entire coordination system, a system which is now too complex to be forgiving of small errors or transgressions.

Each potential applicant for UHF (Ed. note: Or any) frequency coordination, possessing a researched list and tempted to bypass the usual coordination process, must ask himself: "Am I performing coordination from a data base which contains at least 320 separate entries?", and "Do I have accurate technical data for the relay stations on my list?" If the answer is "no," then the individual must realize, or be convinced, that he is operating *from* a position of ignorance and that his actions are a potential threat to all members of the UHF community. We can no longer tolerate self-coordination; those days are gone!

THE TECHNICAL COMMITTEE AND THE SCARCITY PROBLEM

(Ed. note: Here is the heart of any voluntary frequency coordination effort. It is the ongoing dedication of people who serve as coordinators or committee members that pulls it all together. If they fail, it's a failure for all amateurs in a given area. In SCRRBA, we see the epitome of a successful coordination body. Many of those serving in its organizational structure have done so dating back to the CARC years. Building and nurturing a successful coordination body takes time, dedication, and understanding. The lack of abdication by those who have joined with SCRRBA is strong testimony for the people and principles with which the organization was founded.)

The vast increase in the number of coordinated systems, together with the relatively constant demand for new channel assignments, has greatly increased the workload of the Committee. This increased workload is straining the Committee's ability to provide accurate and timely new coordinations and has prompted the writing of this special report.

While much of the Committee's work is done on a continuing basis, including handling incoming and outgoing correspondence, updating records, conducting band-monitoring studies, etc., all actual coordination actions are accomplished only at Committee meetings. It has been the Committee's practice to try to meet relatively often in order to keep on top of the coordination applications. However, increasing travel costs have mandated somewhat less frequent meetings. In order for the Committee to function, members must assemble at one location. (Out here, this usually means either Los Angeles or Orange County.) Members travel from as far away as San Diego and Santa Barbara to attend; this can mean as much as 5 hours of driving time for some, with *no* reimbursement of expenses. Since SCRRBA coordination is of the voluntary, amateur-sponsored kind, Committee meetings occur at night or on weekends. Every meeting entails loss of leisure time which could be spent with family or working on radio systems.

Hand in hand with the occupancy of the UHF band (Ed. note: Again remember that the band in question depends upon your own particular geographic locality...this is written in regard to southern California UHF, but in this region it could be applied to 10 meters, 2 meters, and 220. In a year or so, we will apply it to six meters as well.) has gone increased length of Technical Committee meetings. Whereas it formerly required 15 minutes to handle the average request for coordination, including selecting an appropriate frequency pair and entering the action onto the coordination data base, it now averages one hour to do the same job. While a few applications can still be handled in the previous 15-minute period, others may require in excess of 2 hours if the application is a difficult one. Consequently, Committee meetings are always marathon affairs.

SUMMARY TO DATE

In parts I and II of the SCRRBA Special Report, we have seen the problem facing the coordination body for one band in a highly populous geographic region. First we had a general overview, and now we've had direct insight to the problems of frequency coordination. Unless you have served on such a committee (and your editor spent 8 years with the Southern California Repeater Association in various functions), you have no idea what performing this seemingly simple task entails. I know what it is to give of my personal time, doing so week after week and year after year. I know firsthand of the hardships involved in being a member... an active member of such an organization.

I also know that it is impossible for such organizations to make everyone happy. The coordination process dictates that somewhere along the line some individual or group will be unhappy if for no other reason than the channel pair they long to possess is already in use by another.

Reality dictates that for a voluntary coordination body to be successful, it must be prepared to face any eventuality. For instance, with many areas of the nation already saturated with FM two-meter activity, many manufacturers seem intent on making 450 the next big VHF/UHF marketplace. There's nothing wrong with this in my book, as this is the name of the game in our free enterprise system. But even they must be accountable to the amateurs of a given area, and there are some geographic locations that do

not lend themselves to UHF transient relay mobile communication. Southern California is one of them.

Of the some 320-odd UHF relay systems now operational in Southern California, only 13 are "open" or "public access," as SCRRBA refers to them. Of these, only 6 serve Los Angeles proper. All the rest are "private" category machines that do not welcome transient operators even if the transient happens upon the proper CTCSS access. I may be wrong, but unless some drastic changes happen to the thinking of most UHF operators, changes I doubt will take place in the foreseeable future, I doubt if any major inroads will take place on 450 by the average ham in this region. The very structure of the band precludes it. The manufacturers of new equipment may and hopefully will find success in other major markets, but I would not want to bet my advertising budget on southern California. The place is just too set in its ways.

But even SCRRBA recognizes this problem, if one deems it to be a problem, and is planning on ways to cope with it. SCRRBA is perhaps the most successful voluntary coordination body in the nation mainly because they have an eye on that famed expression, "Plan Ahead." We will conclude this three-part mini-series come January, since next month we have a special Christmas column for you. Till then.... a Happy Thanksgiving from those of us who write the late shift from Los Angeles.

LEAKY LINES

Dave Mann K2AGZ
3 Daniel Lane
Kinnelon NJ 07405

The editors of *QST* saw fit to include in the Correspondence Section of the September issue a letter that really opens a can of worms that needs to be examined with care. The writer of the letter takes the position that the neighbors of an amateur are entitled to enjoy a vista uncluttered by antennas. He equates this right with his own right to insist that nobody play loud rock music after 1 o'clock in the morning. The comparison, aside from being both odious and foolish, is mischievous and can cause trouble. For if ever we allowed ourselves the luxury of blithely permitting such specious arguments to be injected into the general question of community zoning, we would be begging for the establishment of highly dangerous precedents that could be used over and over again by unsympathetic, hostile local government groups.

What possible analogy can be drawn between noisy public disturbances after midnight and the inherent right of the possessor of a federal license grant to exercise the privilege conferred through the issuance of the license? There is no analogy; the two are as unalike as bananas and stalks of celery!

The writer further states that he purchased his home "knowing full well that no flagpoles, clotheslines, garbage cans, *or outside antennas* were allowed." Not allowed by whom and by what sort of a covenant? If he is referring to the builder of a development who establishes such sanctions as an integral part of his plans, then he is correct. But in all other cases he is wrong. It may be proper for a community to insist upon certain limits of one sort or another, based upon sound engineering and safety, and upon avoidance of property line infringement, but it is improper for the community to condemn and outlaw all antennas generically. The term is literally a catch-basin, totally unspecific. It runs a broad gamut, embracing anything and everything from the simple dipole or whip through yagis, quads, rhombics, long wires, phased arrays of dozen of types and configurations, and some which have not even yet been devised! The sentence betrays an astonishingly naive attitude that one would never have thought would be expressed by any mature amateur.

In the first place, such disallowances have been successfully beaten down in test after test in the courts. Communities frequently attempt to sanction various uses of property by owners. If the individual is foolish and pliant enough to accept it without raising a ruckus, the town or county gets away with it. So what this man describes as "knowing full well" is merely an admission that he is willing to turn up his toes and play dead for the zoning board. He ought to have written instead: "...knowing full well that the town disapproved of antennas, but that this disapproval could not stand up if I chose to fight against it."

Now, in the matter of "laws that make others pay to prevent our hobby from being a nuisance to them," the writer is entirely balled up. For years it had been demonstrably evident that the manufacturers of TV receivers, hi-fi units, and other electronic entertainment devices willfully and deliberately omitted adequate filtering and shielding in order to make larger profits. In a vast majority of cases involving complaints of RFI and TVI to the Federal Communications Commission,the amateur stations concerned were proven to be blameless, and the devices of the complainants were shown to be at fault. Further, it can be shown that literally hundreds, if not thousands, of appliances of every sort have been made and sold which radiate interference in violation of radio regulations. Laws which compel compliance with state-of-the-art technological standards are not inappropriate in any way, for they merely force manufacturers to do what they are supposed to do in the first place.

I am not being fractious; I am just growing a bit weary of the arguments of hams who ill-advisedly want to run and hide, who feel that they would rather switch than fight, who think that it is best not to make waves. I don't know just how important his radio hobby is to this particular writer. But I do know that to hundreds of thousands of us it is very important indeed. We are not about to play the "shrinking violet" every time some local political hack or shyster waves an arbitrarily written local ordinance in our faces and threatens us with dire consequences. We are willing to fight for the rights conferred along with the license grant, a right which generally supersedes the petty, picayune statutes formulated by persons with neither any understanding of the Bill of Rights nor any inkling of the splendid record of public service and innovative contributions to the art of communications run up by the amateur service.

Incidentally, I think it is somewhat interesting, if only coincidental, that the same issue of *QST* carries an editorial on the subject of RFI, as well as a report on a recent reversal on appeal where there had been a conviction on one of these malignant regulations of which I have been speaking.

This chosen avocation of ours did not arrive at its present state of popularity and growth through the docility of a pack of passive dilettantes. We have a long tradition of passionate involvement and dedication to our hobby, notwithstanding the phlegmatic indifference of a few among us, who, like the writer of that letter, not only back down in the face of challenge, but also convince themselves and attempt to convince others that it is right and proper to do so.

On the day that amateurs become willing to accept the repression of our activities without a murmur, we will be witnessing the beginning of the end of ham radio. And if we ever become resigned to the idea that we exist merely through the sufferance of others, that our operation is contingent upon tolerance from those who are prejudiced against us, then we will richly deserve to be flushed right down the drain! Among other qualities demanded of us, one that stands high is militancy. For just as in life in general, the continuance of ham radio also depends upon the exercise of the instinct for self-preservation.

The only thing in the letter with which I agree is the last paragraph, but even that is somewhat flawed because he implies that we should be reacting to pressure from the so-called anti-antenna movement through technological growth. The fact is that such growth has always come about through the natural curiosity and inventiveness of the amateur community rather than as a reaction to the pressure of outside forces. This process will continue. And the adversity posed by the activities of our foes will merely intensify and reinforce it.

In passing, I must observe that this is the very first time in a long and rewarding relationship with the hobby that I ever heard of any amateur who equated "making the community more beautiful" with the elimination of antennas! I never met a ham who failed to view a fine antenna installation as a thing of beauty.

Well, perhaps the answer is that this particular ham is not as dedicated to the hobby as most of us are. Say, listen... maybe he's a real-estate developer or the owner of a beachfront condominium building. He sure sounds like one!

Enough of this, except to reiterate my wonderment toward the impulse that caused the *QST* editors to select this particular letter out of the hundreds which must arrive every month. Perhaps it was their way of playing "devil's advocate" and they hoped to provoke dialogue on the subject. If this is so, then I politely tip my hat in their direction. For they have afforded me an opportunity to express some thoughts on it, too.

I sincerely trust that others will have detected the sour notes in this masochistic, self-flagellating cantata of capitulation to our adversaries. And I hope that there will be a flood of letters written to *QST* to belie the false contentions of the writer. They merit the condemnation of every amateur who is interested in preserving ham radio and protecting it from the sniping to which it is constantly exposed. The very notion of bowing our heads submissively and failing to fight against unfair antenna sanctions should be repugnant to every amateur. We must not allow ourselves to become second-class citizens simply because others happen to dislike us or our chosen hobby. As the old British motto puts it: Let right prevail.

DX

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Canada

SALUTE TO CW

Who needs it? The answer is: *you* and everybody else. Why? Because it separates the ham from the rest of the crowd and all those big-mouth, never-shut-up screamers and list operators. Let's have a look at a few points.

1. CW is the most reliable mode of communication. It can be copied at times when even SSB signals and other modes become unreadable. It is quite common to find that when the SSB signals are just fading out into the noise, stations switch to CW and it is like magic—signals are still readable and the difference is equivalent to 2-3 S-units. This is the reason why CW is used where there is the need to communicate at very low signal levels, such as VHF moonbounce, 160 and 80 DXing, remote area DXpeditions, etc.

2. It takes a little bit of devotion and work to master the speed. This is what separates the true-blue ham from those who are in the hobby to mess things up and deregulate it to the 27-MHz "state of the art."

3. Some are saying that CW is the old-fashioned mode, outdated and dying. Well, I think we are in for big revival. It is not dying; there are still a number of stations that can not afford SSB or more sophisticated rigs, and they have to home-brew their equipment. A CW rig is the easiest thing to build. Now with the explosion of computers, we will see more and more operators going back to CW and away from all those list undertakings. We can perhaps standardize one or two speeds on CW and let the computers talk to each other or to people. The wonderful thing is that they are compatible and could be fully automated. It also makes more sense to use CW than RTTY or ASCII, mainly for the possibility of communicating with those who have only ears. The present state of the art allows us to use fairly simple decoders and with the proper filtering and stability of today's rigs, it should be a relatively easy thing. Not to mention that keyboards make the CW machine quality perfect and easy to use.

4. Coherent CW is making its inroads and is offering another about 12 dB of signal-to-noise advantage. This offers another step of improvement. By narrowing the bandwidth on the receiver, we are making more room on the band; stations are able to get closer to each other.

5. There is a breed of operators who are operating almost exclusively on CW, away from the lists, etc. You can't help but feel much better when you tune down below the phone bands. The old ham spirit still lives there.

6. Numbers of expeditions have found that they can work the stuff much faster on CW than on phone. Sound strange? Not really. You can separate the stations much better on CW, especially when the pileups tend to get very heavy. With all those compressors adjusted for 20 dB of compression, there is more crud on the band than modulation. Sometimes they can even manage to QRM their own signals. You can quite often hear the background noise louder than the actual operator's voice.

So don't throw your key or keyer away; whenever you feel like it, give it a try. Besides, a number of countries and expeditions operate only CW. So be ready when you need that one.

One note to CW operators: Some rigs have drive control on the transmitter. It is important to set the level just below the point where there is no more increase in the transmitter power when increasing the drive level. It may seem that it does not matter, since there is no more signal going out. It makes a big difference on the signal quality; clicks and wide signals start coming out of the transmitter and give you a bad image among the fraternity. So be sensitive to that level setting and keep it clean!

Another note on the technical side: Be aware of your frequency. With the SSB rigs, good filtering and single signal reception, it is important to know if you are equivalent to USB or LSB on the filter. This is important for the receiver calibration, especially when you want to operate close to the band edge. The best thing is to use the zero-beat frequency. Some rigs use USB and some LSB for CW, so sometimes there could be over one or two kHz difference.

It is also important to know your transmitter offset on CW. Most rigs have offset around 1 or 1.4 kHz. When you operate transceive and you prefer tone around 500 Hz, when you call the stations you would be about 800 Hz or so out. If he is using a sharp CW filter, he might not hear you, especially when the bands are crowded (more important in a contest!). The best thing with the transceiver is to use RIT with the receiver and offset it in order to match the frequencies on receive and transmit. It is not uncommon to find some stations off frequency by as much as 3 kHz. Most hard-core CW operators use a separate receiver/transmitter combination, and there you can tell exactly where you are. So if you have a transceiver, it pays to find out where your signal is on transmit, and if it needs adjustment, most rigs can be adjusted by trimming the CW transmit offset capacitor.

Vince Thompson K5VT

Vince is a real delight for those hard-core CW operators.

Vince is making an extensive tour through Africa and has put a number of very rare countries on the air. He operates just about exclusively CW and the operation is first class. No wonder, he belongs to the FOC—the First Class Operators Club. He is working them fast—that means at high rates and good high-speed CW. He follows the propagation and tries to adjust his operating hours so he can satisfy just about everybody who needs him. He prefers the 15m band and can be found around 018-025 from the band edges. He usually operates split, listening from 1 to 6 kHz up. QSL cards go to his home call, K5VT.

So far, Vince has put on the air the following calls: 7P8CF, 9Q5VT, TN8VT, 9U5AV, S79WHW, S9VCT. Next on his program were supposed to be: 5V, 5U, TT8, and possibly others.

Bad tongues are saying that Vince goes to see the licensing officer who is ill. Being a doctor, he "fixes" him and the rest is a snap—a license in hand for an otherwise inaccessible rare country. Hi.

Vince is doing an excellent job and has to be congratulated for true high-quality operating and the choice of the countries he has activated.

Some Tips

How does one catch Vince and others that operate in a similar style? Here are some crude recipes:

First you tune across the band and you usually spot the big pileup. There is always a reason for that, so you can start looking for it. Most of the time, that reason is that rare DX is usually sitting a few (3-5) kHz below the bottom edge of the pileup. Then you have to start tuning very slowly and carefully to find him. Slowly, because he is usually coming back in short bursts of calls and reports, and you can very easily pass over him. If you have a rotatable antenna, it is also good to know where is he coming from so you can get enough signal for the receiver if he is weak (like VU7AN). Once you have found him and know who it is, half of the work is done. If you need him, then you have to do the other half—work him.

The most effective way of doing that is to find out his operating style or technique. Where is he listening? Is he picking the calls randomly at different frequencies, or is he going up the band or down? Try to find the stations he is working and establish the pattern. Once you know that, try to "tailgate" the last guy worked on the frequency or just slightly up or down. With a reasonable signal, this is usually the quickest way to work him. It is well worth spending the time to find out the pattern.

Or you can just pick the frequency and keep calling until he finds you. It is almost equivalent to the lottery , but it works, too.

This procedure, of course, applies to the split-frequency operation, which most DXers do use. Those that work on the same frequency get usually snowed under the never-ending pileup, and nobody can even hear them coming back to the stations.

Another important thing is to not call when someone is sending his report; be civilized and let him complete the contact. Otherwise, you will drive the DX away and nobody will get him. I have heard Vince asking the W6. . for his report and not get it, because others just kept calling him. After a few tries he gave up and quit. Proper thing to do.

What a difference in working our Japanese friends. If you ask for a stations with a "J" in the callsign, only the one that has the "J" in the suffix comes back, not the whole of Japan! What discipline and politeness! The net result is that many stations work the rare one and everybody is happy. Can you get the same result if you said: "QRZ W-something?" or "QRZ I-something?" No way, everybody all of a sudden forgets his callsign and actually tries to convince the poor DX that it is him that he has heard. The result? Big mess.

So what will the good operator do? He will throw in his callsign once or twice and wait, giving the DX a chance to come back to somebody. Try it; it works! But we all have to do it. If we try to be the last one in the pileup, then everybody wants that and the result is a never-ending screaming pileup and vanishing DX.

CQ WW DX CW Contest

This contest is a great opportunity to do some fishing for the rare ones and brush up on the rusty CW (oops, Morse code) and also observe some operating tricks and tactics by the big guns.

A number of rare expeditions are being planned and one can easily work his first 100 countries on that weekend. It is always the last weekend in November. Don't forget to send the log from the contest; sponsors always appreciate that.

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We are looking for some pictures and stories from the expeditions or any DX stations. So please send pictures and a few lines about yourself. Many are curious to find out how you look and what are you running.

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DX NEWS

CEØX San Felix Island. This very rare spot was to be activated by WB1GDQ, N4CNL, WB9AAD, SV1JG, WØAX, and possibly SV1IW. Apparently permission to operate has been granted and the latest info was that they should be starting around October 15th.

Juan Fernandez Island. CEØZAC and CEØZAD, a YL/OM team, are on the island for about three months, starting in September.

FB8WG Crozet Island. Rumored to be on around the 10th of September by a group of French operators.

HS1AMC Thailand. Apparently the bad news from there is that amateur radio activity was again suspended, so we will not hear them for a while. HSØHS operated during the *CQ* WW CW contest.

Belize. A J9 prefix will replace the VP1 prefix.

W6SOT/LX Luxembourg. Please QSL via KA5CCO and not via KA5CCD. Same for his operation as W6SOT/3A.

S9, Sao Tome Island. Activated by K5VT. Another operator should be stationed there very soon. If he obtains his license, he should be active for about two years.

UA1PAM Franz Josef Land. Operator Slava active around 14017 2000Z. QSL via UK3SAB.

VE1AWS/1 Sable Island. Mostly CW; QSL via W3HNK (ran out of VE managers?).

VE1BL/1 St. Paul Island. QSL via W3HNK.

K9MK/VP2A and KN5N/VP2A Antigua. All cards go via K9MK.

VP2MMR Montserrat. Operated by Dick Bash. Makes you wonder if he used his books to get his license. It sounded more like someone from the 27-MHz crowd than the amateur. HI. QSL via KL7IHP.

VP8 South Orkneys. Stations VP8ZR, Denis, QSL via G3KTJ, VP2AJL Op. Ray QSL via Signey Island, Stanley, Falkland Island, and VP8AEV Bob. They are all on Signey Island, quite frequently on 15m around 21272.

VP9CB Bermuda. Please QSL direct or via bureau to VP9CB and not to VE3MPZ/VP9.

Andaman Islands. VU7AN showed up surprisingly. Signals were very weak on the east coast. VE3BMV Razor Beams scored that one. Operation mostly on 15m CW around 21095. QSL via VU2WTR.

VU7 Laccadives. JA group is planning to operate before the end of October.

XZ5A, XZ9A Burma. Still quite active and easy to work. They are showing up on some lists, but also operate "solo" and split on 15 and 20m. Bad news from the ARRL is that apparently those stations are not to be accepted for the DXCC. Some don't care if the ARRL gives its blessing; they simply work them and collect the cards. It seems strange that stations operated by the nationals from the country where they live are not considered "kosher." Do I have to send my license to Newington so all those that worked me can use my QSL cards for the DXCC credit? I would think if there is no doubt about the presence of the station in that country, then it should be OK. Operations by comedians that can travel by boat from NY to Antarctica in 5 hours should be questioned.

1AØKM Sovereign Order Of Malta. Apparently even after the recommendation of the ARRL DX Advisory Committee, this was not accepted as a separate country. Another Muppet show?

3C1MM Equatorial Guinea. Worked on CW early August. QSL via EA1QF.

7Q7LW Malawi. Quite active, mainly on 15m working lists and solo (much faster). QSL cards are being received and are good for DXCC.

Top Ten Most Wanted Countries

According to *The DX Bulletin* (K1TN), the list is: BY, VS9K, XZ, ZA, VU Lac., VKØ, 7O, XU, FB8W, VU7 And. It looks like about two or three can be easily blown off that list before the year's end.

HAM HELP

I am looking for work in the electronics field in the Knoxville, Tennessee, area. Will be able to start February 1, 1982. My experience includes 20 years working on transmitter and receiver equipment from dc to GHz. I have an Extra class amateur license and First Class radiotelephone license with radar endorsement.

Herman F. Schnur
115 Intercept Ave.
North Charleston SC 29405

I have an R336/GRC26 Army radio receiver made in September of 1951, with a tuning range of 1.5-18 MHz.

I would like to convert this unit to an rf generator, vfo, or heterodyne exciter. I hope someone may be able to help me. Any information you can give will be greatly appreciated.

Kevin Neal
Rte. A, Box 221A
Flippin AR 72634

I am in need of help to repair a Canadian No. 19/MK III wireless HF surplus transceiver. The tuning dial is jammed. Any MK I, MK II, and MK III units for spare parts are needed. Also, any conversion info and manuals are needed. Please write and let me know what you've got. I'll reimburse printing and postage expenses. Thank you.

Jim Miyagawa WD8NRG
1529 Woodland
Portage MI 49002

I am in need of the manual and schematics for the Collins KWS-1 transmitter and associated power supply. I will gladly pay for reasonalbe reproduction and shipping costs.

John C. Lane WA8VEU
2400 Gannon Rd.
Howell MI 48843

I need a manual on the AM 1955A/GRC amplifier-converter which operates on 600-1000 MHz, as well as a manual on the RP-119/GPH signal data reproducer.

Roy W. Johne W9NNM
201 West "A" Street (4)
Iron Mountain MI 49801

I need a little help getting a manual for the Wilson T-1402SM hand-held transceiver. I would also like the sheet on the touchtone pad and the T-15-NC dropin charger.

I will gladly pay all copy costs and postage. I have copying facilities available.

Any help you can give will be very much appreciated as I am dreading the day the radio quits and I have to work on it.

Carl Hattan K0BZU
PSC Box 6752
Patrick AFB FL 32925

I need a schematic and any other information I can get for a Monsanto counter/timer (Model 101-B). I will pay for schematic/manual (or copy) or I can copy and return original. Thank you.

Nicholas Santillo
Box 22, RD 1
Sycamore PA 15364

Does anyone know where I can get my Standard SR-C-145B repaired?

Don Sywassink K7ZIO
4525 Paseo Arruza
Sierra Vista AZ 85635

I need a mixer coil for an HQ-170 Hammarlund receiver—top slug 455 kHz and bottom slug 3035 kHz. I am repairing the receiver for a man with M.S. and any help would be appreciated.

Jon Andrews WA2YVL
PO Box 222
Greenlawn NY 11740-0222

William Tucker W4FXE
1965 S. Ocean Dr., 15-C
Hallandale FL 33009

Cartography for Kerchunkers

—making repeater maps

JAX 6040-6640 6130-6730 6160-6760 6205-6805 6250-6850 6280-6880 7645-7045 7690-7090 7795-7195 7900-7300 7990-7390	JUPITER 6025-6625 LAKE CITY 7750-7150 LARGO 6370-6970	KEY WEST 6340-6940 LAKE PLACID 6445-7045 7645-7045 LECANTO 6355-6955	LAKELAND 4690-5290 4830-5430 6085-6685 LIVE OAK 6340-6940	LAKE WALES 7930-7330 LAKE WORTH 7885-7285 MARIANNA 6070-6670
NICEVILLE 6130-6730	MELBOURNE 6010-6610 6250-6850 6385-6985	MILTON 6100-6700 OCALA 6010-6610	NAPLES 6070-6670 OKEECHOBEE 7795-7195	N.P.RICHY 6025-6625 6070-6670 ORANGE PK 6070-6670
PAHOKEE 4650-5250	PALATKA 7660-7060 7930-7330	PERRY 6370-6970	PLANT CITY 4560-5160 4870-5470	PANAMA CITY 6340-6940 7990-7390
PLANTATION 4770-5370 6190-6790 7930-7330 SANFORD 6130-6730 SEBRING 7870-7270	ORLANDO 6040-6640 6100-6700 6130-6730 6160-6760 6220-6820 7720-7120 7825-7225 7990-7390	PENSACOLA 4510-5110 6160-6760 6250-6850 7750-7150 7930-7330 SINGER ISLD 4570-5170 7765-7165	SARASOTA 4530-5130 6130-6730 RUSKIN 7705-7105 ST.CLOUD 6190-6790	POMPANO BCH 6010-6610 SAN ANTONIO 6280-6880 TICE 6115-6715
FT.LAUD 4510-5110 4630-5230 6310-6910 6355-6955 6430-7030 7630-7030 GAINESVILLE 6190-6790 6220-6820 6310-6910 CLERMONT 6295-6895 7780-7180	TAMPA 4890-5490 6160-6760 6190-6790 6235-6835 6265-6865 7630-7030 7705-7105 7750-7150 7810-7210 7840-7240 7945-7345 7975-7375 COCOA 6280-6880	ST.PETE 4850-5450 6310-6910 7600-7000 7660-7060 7915-7315 7960-7360 ARCADIA 7675-7075 BRADENTON 6010-6610 6220-6820	W.PALM BCH 6070-6670 6145-6745 6280-6880 7960-7360 VERO BCH 6040-6640 BELLE GLADE 4850-5450 7600-7000 BROOKSVILLE 6115-6715	TITUSVILLE 6070-6670 6310-6910 6370-6970 WINTERHAVEN 6055-6655 BOCA RATON 6220-6820 BRANDON 7765-7165 7990-7390
COCOA BCH 6430-7030	CRESTVIEW 6430-7460	CRYSTAL RIV 7870-7270	DELAND 7960-7360	DEERFLD BCH 7720-7120
DAYTONA BCH 7750-7150 7840-7240	DISNEY WLD 7900-7300	EUSTIS 7855-7255	FERNANDINA 6010-6610	DEFUNIAK SPR 7720-7120
HALLANDALE 6250-6850	HOLLYWOOD 6085-6685 6385-6985	FT.MYERS 6190-6790 6280-6880	FT.PIERCE 6130-6730 7810-7210	FT.WALTON B 6190-6790 6280-6880 7600-7000

Fig. 1. Sectionalized list of repeaters.

A few years ago, on one of several trips to New Jersey to visit with our children and grandchildren, I found myself with a microphone in one hand, a repeater manual on my lap, and my dear wife, Janet, struggling with a large road map trying to pinpoint the location of Podunk Hollow where there was supposed to be a repeater on .16/.76. "There must be an easier way!" I thought.

Before making the next trip, I made up repeater maps for each state I would be passing through, by marking repeater frequencies directly on the map at their exact locations. In this manner, I could determine whether or not I was within range of the various repeaters and operate accordingly. Two-meter mobile operation then became a real pleasure.

Repeater maps can be made up in several ways using standard-size road maps. Depending on the number of repeaters at a given location, sufficient space on the map can be covered with typist's white correction fluid and, when dry, repeater frequencies can be neatly inscribed on top by hand. A black, felt-tip pen can then be used to provide an outline of the white area to greatly improve visibility. Another method is simply to use

white paper sections cut to size as paste-ons at repeater locations on which frequencies are inscribed.

I recently made up a repeater map of Florida (Fig. 2) which is being distributed by *Florida Skip*, an intrastate, non-profit monthly publication.[1] A handy 11" × 17" size, it is printed on a heavy, pale-green, 60-weight paper. (It was to be displayed in that size as a center-fold spread in *Florida Skip* on much lighter white paper.)

The map was constructed using an 11" × 17" state map put out by auto-rental firms. After a thorough study of the various repeater manuals and the latest Repeater Council listings, a request was made to all trustees to send me up-to-date information about their repeaters as to correct frequencies and location. I then typed a sectionalized list of Florida repeaters (excluding closed repeaters) on 8½" × 11" white bond paper, using a typewriter with a carbon ribbon for good reproduction clarity. (More than one sheet was required to list all the repeaters. Fig. 1 is a reproduction at 69% of its original size.)

The typewritten sheet was then photostatically reduced to 40% of its original size so that the sections could be cut out and pasted directly on the map. After a careful paste-up, a black felt-tip pen was used to outline the white areas. Because blue areas such as the ocean and lakes do not reproduce too well in black and white, the entire state as well as the larger lakes were outlined in black to provide better reproduction.

The repeater listing according to frequency also was typed on 8½" × 11" white bond paper and reduced to 40%. This list has proven to be very useful, especially with the new two-meter rigs with scanning capabilities. After the entire paste-up has been completed, the rest is up to your local printer.

This repeater map has been very enthusiastically received in Florida and probably would be much welcomed in other states. It is indeed a worthwhile project for an active two-meter repeater club. ■

Reference

1. Map available for $.25 and a business-size SASE from Andy Clark W4IYT, Editor, *Florida Skip*, PO Box 501, Miami Springs FL 33166.

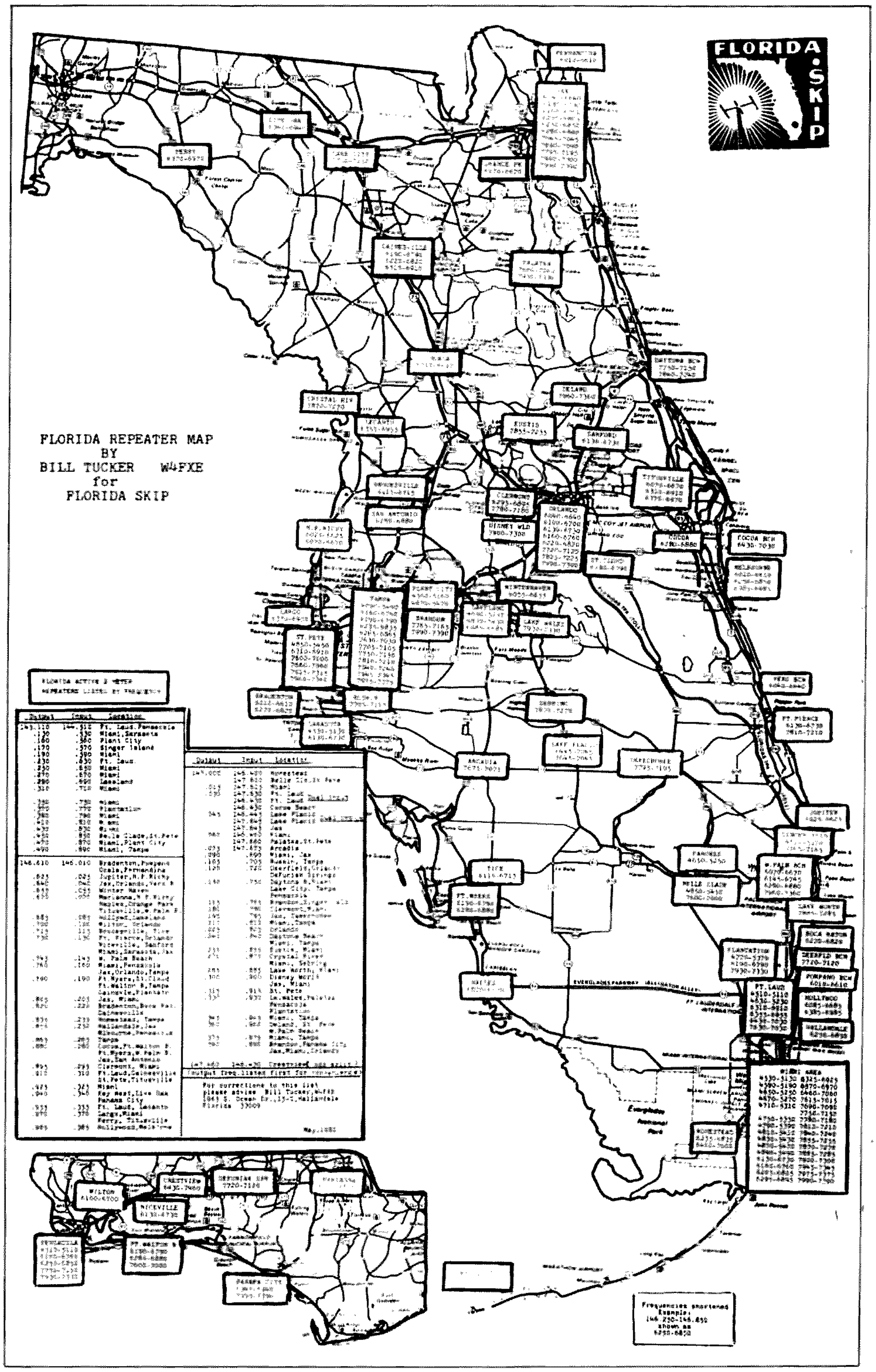


Fig. 2. Repeater map of Florida.

George M. Ewing WA8WTE
PO Box 502
Cheboygan MI 49721

Ten-Meter Lunch Hour

—ham radio for school kids

March has always been a bleak time of year for school kids in northern Michigan. Christmas vacation is long past and Easter break is still several weeks in the dim future. Once the craziness of basketball tournaments is over, there is little to do but study, stare at giant snowdrifts that half-cover the windows, and daydream of spring. Our high-school librarian, in a valiant effort to cheer up a blah faculty and student body with any sort of colorful diversion, was recruiting displays to liven up the big glass cases around the sunken main floor reading room.

I had had a ham radio display the year before that had met with quite a bit of student interest, and I resolved to try again. Along with the usual OSCAR pictures, photos of exotic DX islands, and fancy equipment, I planned to include some simple, low-cost gear that the average ninth- or tenth-grader with a part-time job and a modest budget could realistically afford. From years of experience working with teenagers, I've found that next to problems with the code, the one thing that tends to discourage young people interested in amateur radio is the perceived high cost of the equipment.

Students listening to another school station in Florida. The poster at the left listed license requirements and privileges.

Experienced hams know that it is perfectly possible for a beginner to get on the air for little or no cash outlay, using used or borrowed gear, surplus, or even home-brew rigs (with a little friendly coaching from a more advanced builder), but the school kid just starting out doesn't realize this. He or she sees the ads in the magazines for rigs costing kilobucks—plus riceboxes, kilowatt amplifiers, beams, towers, and elaborate satellite installations. The average kid knows how much money the dealers are asking for fancy CB gear and tends to assume that ham gear, with its greater power, range, and number of "channels," must cost proportionately more.

The display case was prepared with equipment, books, photos, and magazine articles to be changed weekly and new material rotated in for a six weeks period. An attempt was made to include as much simple, home-brew, and low-cost equipment as

Ned Workman, yearbook advisor and old Army radio operator, impresses everybody with high speed CW copy. Since this was taken, he has become KA8KQY.

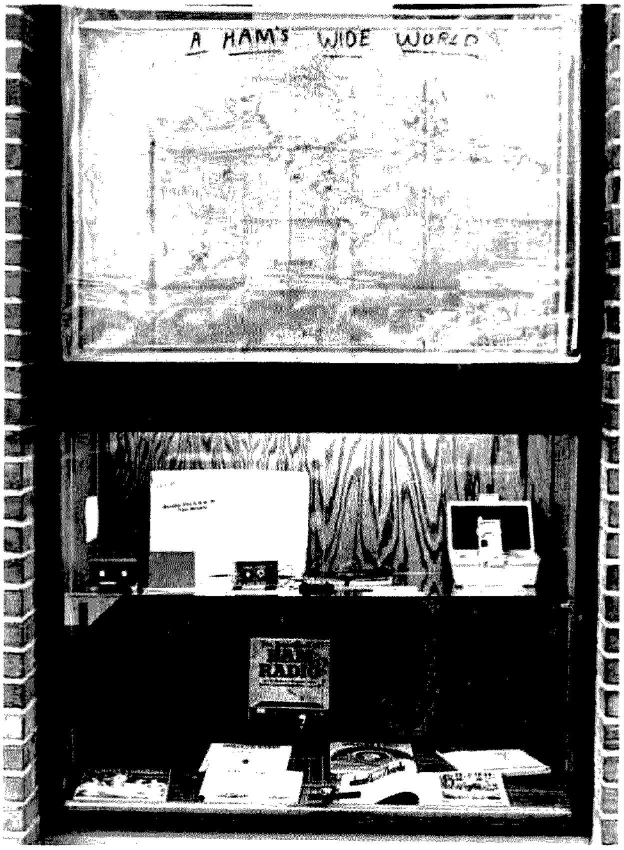
possible. Along with the other gear, a complete Novice station was laid out, consisting of a Heathkit DX-60B, HG-10 vfo, and Lafayette HA-63 receiver.

This display hadn't been in the case for more than a few minutes before requests from students and faculty members began coming in: Why not take the gear out of the glass case and actually put it on the air, perhaps during lunch hour or after school?

I promised to take the matter under consideration and then sat down to think it over. There were some potential problems. I had tried an operating display two years before with the help of a couple of other area amateurs, but with mixed results. Because of severe antenna limitations imposed by the location in the building, we had been limited pretty much to operating with a small vertical antenna on twenty meters. A barefoot transceiver with a less than ideal antenna had left us with a dearth of contacts, especially on phone. The students had enjoyed the display, but the results were less than exciting and hardly seemed to justify the hassle of setting up and stringing long coax runs out of the way of the students who had to be able to use the library during regular school hours.

After considerable thought, I came up with what seemed to be a more practical plan. High-power SSB on the 20- or 15-meter phone bands wasn't the answer. We'd no doubt make contacts, but the whole point of showing what could be accomplished with inexpensive gear and modest power would be spoiled. Daytime in March was just about the peak of the season for 10 meters, and there was more and more low-power AM gear on the air now, thanks to all the CB conversions. An 8-foot vertical could be raised above the surrounding metal-framed buildings and should give good results. The good audio quality of AM would be easier for the students to follow, as many had had trouble with the highly compressed, filtered, and often QRM-blessed voices in the pileups on 20.

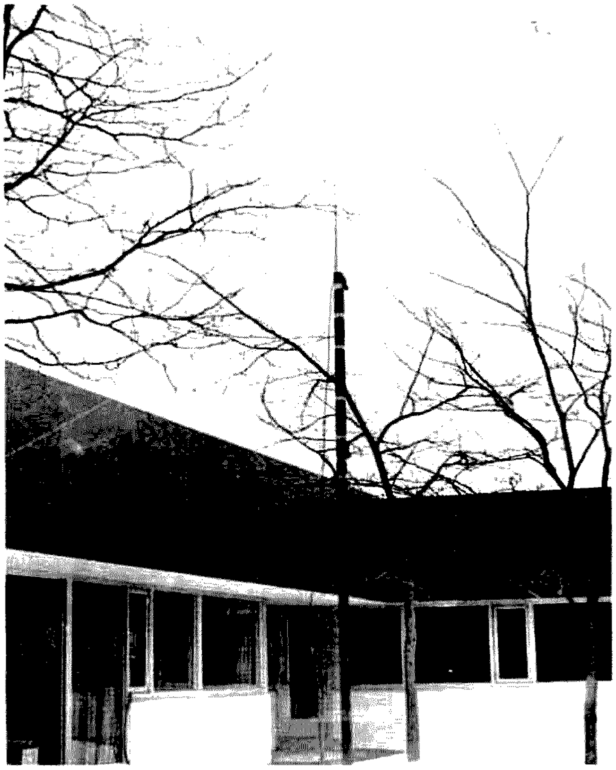
The final installation included the DX-60B and vfo, the Lafayette receiver, an swr bridge, a home-built kit



This display was changed every few days, with an effort to include as much home-brew and low-cost gear as possible. Students marked DX contacts on the world map as they were made.

frequency counter to check up on the calibration and keep us in the band, and a large hi-fi speaker so that class groups could follow the QSOs without straining their ears or having to share earphones. Outside, in the enclosed courtyard that was the only possible antenna site, we raised a makeshift 24-foot T-mast made of 1 × 4 lumber nailed together and painted

Touchy tuning, but that rare DX is still hanging in there.



The antenna. The ground in this inner courtyard was five or six feet below outside ground level.

"Now, where the heck is Victoria, Texas, anyway?"

with the school colors. An 8-foot aluminum tube was the ¼-wave vertical radiator, with three wire radials also serving as guys. With the addition of a piece of wooden dowel, the entire radiating part of the antenna was above roof level, although a three-story metal gym to the south might block some of the best DX.

Since my school preparation period overlapped with the three half-hour lunch periods, I would be able to be in the library over a 90-minute period each day between 1130 and 1300 local time, just about right for the skip to be in on ten.

The first day's operating began with a fifteen-minute dead spot, when there was nothing to be heard on the band but fluorescent lights and the arc welders in the metal shop class down the hall. But a minute or two later, there was a guy in New Mexico calling CQ mobile, his blistering 3-Watt converted CB rig booming in ten over nine; then he was drowned out by several DX stations speaking Spanish, and the fun was on.

In all, we made about two hundred contacts and spent a lot of time eavesdropping on as many more. A couple dozen of these were DX on AM, including Zagreb, Hamburg, the Canal Zone, and several from Great Britain. This is nothing compared to what a serious DX station would do in a contest, of course, but it was felt that a leisurely, rag-chewing approach would be more interesting to the students than just trading signal reports for a QSL. Big world and North American maps were kept posted on the wall and on the operating table, with callsign districts marked off with felt markers on plastic overlays. New states and all DX contacts were marked on the maps with little discs of fluorescent orange paper donated by the librarian.

The high points of student interest were a long (1-hour-plus) rag-chew with another high school student in Florida operating a school station (the W4 flatly refused to believe the nine-foot snowbanks the Michigan kids were describing) and another long visit with a G3 in Lancashire. That particular day, the school was celebrating a 1950s revival for a yearbook benefit dance, and the students were all in bobby sox and Fonzie jackets. The English ham was an old rock-and-roll fan from the 50s, and he kept the kids interested with tales of a recent Bill Haley concert, British rock concerts, and soccer riots. The yearbook advisor amazed everybody by copying high speed CW with his trusty layout pencil; he had to switch to a typewriter for copy over 35 wpm, however!

Overall, the project was a resounding success, though there were minor disappointments. The old receiver, while performing admirably on AM, was too touchy to tune SSB and CW satisfactorily, and much good DX may have been missed as a result. CW was also rather disappointing, although a few contacts on 10 were made, and we loaded up the coax and ground radials with a random-wire antenna tuner and managed to work a few Novices on 40 and 15 meters. The other disappointment was that we were unable to hear any OSCAR passes, although several attempts were made.

On the positive side, everybody's winter blahs were temporarily interrupted, and enough interest was raised so that several students expressed interest in getting a Novice ticket. The community enrichment night school decided to offer a licensing class that spring, with eight or ten people ready to sign up.

I have no doubts but that the project was a worthwhile one, and the library staff agreed—despite the noise and cables strung around the room. All the ham-related materials were checked out from the library and remained in high demand for a long time after the lunch-hour station first went on the air. ■

HAM HELP

I need a schematic and/or manual for a Central Electronics Multiphase rf analyzer, Model MM-2. I will copy and return, all postage paid.

Marvin Moss W4UXJ
Box 28601
Atlanta GA 30328

I need info on modifications, hints, kinks, and improvements which may be used on the Radio Shack Model AX-190 ham-band receiver.

John Dolan KA4OXO
PO Box 651 T.S.
Greenville TN 37743

I am in need of an assembly manual for a Mosley quad, Model MCQ-3B. In particular, I need the length of the wire elements.

William P. Smith K3LF
RD #2
Cold Spring Creamery Rd.
Doylestown PA 18901

I need schematics and manuals (both operating and maintenance) for the following equipment:
1. Alltronics Howard Model "L" teletype converter;
2. Heathkit "Twoer" ("Benton Harbor lunchbox");
3. DEI signal monitor, Model SM-7403;
4. Kleinschmidt TT76 and TT98 teletype equipment.

SSG Gary Kohtala WA7NTF
S + F Co., Box 918, USAISD
Ft. Devens MA 01433

CORRECTIONS

The TR-9000's microprocessor is *not* the 6500-based chip mentioned in the August, 1981, review. It is a NEC 650C CMOS microprocessor. This 4-bit device features 80 instructions, a 2000-byte × 8-bit read-only memory, and a 94-byte × 4-bit programmable memory. The same chip (with different ROM memory) is used in Kenwood's TR-2400 and TR-7800.

Paul Schmidt K9PS
Crane IN

Several errors crept into the September and October issues of *73*. Here they are:

- K7NZA's article, "That They Might Communicate," on pages 66-69 in the September, 1981, issue, incorrectly refers to J. C. Buckner as a J. C. Betner. Our apologies to Mr. Buckner.
- Contesters, beginners and experienced alike may want to note several corrections for "The Contest Cookbook" which appeared in the October, 1981, issue. The correct Field Day exchanges are:

CW: "K6ZM 1C EB de WB6CEP K"
Phone: "K6ZM one charlie East Bay from WB6CEP, over"

When discussing rest period strategy, author N6OP defined "short contests" as those that are 20 to 30 hours long. This category should also include the mini-contests—even those as short as four hours.

- QSO party enthusiasts will be pleased to know about several new contests that can be added to Table 1 of the article "Controlled Chaos," which appeared in the October, 1981, issue. Alabama holds their event on the fourth weekend in August; out-of-state stations are required to send their state. The second weekend should be reserved for the New Mexico QSO Party. Out-of-state contestants need to relay a serial number and their state.

Changes for Table 1 include the date for the Alabama contest; it's now scheduled for the fourth weekend in August. You can plan on working South Carolina stations the second weekend in March. Finally, the Nebraska square-off has been moved to the fourth weekend of the month listed and Vermont's QSO Party is now on the second weekend of the month listed.

Tim Daniel N8RK
***73 Magazine* Staff**

✓See List of Advertisers on page 130

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received two months prior to the month in which the event takes place.

HICKSVILLE OH
NOV 1

The Defiance County Amateur Radio Club will hold the Defiance County Hamfest and Flea Market on Sunday, November 1, 1981, from 8:00 am to 4:00 pm at the Defiance County Fairgrounds, Hicksville OH. Donations are $1.50 in advance and $2.00 at the gate. There will be free parking, overnight camping (October 31st), and trunk sales space. Doors will be open for setups at 4:00 pm on October 31st, and table space will be available. First prize is a 2m mobile. For hamfest inquiries and table reservations, contact Ed Ballard, Jr., WD8JVV, RR 1, Roland Road, Sherwood OH 43556, or phone (419)-899-4209.

SOUTH GREENSBURG PA
NOV 7

The Foothills ARC will hold its annual swap and shop on Saturday, November 7, 1981, at St. Bruno's Church in South Greensburg PA. Doors will be open from 9:00 am until 3:00 pm. Registration is $2.00 each or 3 for $5.00. All facilities are indoor. Main prize is a Kenwood TS-530S HF rig. First prize is an Icom IC-2A hand-held. Talk-in on 146.07/.67 and 146.52 simplex. For advanced table reservations, phone Chuck Hamman WB3HZM at (412)-837-9194 after 5:00 pm.

SELLERSVILLE PA
NOV 8

The R.F. Hill ARC will hold its 5th annual hamfest on November 8, 1981, in the Sellersville National Guard Armory, Sellersville PA. Doors will open at 7:00 am for sellers and 8:00 am for buyers. There will be a grand prize, door prizes, refreshments, and heat. Talk-in on .28/.88 and .52. For further information, contact R.F. Hill ARC, Box 29, Colmar PA 18915, or Chet Pierson K3TV, Box 336, RFD 1, Greenlane PA 18054.

NORTH HAVEN CT
NOV 8

The Southcentral Connecticut Amateur Radio Association will hold its second annual Electronics Flea Market on Sunday, November 8, 1981, from 10:00 am to 4:00 pm indoors at the North Haven Recreation Center, Linsley Street, North Haven CT. Admission is $1.00; children under 12 will be admitted free when accompanied by an adult. Sellers may set up at 9:00 am; spaces are $5.00. Refreshments will be served and door prizes will be awarded. Talk-in on 146.01/.61 (W1GB). For information about special arrangements for commercial exhibitors or for reservations (make checks payable to SCARA), contact the Southcentral Connecticut Amateur Radio Association, PO Box 81, North Haven CT 06473.

MASSILLON OH
NOV 8

The Massillon ARC will hold its 24th annual auction, Auctionfest '81, on Sunday, November 8, 1981, from 8:00 am to 4:00 pm at the Massillon Knights of Columbus Hall, Cherry Road, Massillon OH. Tickets are $2.50 in advance or $3.00 at the door. The flea market opens at 8:00 am and dealer tables are $3.00 per 8-foot table. The auction, beginning at 11:00 am, will include prizes of a Kenwood TS-130S, a Ten-Tec Argosy 515, and an Icom IC-2AT. Door prizes will be given away hourly. For further information or table reservations, send an SASE to Steve Nevel WD8MIJ, 1864 Massachusetts Avenue SE, Massillon OH 44646.

NEWMARKET ONT CANADA
NOV 14

The York North Amateur Radio Club will hold its fifth annual flea market on Saturday, November 14, 1981, at the Newmarket Community Centre, Newmarket, Ontario. General admission is $1.50, which includes a door prize ticket. Admission for exhibitors is $3.50, which includes a door prize ticket and one table. Additional tables are $2.00 each. The flea market will run from 0800 to 1400 EST, but the doors will be open earlier for exhibitors. Talk-in on 146.52 (VE3YNA) and 147.225/.825 (VE3YRC).

GRAND FORKS ND
NOV 14

The annual FORX ARC Hamfest and Banquet will be held on November 14, 1981, beginning at 9:00 am. The A.V.T.I. and banquet will be at the Ramada Inn. The registration fee for the hamfest is $2.00 and the banquet is $7.50. Talk-in on 146.34/146.94. Contact WBØBNR or KAØHDN, or write WBØBNR, Box 1638, Grand Forks ND 58201.

STONE MOUNTAIN GA
NOV 14-15

The Alford Memorial Radio Club, Inc., will hold its 9th annual Famvention on Saturday and Sunday, November 14-15, 1981, at the Stone Mountain Inn, Stone Mountain GA. Activities include dealer displays and large flea market area. Registration is a $5.00 donation. Talk-in on 146.16/.76 and .52. For further information, contact Carl Nichols K4ZYK, Chairman, 1657 Flicker Drive, Jonesboro GA 30236; phone (404)-478-4515.

FORT WAYNE IN
NOV 15

The Allen County Amateur Radio Technical Society, Inc., will hold the 9th annual Fort Wayne Hamfest on November 15, 1981, from 8:00 am to 4:00 pm at the Allen County Memorial Coliseum, Fort Wayne IN. Admission is $2.50 in advance or $3.00 at the door, with children 11 years old and under admitted free. There will be a large flea market, forums, and door prizes. The Coliseum charges a $1.00 parking fee. Regular tables are $6.00 each and premium tables (on arena perimeter with curtain backdrop, ac power, and personal attention) are $20.00. Talk-in on 146.28/.88. For more information or pre-registration, write Allen County Amateur Radio Technical Society, Inc., Attention: Hamfest Committee, PO Box 10342, Fort Wayne IN 46851.

OAK PARK MI
NOV 29

The Oak Park High School Electronics Club will hold their 12th annual Swap 'n Shop on Sunday, September 29, 1981, from 8:00 am to 4:00 pm at the Oak Park High School, Oak Park MI. There will be door prizes and refreshments. Admission is $1.50 in advance; $2.00 at the door. 8-foot tables are $5.00 in advance; $6.00 at the door. For reservations or more information, send an SASE to Herman Gardner, Oak Park High School, 13701 Oak Park Boulevard, Oak Park MI 48237, or phone (313)-968-2675.

FAIRBAULT MN
DEC 5

The Courage Center Handi-Ham System will hold its annual winter hamfest on Saturday, December 5, 1981, at the Eagles Club, Fairbault MN. There will be a flea market, a dinner at noon, a program, and prizes. For more information, contact Don Franz WØFIT, 1114 Frank Avenue, Albert Lea MN 56007.

HAZEL PARK MI
DEC 6

The 16th annual Hazel Park Amateur Radio Club Swap & Shop will be held on Sunday, December 6, 1981, at Hazel Park High School, Hughes Street at 9½ Mile Road, 1 mile east of I-75, Hazel Park MI. Tickets are $2.00 and tables are 75¢ per foot. Doors will open at 8:00 with the main prize drawing at 2:00 pm. There will be plenty of food and free parking, plus hourly door prizes. Grand prizes are included with the admission ticket. Talk-in on 146.52. For more information, send an SASE to Jack Field W8UPU, 1444 E. Evelyn, Hazel Park MI 48030.

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

from page 8

strike holding our plane up for connections from the US. We'd avoided the problem in the US by driving to New York for the flight instead of starting from Boston or Manchester, New Hampshire, as we had first planned. Despite the late arrival hour, we were met at the airport by a ham/computer contingent, complete with my ham license and an HT to use with the local repeaters. W2NSD/ZS was on the air!

The next morning, I woke up and opened the curtains of the hotel room...to find myself in the middle of a large city, complete with high-rise buildings. It could have easily been Chicago or Philadelphia. I checked in on the 145.650 repeater and talked with a bunch of well-wishers. In minutes, I was being visited by Julius Lieberman ZS6AF, the local ham store owner and Kenwood dealer. He brought up a 2400 HT, charger, and special cube tap to fit the weird power sockets.

The day started out with an interview with the editor of *Computerweek*, followed by an interview for the local paper. Then I recorded a tape to be played over the ham network on Sunday, since I would be out of town at the time and might not be able to call in on the countrywide net. In fact, I was flying at the time of the net, so the taping was a good precaution.

In the afternoon, I visited ZS6AF's shack and managed to hook W2NSD/ZS up with W2NSD/1 in Peterborough... plus many more contacts around the US and through Europe. Then Sherry and I went on to dinner with a computer group, enjoying a banquet of South African seafood.

With not a lot happening over the weekend, Saturday was the best time to take off for a couple of days of new country visiting. Dave Sommerville, who runs Rand Electronics, had arranged the flight to Swaziland for us. We met our pilot and Cessna at a nearby airport and then spent an hour trying to get the plane started. That wasn't critical in Johannesburg, but what if the plane turned stubborn in Swaziland? The hope was for the battery to charge up during the flight.

It is difficult to build up a lot of confidence in a plane which takes an hour to jump-start, so perhaps we were a bit unsettled when we finally took off from Johannesburg and headed toward Mbabane, the capital of Swaziland. I had my HT in one hand talking with Dave as we left and my camera in the other taking pictures of Johannesburg from the air. I soon was so wrapped up in making contacts through the various repeaters and snapping pictures of the farm country below that I forgot about the plane problems.

When one thinks of Africa, one normally thinks in terms of dense forests, not flat farmland almost identical to our midwest. South Africa is a big country, so they probably have some forests somewhere, but in the triangle I covered during the next two days it was farmland, farms, and small towns...about 800 miles of this.

With 12 million blacks and only 4 million whites, I expected to see some sign of bush-type villages here and there instead of the European (and American) type of settlement. I didn't see anything like that until I crossed over into Swaziland. On the way in, I discovered the Swaziland repeater on 145.650 and contacted 3D6AX, the chap who issues licenses for the country. He told me they had my authorization waiting for me and that it was all okay for me to start signing W2NSD/3D6 as soon as my plane crossed the border. I kept a sharp eye on the flying chart and made him my first 3D6 contact as we went over the border.

Doug Goldman 3D6BG, the proprietor of the Smoky Mountain Hotel, was waiting for us when we landed. Not bad having a hotel owned by a ham...complete with a nice ham station on the premises. That's a lot better than carting a big suitcase full of ham gear 25,000 miles, through customs people, and paying about $5 a pound for overweight now and then. Some countries make you put up a bond on ham gear which is more than the value of the equipment, to make sure you don't accidentally leave it behind when you go.

The hotel is made up of a group of small cottages, with a central building for the bar and restaurant. Not being much of a drinker, I can't say about the bar, but the food at the restaurant was right up there with some of the finest places I've visited. Everything was superb! Doug, who built the place himself and trained all of the help, is looking for a buyer so he can travel and take it easy for a while. Running a hotel anywhere is difficult, but in a small country like this there are special problems...such as no people with any training at all. He had to teach the locals how to garden so he would have fruit and vegetables for the restaurant...and so on.

The night life in Mbabane is at one of the Holiday Inns. There are three of them, with two being right across the road from each other. Two have casinos, so we popped over there to see the action. "The Devil and Miss Jones" was playing...it seems that such pictures are forbidden in South Africa, as is gambling, so the South Africans come to Swaziland for their gambling and dirty movies. I dropped a couple of dollars in the slots and thought that was enough of a donation for the well-being of the country.

The next morning, Doug took us for a tour, showing us the king's palace and the compound next to it where the king lives with his 87 wives and 850 children in small native huts. I got out of the car on a hillside to take a picture of the palace and was hassled by a truck driver who stopped and wanted to know from whom I had gotten permission to take that picture. Well, it's a pretty country, but I really don't need hassles like that.

The king, by the way, has been in business for 70 years... the longest reigning monarch in history. He's still going strong.

With that, we headed for the airport and my flight to Lesotho. I'll go into that a bit next month, along with some pictures of the trip.

DIGITAL TRANSMISSIONS

After all that fuss to get ASCII legitimized, perhaps it is time for the more experimentally minded to get cracking on digital transmissions. The more I think about this...and talk about it...the more enthused I get. But let's move as quickly as we can to 9600 baud (murs?) and not horse around with the slow stuff.

Once we get these systems going, we'll have a corking good emergency system right there waiting for us. The idea for having emergency nets set up with the net control polling the net stations automatically, waiting for any traffic to be sent digitally, is exciting. With this system, we can interface the small pocket computers with our rigs, type in a message and its destination, and the rig will take over when polled by net control, dumping the message at 7300 words per minute...immediately forwarding it automatically to the addressee. We could increase our traffic-handling capabilities by a thousand times or more.

The startup for this, as I mentioned last month, can be with bulletin-board stations which can be accessed over the air. The caller would specify the transmission speed, whether it be 300, 1200, or 9600 baud. The RBB station would then send the menu and wait for the response. This system is developing rapidly via the telephone these days and could just as easily be implemented over the air. Indeed, the gang here at W2NSD/1 is working on a project to put an RBB service on... probably on 14.100 MHz...just above the RT group and below the Canadian phone band.

To recap, the idea of a RBB station is that when you call in, you get a menu. Let's say you pick item #1 from the menu, DX news. Then you would get a list of the currently active rare DX stations, their known operating frequencies and times, operator name, QSL information...and so on. Bulletin boards are two-way devices, so you would be

able to add to the information if you had any good DX news.

#2 might be a status report on the latest FCC news. It might list the dockets up for discussion and the dates of reply, proposed rule changes, and recent FCC rule changes which have been implemented. #3 might be a listing of hamfests and conventions, with the usual information on when, where, how much, who to contact, and so on. #4 could be a list of coming contests, with data on scoring, rules, where to send logs, and so on. #5 could be a place to list your tentative contest scores for comparison after a contest. #6 could be a list of recent certificates announced. #7 could be satellite schedules...and so it goes. At 9600 baud you can offer a lot of service for a lot of users without running out of time.

For the time being, I'd like to encourage all of the experimentation possible, complete with reports and articles in *73* on the results. Without a lot of articles, we are not going to be able to generate the enthusiasm to make this really work. By the time we've published a couple hundred articles, I think we'll start seeing some commercially-made digital gear appearing...and the beginning of a whole new kind of amateur radio.

If you have any problem getting permission from the FCC for experiments, please let me know about it. As far as I know, they've taken the lid off amateur experimenting...a very welcome relief after all these restrictive years...and we are again able to do some experimenting and pioneering.

It took us about five years to get FM and repeaters popular, starting with the *73 Magazine* push in 1969...and the publishing of hundreds of articles, a lot of books, symposiums all around the country, and so on. Perhaps in five years we will see a similar change as a result of digital communications.

HIGH SCHOOLS

As I pointed out to the people in Brazil and South Africa, the electronics technology of any country is directly proportional to the number of hams in that country. This is why Japan is getting so far ahead of us in many technical areas these days. They have over 500,000 amateurs...the great proportion of whom are active. We have a bit over 385,000 hams, of whom perhaps 50% at the most are active. So we have to sit here and choose between Japanese television sets, video recorders, ham transceivers, HTs, calculators, talking clocks, cameras... and so on.

The answer to the situation is for us to get going with more hams. I frankly view this as an emergency situation for America. The FCC can help by providing rules and a licensing situation which will best encourage the entry of new hams. The ARRL can help by getting as many clubs as possible to think in terms of ham growth. We need to get into a 33% growth pattern, not the present 3%... or even the 11% we had in the 1950s and up until the "incentive licensing" disaster.

The best approach I see to getting things going is to bite the bullet as far as our rules are concerned...and then move ahead with our ham clubs and get into every high school in the country and spread the word.

After over 40 years of hamming, and publishing for 30 of those years, I have to admit that I still don't really understand what it is about amateur radio that grabs kids of 14 and 15 years of age. I know that I was excited about the ability to talk with other people...and that working DX was kind of the ultimate thrill in this line. But I've watched thousands of kids be exposed to the same idea and come away bored. What *is* it? I've had it happen in my own shack. A nearby school sent over a batch of students in the right age group. I put on the show, with a few contacts with Europe and Asia...and nine out of the ten kids yawned and retired to another room where it was less noisy. The tenth couldn't be pried away with ice cream.

If we can ever discover what the button is that gets pushed, perhaps we can start pushing that button in all of the high schools.

Why am I stressing the 14-year-olds? Well, most of the studies of ham licenses have shown that about 50% of all newcomers to amateur radio are either 14 or 15 years old. Further, about 90% of these kids are trapped for life, going into electronics or communications later on as a result of their interest. If you read any magazines or newspapers, you know that Japan is way ahead of us in engineers and technicians...and unless we do something about it there will be no catching up. Well, Japan has been pushing ham radio in their high schools for years and it may be no accident that they are now ahead of us in electronics technology.

The Japanese ham magazines run whole sections of pictures of high school club activities. I wrote about this a few months ago and asked for some pictures from our clubs to encourage this type of development. I'm still waiting for the first picture. That tells me something.

Ham clubs can work with high schools to put on amateur radio demonstrations. They can help to set up clubs, with club members coming in to give talks and theory discussions. They can invite the students to come to club member stations to work some DX, RT, and other ham interests. With the present affluence of kids...and the relatively low cost of a ham station...there isn't a lot of demand for club stations any more. When I was a kid, an AM phone station of any power was a very expensive matter. Heck, the cheapest crummiest ham receiver sold for $30 (about $450 in 1981 dollarettes). I had a medium performance receiver and it ran me about $1,350 in today's Monopoly money. Of course, you had to build your transmitter then... there weren't enough hams to make it worthwhile to sell them commercially (we had only 40,000 hams). But even a modulation transformer for a 500-Watt rig cost about $5,000 in today's money. That's why club stations were popular then.

I'll be talking further with the FCC about this situation...and perhaps something can be done to even get a word into the White House about the need for hams as a genuine American emergency. If we do manage to get into another war, we don't want to have to set up defense contracts with Japan for our electronics equipment.

Just as a reminder...perhaps timely in the face of the "plain language rules" which essentially delete any reference to the reasons for amateur radio to exist as a service...one of the basic reasons for amateur radio, as stated in the old rules, had to do with providing a group of trained electronics people for times of emergency. When WWII came along, we had 50,000 hams and 80% of them went into the armed services. Yes, 80%. Many of these hams went right into military training schools to teach civilians the basics of radio and radar. My class at the Radio Materiel School on Treasure Island, as I have mentioned before, had virtually 100% ham instructors...and a bunch of hams in the classes. That was a super school.

Well, we don't have a war coming up...I hope...but we do have economic warfare right now and it is going strong. This is a war that we are losing. We have already fallen so far behind in our electronics troops (engineers and technicians) that even at a 33% growth rate of hams it will take us until 1990 just to catch up to Japan.

AFRICA IN PERSPECTIVE

Having visited a number of African countries...and boned up on most of the rest of them through books, talks with hams who have worked in them, or via letters from hams living in them...I think I have a good grasp of the overall situation. It is not comforting.

In a great many of the countries, you have an educational situation which has no good solution. After generations... hundreds of years...of tribal living, where the women did most of the work and the men hunted now and then, there is a strong resistance to either work or education on the part of the men.

The next problem is one of leadership. With educational levels so low, there is not a lot of communications between people and thus it is relatively easy for a small group to take over a country. Once in power, they have two main objectives...to stay in power and to get as much out of it as quickly as possible. In one country after another, I've seen aid money from other countries going into the Swiss bank accounts of the rulers and their close buddies...with little ever getting to the people. The rulers have no incentive to make long-range plans to help the country be-

cause they know they will not be around to reap the benefits.

This is not a good situation from the ham point of view because if we are going to get hams in these countries, we are going to have to start with relatively well-educated people... and there are very few of these. Then we are going to have to try to interest these few people in amateur radio and spending the time to get further education in electronics... all without any help from the government. Further, a ruling regime really doesn't want a bunch of people who are able to have private communications because that makes it too simple for them to plot to take over the country or to organize terrorist acts.

Those of you who have been reading my editorials for any time know that I'm an optimist and that I try to think in terms of solutions to problems. Well, here's one where I have no solutions. I see all but one or two countries in Africa (out of 57) going downhill... away from civilization. That doesn't provide much of a prospect for the development of amateur radio.

KAHANER REPORT

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JUST ONE WORD

Like that salesman in the movie "The Graduate," I just want to say one word. No, not plastics.

Deregulation.

It's in the stars for ham radio.

The FCC is on a hands-off kick, not just for amateurs, but for those in all other services: broadcast, common carrier, CB, marine, even business radio. The attitude change was inevitable, and I wish I could say it stemmed from some great karmic enlightenment by the Commission. It didn't. it reflected the FCC's only logical response to rapidly changing technology and, to a lesser extent, a citizenry tired of petty rules.

At one time, conditions forced the FCC to keep a close watch on the airwaves. Unsophisticated radio gear, splattery transmitters, and unselective receivers made everyone's life miserable. Without meaning to do so, communicators and broadcasters continually interfered with each other.

Then came the technology boom. You pulled a switch and talked. You twisted a dial and your receiver picked up only one station, eliminating those around it. Your TV sported automatic fine tuning. All that technology forced the FCC to look at things differently. Not immediately, mind you, but the Commission did finally respond.

For instance, the FCC recently ended the once necessary requirement that a First Class licensee be on hand at a radio or TV station. Unless you're a broadcast engineer who worked like crazy to get his license, you'll have to agree that the ticket really isn't necessary. You turn the station on; you turn the station off. The newer high-technology transmitters rarely go blooey anymore. No need to watch it out of your eye corners. And when major trouble occurs, you call the serviceman. His pocket beeper ferrets him out quickly, even in the deepest, darkest saloon.

The same goes for telephones. AT&T convinced the FCC that no one should be allowed to interconnect any device—such as automatic answerers or speed dialers—to their telephone lines because it would degrade the system. Only Western Electric, Bell's supplier, knew how to build equipment good enough for the sacred network, said AT&T. The FCC bought that argument for quite a while until it finally realized that others could build stuff just as technically sophisticated as Western Electric. It deregulated that part of the common carrier rules now permitting you to connect equipment to your telephone as long as it meets certain specifications.

And while the FCC got comfortable relaxing rules spurred by technology, It embarked on deregulation not necessarily caused by state-of-the-art advances. Radio broadcasters, for example, don't have to adhere anymore to rules which prescribe how much public service time they must air each week or how many commercials they send each hour. It's now up to each station.

Deregulation fever is spreading throughout amateur radio. Several years ago the FCC relaxed rules on log-keeping, mobile identifications, and a few other small items. Everyone seemed to like the changes except some old-timers and, interestingly enough, some just-weaned hams. For reasons only a PhD in sociology understands, these people feel cozy with constrictions and revel in restraints.

No matter; deregulation is in full swing, and a just-released FCC report gives us great insight into where the deregulation future lies for hams.

Now, I'm not much on government reports. Sure, some of them make fun reading, like the GAO studies that show how Congressmen pay two bucks for a haircut because their barbershops are taxpayer subsidized. But this isn't always the case. Most government reports remain dull and dry.

Not so with the FCC report titled "Deregulating Personal and Amateur Radio." It's from the Office of Plans and Policies, the closest thing the FCC has to a think tank. They form projections, raise questions, and suggest innovative, often radical answers to old, crusty problems.

Keep In mind they didn't just issue a "report." That's too banal for OPP. It's officially dubbed a "working paper."

Despite the high-brow moniker, it's written simply, presented so an FCC commissioner can understand it. Although authors Alex Felker and James Brown warn that: "The opinion expressed In this paper is the authors'. They do not necessarily reflect the policies or views of the FCC or any other organization or individual," we know who signs their checks. They're on the same floor as the FCC commissioners.

One of the main points of this 70-page report is that the FCC should eliminate minor rules partly because of new technology, partly because it would encourage new technology.

The paper said: "A number of regulations seem inconsistent with the goals of the amateur radio service. They probably no longer serve any useful purposes either because of technological advances or because they were based in the first place on overly pessimistic predictions of trouble that might arise. Although individually these regulations are not serious constraints to goal achievement, collectively their impact might be significant."

For example, the authors suggested the FCC drop restrictions on automatic repeaters. They indicated that equipment is reliable enough, and the state-of-the-art advanced enough, that any problem—such as a stuck transmitter which so terrifies the FCC—could be handled with little trouble. The present restriction, they said, prevents experimentation with spectrum-efficient techniques such as packet switching, electronic mailboxes, and other digital modes.

One reason the FCC dragged its red-taped feet on allowing hams to send ASCII was that it couldn't monitor transmissions. That argument never held water, the paper suggested, because hams are generally self-regulating, and besides, the FCC hardly listens anyway.

Unfortunately, that same concern still permeates the Commission. When the FCC met earlier this year to discuss whether hams should be allowed to use the new mode known as spread spectrum, Commissioner Abbott Washburn, at first, objected. He said that because the FCC couldn't monitor spread-spectrum transmissions, some hams might operate illegally.

Fortunately, Jim McKinney (who was then Chief of the Field Operations Bureau, now Chief of the Private Radio Bureau) quelled his fears and said hams could be trusted. Subsequently, the Commission Issued a notice of inquiry; comments are welcomed and encouraged.

The report emphasized that

the Commission bears responsibility for slowing technical progress. It stated: "If there is criticism of amateurs from not being more technically advanced, it might be misdirected. Perhaps one should place some responsibility on the regulations, not the licensees. Substantially more regulatory flexibility than the service now has would be desirable."

The report also said that the FCC should relax identification requirements to allow amateurs greater opportunity in using new modes without having to sign on and off in Morse code or voice. Some other suggestions included giving Technicians expanded privileges, establishing a digital license (no Morse code needed), and permitting repeaters below 10 meters. In conclusion, the paper said: "It may be too much to ask that regulation take strong affirmative steps to develop new technologies and other new approaches for personal radio. It is not, however, too much to ask that regulation simply not stand in the way of the new."

The paper recommends that the FCC remember one word. Deregulation.

(Copies of the working paper "Deregulating Personal and Amateur Radio" are available from the Office of Public Affairs, FCC, Room 227, 1919 M St. N.W., Washington DC 20554; (202)-254-7674.)

RTTY LOOP

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It seems as though interest in RTTY has never been higher. Maybe it's the time of year; maybe the computer revolution has something to do with it. I like to think that this column played a significant role in the introduction of RTTY to hams who might otherwise have missed out on this great mode. This month, I am going to respond to the large number of newcomers who have addressed the question of entry into RTTY, particularly using a computer or video-based terminal.

I have a letter here from Zacharias Liangas, who reads *73* at his home in Thessaloniki, Greece. He is interested in RTTY but has several questions regarding RTTY that help to illustrate some basic points.

Zacharias' first question asks for a definition of RTTY and how that differs from SSTV. I think that the confusion in your mind comes from the fact that both modes are transmitted using similar techniques. But there the similarity ends. To begin with, let's look at RTTY. Radioteletype, abbreviated RTTY, is a method of encoding data describing alphanumeric characters by defining two discrete states of a carrier frequency. Since each character is defined by a number of bits, five in the case of Murray code and eight with ASCII (which we shall discuss later), and each bit may be in one of two states—on or off—so the frequency shift is defined. The on state is termed "mark" and the off state is "space." Arbitrarily at first, and later through legislation, what these exact frequencies may be has been well defined.

Looking at audio frequency shift keying, an audio tone of 2125 Hz is normally used as the mark frequency. During the transmission of one character, the frequency is abruptly changed, in step with the pattern of bits defining that character, to the space frequency. Using the long-standing standard of an 850-Hz shift, or difference between mark and space, this would yield a 2975-Hz tone on space. These days, narrower 170-Hz shift is used; in this case, the space would be 2125 + 170 = 2295 Hz.

I realize that this is a very brief explanation of radioteletype, but the thing to keep in mind is that the carrier frequency changes state *abruptly* from mark to space and back again. This shift is in tune with a bit pattern that defines each character to be sent.

Now, SSTV stands for Slow-Scan Television, and, while it also is sent by frequency shift keying, it is an entirely different animal. A television picture is produced by a scanning beam of electrons sweeping across a cathode ray tube, covering the entire viewing surface in one-thirtieth of a second. The intensity of that beam is modulated in order to produce a picture and the faster the beam travels, the faster the modulation must vary in order to keep up, if you will, with the traveling beam. A faster beam thus requires a higher modulating frequency, and commercial TV signals approach four megahertz in bandwidth requirements.

But, if you slow the scan rate so that it takes, say, several minutes to cover the screen, then you can slow the modulating waveform down accordingly, and with it reduce the bandwidth. That is exactly what SSTV does. By sending one picture every eight minutes, rather than thirty per second, the modulating frequency is reduced to the point where it may be superimposed upon an audio carrier. The carrier is then shifted in frequency in order to encode the level of modulation, much as the RTTY signal is shifted. But here, rather than being only on or off, the frequency may vary anywhere between the mark frequency, here defining a black screen, and space, for white.

Now there are some problems. For example, if you sent an SSTV signal out and used a RTTY signal to modulate the carrier, you would be sending out a form of RTTY in SSTV's clothing. That scheme was described recently in *73* as a permissible way to send ASCII over the air before it was fully authorized. But let's avoid the exceptions and deal with the general case, OK? For the sake of this discussion, RTTY is for sending text to a teleprinter and SSTV sends pictures to a TV monitor. Fig. 1 is an attempt to show the mechanics of this transition in graphic format.

Zacharias' next question relates that several shortwave receivers have a RTTY position on their panels. He wonders what that is for and if it is usable on RTTY. Well, recall that we said that RTTY is sent with audio tones. If you put these audio tones into a well-designed sideband transmitter, what would come out over the air would be an rf carrier, shifting in frequency, exactly analogous to the shifting audio tones. This is called FSK, or frequency shift keying, and requires a beat frequency oscillator (bfo) for reception, just as receiving CW does. That is all that RTTY position means, that there is a bfo present which can supply the missing audio tones. It really says nothing about the stability of the receiver, which is vital to its use on RTTY, and assumes the availability of RTTY receiving equipment, such as a demodulator and printer.

The third question deals with a matter of confusing words, in which confusion Zacharias is not alone. He asks what the difference is, or relationship between, baud and Baudot. Let me deal with the second word first. Baudot is the common name for the five-bit code we use on RTTY. This code is more properly called the Murray code, or even better, the International Telegraph Alphabet No. 2. But Baudot it has been for forty years, and we try to go with the tide.

Baud is an entirely different matter. Data transmission is measured in a speed related to bits per second. That measure, bits per second, is called "baud." In the case of standard ham-version 60-wpm RTTY, that is 45.45 baud. This derived from the length of one data pulse, 22 ms. If one pulse is 22 ms, then there are 1/.022 = 45.45 pulses per second, or baud. Simple, no?

Another newcomer, Avery Comarow W4OGK, from Great Falls, Virginia, writes of his problems with FSK vs. AFSK input to a sideband transmitter. If you look at the spectrum of SSB

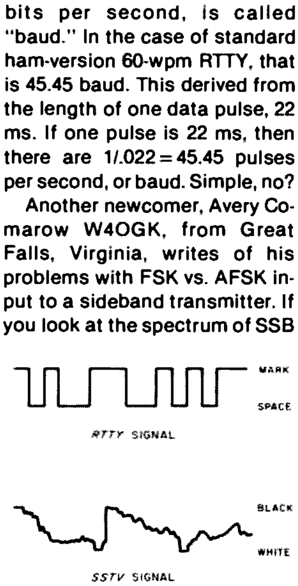


Fig. 1. RTTY vs. SSTV.

transmitters being marketed, you will quickly gain an appreciation of why AFSK is so popular. Many of these rigs either have sealed vfos or have circuits difficult to shift and still maintain stability. That makes a manufacturer of interfacing equipment nervous. So, for such a manufacturer, the most straightforward way to interface with the vast number of rigs out there is to provide a signal that any transmitter can accept—audio. They assume, and you should ensure, that any spurious emissions should be down far enough so as to be legal and not cause trouble.

My advice is that if it is not too much work to directly frequency-shift your transmitter, do it. I think the results are better, and there is less chance of difficulty. By the way, if you do use audio tones, remember to use *lower* sideband to transmit. Audio tones are normally high space, low mark. Using lower sideband reverses this relationship into the common FSK standard low space, high mark. That means that even on twenty, where upper sideband voice prevails, use lower for RTTY.

Avery asks another question which I think the readers of this column might be able to help with. He is looking for objective information on the HAL ST-6000 demodulator. Unable to find any reviews on the TU, he is unwilling to buy it without some impression of the unit. All I can say is that the ST-6000 has a good heritage, through the ST-6 line, and that, examining the manual, it looks like a good demodulator. I certainly would be interested in hearing from users of the ST-6000, pro and con.

A lot of the information covered this month is basic and entry level. The need for more up-to-date material is strong, and there is a new source for this information. Soon the *73* Bookshop section of this magazine will carry the announcement of the *New RTTY Handbook*, about to be published! Containing all kinds of circuits and data, this book covers the gamut of RTTY, from circuit diagrams of machines to computer programs for operating RTTY on the air. Watch for it!

Last December I covered some gift ideas for the RTTYer. I have received quite a few comments on that; watch next month for some more ideas here, in RTTY Loop.

NEW PRODUCTS

DAIWA ANTENNA TUNERS

Daiwa announces two manual antenna tuners for the ham that refuses to compromise on quality!

The CNW-518 is a lightweight, rugged tuner rated at 2.5 kW (PEP), 1 kW CW (50% duty). It will match unbalanced lines from 10 to 250 Ohms impedance and features 80- through 10-meter coverage including the new WARC bands. Attractive styling and planetary gearing provide operating ease and pleasure. Insertion loss is less than .5 dB.

The CNW-418 is rated at 500 Watts (PEP), 200 Watts CW, and incorporates the same features as the CNW-518 except planetary gearing.

Both manual tuners feature the unique Daiwa cross-needle meter that shows forward power, reflected power, and resultant swr at a single glance. Maximize your antenna system performance with these new Daiwa tuners! For more information, contact *MCM Communications, 858 E. Congress Park Drive, Centerville OH 45459*. Reader Service number 479.

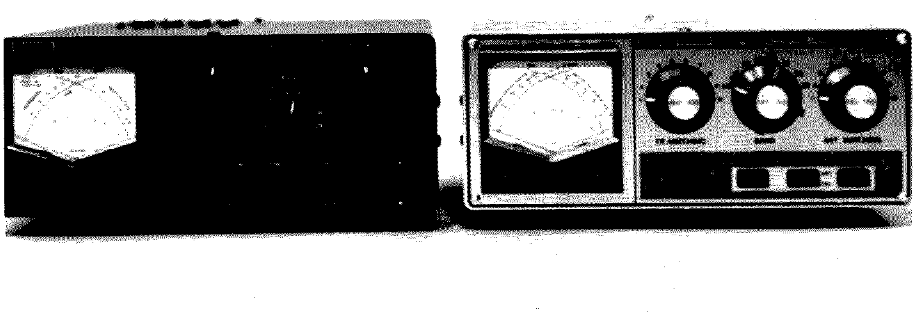
MANHATTAN SOFTWARE'S QSO LOG

Manhattan Software's newest release, QSO LOG, will guarantee a reputation for a phenomenal memory for amateur radio operator users. When the operator hears a callsign on the air, he types it into his TRS-80, and all the details of the last contact with his fellow ham flash onto the screen. Written by a ham/computerist, the program has won high praise from hams who have tested it.

QSO LOG remembers all the details—call, name, QTH, date, time, band, RSTs, and notes on the conversation and the contact's equipment. The 16K version holds 70 QSO records and the 32K version holds 190. The program dumps to tape, loads from tape, and allows on-screen review of all QSO records, updating of contact information, editing, and deletion of entries.

Printout is available, with calls sorted by country and US call area, in notebook format for punching and retaining in a 3-ring binder. A disk version will be available in the near future, with immediate random access to QSOs in a disk file and with a much larger capacity for storing calls and QSOs. The cassette version (16K or 32K) will run on Model I or III and is available through dealers or direct from Manhattan Software.

For more information, contact *Manhattan Software, PO Box 1063, Woodland Hills CA 91365*. Reader Service number 485.



Two manual antenna tuners from Daiwa.

SIMPLE TUNER

Simple Tuner is a RTTY tuning aid that uses an array of LEDs to indicate the presence and the frequency of audio tones. The array is organized in 3 rows and 4 columns, each column indicating a different frequency. The first column indicates 2125 Hz, the second 2295 Hz, the third 2550 Hz, and the fourth indicates 2975 Hz. The top and bottom rows are used to show when the tone is too low or too high, and the center row indicates "just right."

This ability to instantly identify 170-Hz, 425-Hz, and 850-Hz shifts, together with the ability to *see* which way to tune your receiver, makes Simple Tuner a tremendous asset to any RTTY station. With practice, you can usually tell whether the signal is "rightside up" or "upside down." Since hearing the tone is not necessary, deaf hams and those with severe hearing loss can now enjoy RTTY.

Simple Tuner is completely external to your TU and requires only audio from your receiver and a simple +5-V and ±12-V regulated power supply. (If you wish, you can use ±12-V

unregulated if you use Simple Tuner as a standalone unit.) The circuit board measures 5" × 7.5". Simple Tuner is designed to mount directly to the front panel of a cabinet and is compatible with the "SS-20" bus.

After a year of continuous use and having shown this unit to many hams and using their input, we are convinced that Simple Tuner represents a real breakthrough that can benefit anyone active in RTTY. For more information, contact *Inotek Engineering, PO Box 110, Spanish Fork UT 84660*. Reader Service number 478.

CURTIS 8044B KEYER CHIP

Not all Morse operators realize there are two basic types of iambic operation used in modern electronic keyers. Type A, offered by the standard Curtis 8044, does not produce a following alternate element when a squeeze is released during an element (an element is a dot or dash). Type B, employed in keyers from AEA, Ten-Tec, Nye, Heath, and others, does produce a following alternate element after squeeze release. For example, in a type A instrument, squeeze release during the dah in the letter "A" will produce just the "A". In a type B unit, the same action will produce an "R". Similarly, in an "N", squeeze release during the dit produces an "N" with type A and a "K" with type B units.

In order to provide for both user groups, Curtis Electro Devices has designed a new IC called the 8044B (8044BM if the speedmeter function is included). Priced the same as the standard 8044 (and 8044M), the new chip is pin-for-pin compatible and can be used in any existing 8044 socket (or 8043 socket with slight modifications). This is good news for operators who trained on the type B models.

For further information, contact *Curtis Electro Devices, Inc., Box 4090, Mountain View CA 94040, or call (415)-494-7223.* Reader Service number 484.

SHACK DESK FROM RICKER

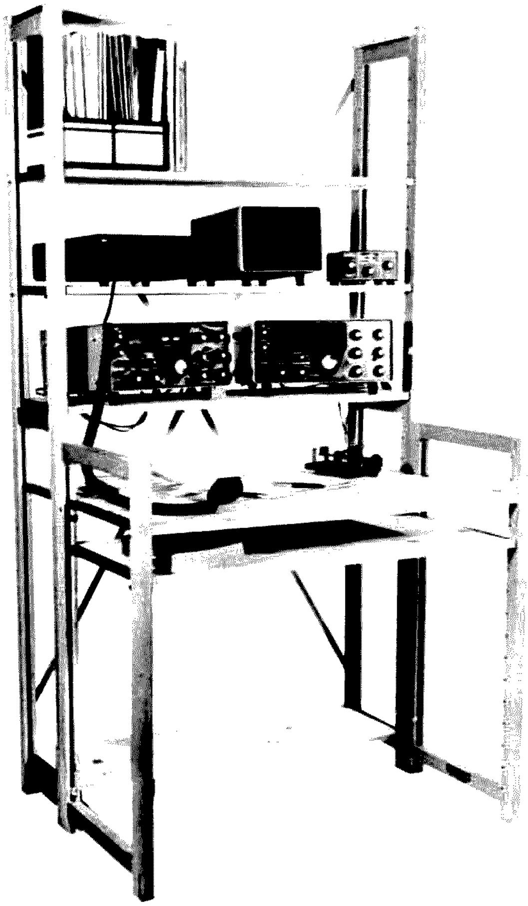
Ricker Equipment, Inc., of Fort Wayne, Indiana, has introduced a new and unique operating desk for use with ham radio equipment and computers called "Shack Desk." It makes use of the space above desktop level more than any other unit on the market.

The Shack Desk is made of wood, with prefabricated uprights and lumber shelves. The shelves are edge-glued, solid lumber designed to carry ham gear weight loads, including linear amplifiers. The standard Shack Desk provides a desktop 30" deep by 36" wide, with 4 shelves above the desktop that are 12" deep and 36" wide. A second 18"-deep shelf 36" wide under the desktop level provides handy storage for reference material. All shelves are vertically adjustable on 2" centers for position, including the desktop level.

The unit is completely open construction at the sides and back for maximum air circulation. Shack Desk offers a fine solution to hams who are working under crowded conditions, making it possible to go up rather than to spread outward.

For hams with plenty of space, the unit is also available 42" wide or in double wide units of 72" or 84". An optional side shelf unit may be attached to the desk with 12"-deep shelves top to bottom. These can be used for additional equipment and/or a technical library. Hams with large equipment will appreciate the unit with deep desktop and shelves—the upper shelves are 18" deep and the desktop is 36" × 36". Shack Desk is sold unfinished with the particular finish left up to the individual user, but it is a simple job to put a finish on any unit.

For further information, contact *Ricker Equipment, Inc., PO Box 12304, Fort Wayne, IN 46863; (219)-745-0825.* Reader Service number 488.



Shack Desk from Ricker Equipment, Inc.

DRAKE ESR24

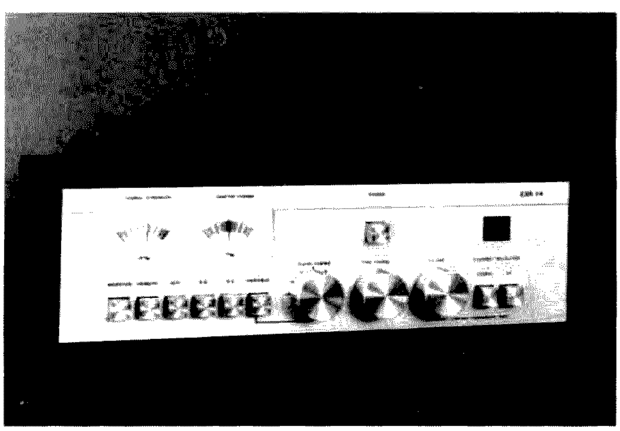
The ESR24 Earth Station Receiver has been introduced by the R.L. Drake Company, Miamisburg, Ohio. This 3.7-4.2 GHz receiver is designed for satellite television reception and features digital channel display, preset and variable audio subcarrier selector, afc for stability, and full metering. For installation versatility, the downconverter module (supplied) may be mounted internally or at the antenna. Accessories for the ESR24 include a remote control, a remote tuning meter, and splash-proof housing. Attractive styling makes the ESR24 suitable for commercial or private installations.

For more information, contact *R.L. Drake Company, 540 Richard Street, Miamisburg OH 45342.* Reader Service number 482.

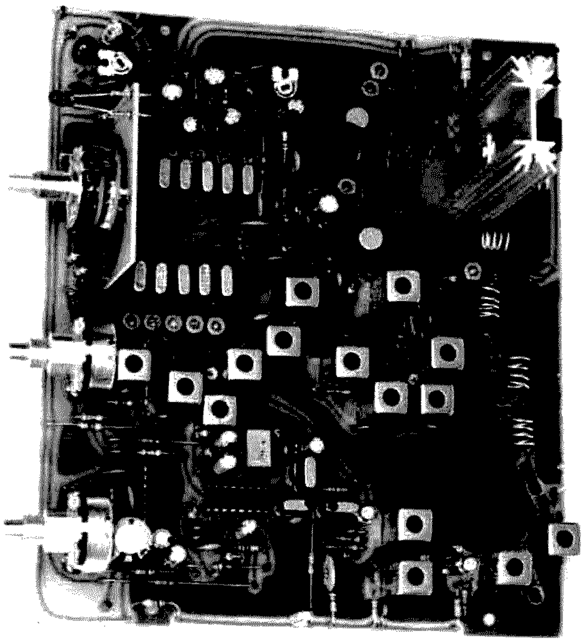
MFJ-1200 CW COMPUTER INTERFACE

The new MFJ-1200 CW Computer Interface converts audio from your receiver to TTL or RS-232 so your computer can "understand" it. It also lets your computer key your transmitter.

When combined with a personal computer and appropriate



ESR24 from R.L. Drake.



Complete Hamtronics VHF FM transceiver all on one PC board.

software, the MFJ-1200 can give you a complete and versatile CW keyboard/reader combination.

For receiving CW, the MFJ-1200 processes the received CW audio from your rig to provide a clean computer-compatible TTL or RS-232 level signal. The MFJ-1200 limits the noise on incoming CW signals, filters it to remove interfering signals, sends the desired signal through a detection stage, post filters the detected signal (this really works to clean out interference), shapes the signal, and finally converts the level of the signal to TTL or RS-232 so your computer can use it.

For transmitting CW, the MFJ-1200 takes keyboard-generated CW at TTL or RS-232 output levels from your computer and drives high-voltage keying circuits to key your tube or solid-state transmitter (−300 V, 10 mA max., +300 V, 100 mA max.).

The MFJ-1200 has 3 red LEDs to indicate tuning, transmit mode, and power on. A reverse/normal switch will invert the output level to the computer if desired. It operates on 6-9 V dc or 110 V ac with the optional MFJ-1309 ac supply.

The all aluminum cabinet is black and eggshell white and measures 6" × 1-3/4" × 3".

The MFJ-1200 is available from *MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762*. Reader Service number 483.

New MBA-RO from AEA.

NEW HAMTRONICS VHF FM TRANSCEIVERS

Hamtronics, Inc., well known for high quality FM transmitter, receiver, and power amplifier modules, now has a complete VHF FM transceiver all on one PC board. The new model FM-5 transceiver kit is available for the 6m, 2m, and 220 MHz ham bands and may also be used in some countries on adjacent commercial bands. It operates on up to 5 channels at 10 Watts output. The receiver uses 10 poles of i-f filtering and dual gate MOSFETs for superior selectivity and crossmod rejection.

By mounting all components, including controls and heat sinks, right on the main PC board, construction is simplified and cost is reduced. Cabinets, microphones, and crystals are readily available as options.

For further information, including a 40-page catalog of all Hamtronics kits, contact *Hamtronics, Inc., 65F Moul Rd, Hilton NY 14468, or phone (716)-392-9430.* (For overseas mailing, please send $2.00 or 5 IRCs.) Reader Service number 480.

MBA™ READER ONLY

C. Mike Lamb, President of AEA, Inc., announced that his firm is introducing a reader for Morse, Baudot, and ASCII operation. Designated the MBA-RO (reader only), he said it is a state-of-the-art device using a 32-character vacuum fluorescent alphanumeric display. Lamb said the 32-character display allows for up to five words to be displayed at one time. This extended display is especially useful during high-speed copy.

The equipment features include speed capabilities of up to 99 wpm for CW copy, 60, 67, 75, and 100 wpm for Baudot, and ASCII at 110 and hand-typed 300 baud. The MBA's designer, Dr. Alan Chandler, said the MBA incorporates automatic speed tracking, ensuring no loss of copy due to rapid speed changes in signal reception. He said the MBA requires a 12 V dc external power supply, making it ideally suitable for portable, mobile, or fixed operation.

Lamb said the MBA reader is an ideal training device because it reinforces audio copy with visual copy.

Specifications are subject to change without notice or obligation. For more information, contact *AEA, Inc., PO Box 2160, Bldg O & P—2006 196th SW, Lynnwood WA 98036*. Reader Service number 481.

MMS1 MORSETALKER TALKING CODE TUTOR

Microwave Modules Ltd. has announced a new Morse code tutor, the MMS1 Morsetalker. The Morsetalker is superior to tapes because it offers instruction tailored to an individual or group's specific needs, yet it doesn't require the presence of an instructor. The Morsetalker is a significant departure from earlier tutors in that it features a voice synthesizer which provides talkback of the Morse after transmission, allowing the student to check his copy. Importantly, the Morsetalker sends completely random code groups, eliminating memorization.

Both beginner and expert are provided for with three different character group lengths—one letter, five letters, or fifty letters (in five-character bursts) before talkback. Once the group is sent, the speech synthesizer "speaks" the letters it previously sent in Morse code. For those who no longer require speech talkback, continuous Morse can be sent.

There are six learning levels—letters only: A-F, A-M, A-U, A-Z; numbers only: 0-9; letters and numbers: 0-Z. Morse can be sent at speeds between 2 and 20 wpm. At speeds below 12 wpm, the Morsetalker employs the Farnsworth method, with the characters sent at 12 wpm and lengthened spacing between letters. A high-speed conversion is available that will send at speeds between 12 and 48 wpm.

The MMS1 is housed in a durable diecast enclosure measuring 7-3/8" by 4-3/4" by 2-1/16". Circuitry includes two micropro-

cessors, two memory chips, and a handful of other ICs and semiconductors. Jacks are available for an external speaker, tape recorder, key, and power at 9 to 13.8 volts at 350 mA. For more information, contact *Spectrum International, Inc., PO Box 1084, Concord MA 01742.* Reader Service number 487.

CUBIC ASTRO C HF TRANSCEIVER

A new HF transceiver is available from Cubic Communications. Priced and designed for military and commercial use, it should nevertheless be ideal for DXpeditioners and other hams who demand a lot from their equipment.

The Astro C is fully synthesized and covers 1.8-30.0 MHz in 100-Hz steps. Frequency selection is accomplished by a VRS scanning system similar to that on the Astro 150, keypad entry, computer control, or an accessory remote control. 100 memory channels are available and will store information on frequency, mode, sideband selection, filter bandwidth, and more. Memory channels may be programmed while the radio is in normal operation without disturbing the frequency you are actually operating on. A 24-hour clock is provided, and a lithium battery will keep it and the memories alive independent of external power for 10 years.

Modes available are full or semi break-in CW, SSB, ISB, AM, RTTY, and SSTV. The solid-state finals are rated for a 100% duty cycle and produce one hundred Watts of output in SSB and CW. The receiver includes such amenities as filters for 2.4, 1.8, and .5 kHz, as well as a 6-kHz filter for AM. A tunable notch filter allows rejection of "tuner-uppers." Frequency stability is claimed to be within .0001%, but an external standard can be used for greater stability.

Wherever ham radio takes you, the Astro C should stand up to it. It weighs in at a reasonable 42 pounds and measures 7 inches high by 17 inches wide by 17 inches deep. Operating temperature range is from −30 to 65 degrees C. It will withstand shock and vibration to MIL-STD 810C. It is weatherproof to MIL-STD 108E, and even the front-panel speaker is waterproof.

The Astro C from Cubic.

Pricewise, the Astro C is out of reach for most amateurs, but Cubic is working on a more reasonably priced ham version that retains most of the Astro C's features to be available next Spring. All indications are that Cubic intends to play a prominent role in the ham market, bringing to bear the sophisticated technology used in their military and commercial equipment. For more information, contact *Cubic Communications, 305 Airport Road, Oceanside CA 92054.* Reader Service number 486.

LETTERS

from page 73

that the more things change the more they stay the same... and the beefs don't change either. Tsk. I say balderdash to your sad list of woes.—Wayne.

F.A.R. WINNERS

The Foundation For Amateur Radio has announced the 1981 winners of the eight scholarships which it administers:

- The John W. Gore Memorial Scholarship ($900)—Brian D. Miller KA0DGT, Englewood CO;
- The Richard G. Chichester Memorial Scholarship ($350)—Allyn R. Anderson WB7RVP, Cove OR;
- The QCWA Silent Key Memorial Scholarship ($500)—Stephen Ketler WA1FWA, West Bridgewater MA;
- The QCWA Silent Key Memorial Scholarship ($500)—Gary Myers WA2CUN, Skaneateles NY;
- The Radio Club of America Scholarship ($500)—Carl H. Puckett KA7BWC, Great Falls MT;
- The Edmund B. Redington Memorial Scholarship ($500)—Craig S. Young KA5BOU, Gretna LA;
- The Young Ladies Radio League Scholarship ($300)—Clara L. Muller KA2DYC, Amsterdam NY.

These scholarships were open to all radio amateurs holding at least an FCC General class license or equivalent. This year's applications were received from 29 states, the District of Columbia, and Canada. The Foundation is a nonprofit organization representing forty-nine clubs in Maryland, the District of Columbia, and northern Virginia. It is devoted exclusively to promoting the interest of amateur radio and to the scientific, literary, and educational pursuits that advance the purposes of the Amateur Radio Service.

Information regarding the scholarships to be awarded next year will appear in the April or May issues of the major amateur radio publications.

Hugh A. Turnbull W3ABC
College Park MD

HAM HELP

I wish to express my thanks for putting my request for a power supply and schematic for a AN/PRL9 in your Ham Help section. I was not aware of such a service and I did not request it to be done. I was surprised to get a letter from Bob Bennett, Las Cruces NM, telling me of his power supply for a AN/PRL9. He is going to send me the schematics for it.

Since I'm not a ham, such a help section is very handy to have, especially to me. Again, thanks for your interest.

Dick Howe
Wesleyville PA

MEETING THE CHALLENGE

Referring to the TVRO challenge (page 6, September): Yes, by all means let's get deeper into this interesting part of electronics. Your July issue with the fine story and photos of the Turks & Caicos Island installation of Coops was tops...

Now let's see a flood of TVRO "how to" articles—and while you are at it, how about some 2300 MHz antennas and downconverter construction articles?

Wilbur T. Golson W5CD
Baton Rouge LA

We are ready. How about you?—N8RK.

KL7 SCHOLARSHIPS

The Anchorage Amateur Radio Club is proud to announce that it has established two scholarships—one each at the University of Alaska, Anchorage, and at Anchorage Community College. Each scholarship is for $500/year and will cover tuition and fees for two semesters. The scholarship at UAA is open to all applicants, with preferential consideration going to hams or those active in amateur radio. The one at ACC is likewise unrestricted, although preference will be shown for students in electronics technology.

The club has recently estab-

lished a special scholarship account, with the intent of permanently endowing the scholarship program. At this time, most of the funds come out of the general operating budget of the club. We would like to change that so the interest earned on a special account will cover scholarship costs and have moved toward that objective. While the club members are justly proud of this accomplishment, we would like to invite others to join us in this worthy cause. Any donations received will be placed in the scholarship account and the interest earned from the account will help provide college-level education to young people.

The AARC cordially invites you to join us in this effort. Other clubs might want to help us or even to establish such a scholarship of their own. Individual hams may want to contribute to their local club programs or even to the program here in Anchorage. In any case, the cost is small, but the rewards are great. Contributions may be sent to the address shown below. The club is a tax-exempt organization but cannot accept contributions that are tax deductible.

Imagine having someone in a full and rewarding career who will always remember that radio amateurs helped make that possible.

Steve Norrell KL7IYX
Member, Board of Directors, AARC
5018 Knight's Way
Anchorage AK 99504

HAM HELP

I would like to convert a Knight T-60 6-80m transmitter to sideband operation. Any information about this mod would be appreciated. Also, if anyone needs a Knight T-60 manual for his set, he can contact me.

Kevin Neal
Rte. A, Box 221A
Flippin AR 72634

I would like to purchase several 7094 transmitting amplifier tubes or receive information on where they can be purchased.

Tort Isaacson KØHQW
65 Dellbrook Ct.
O'Fallon MO 63366

I would like to get in touch with hams in Salzburg, Austria. Let me know the frequency, GMT, and date to meet you on the air. I am now waiting for my Novice license, and by the time you read this I should have my General class.

I would also like to get in touch with anyone who has made a weather radar receiver and weather satellite receiver, and anyone who has converted a 40-channel SSB CB to 15 meters.

K. C. Walker
Route 3, Box 97
Rocky Mount NC 27801 USA

Help! Help! I need a schematic for an NCX-5. Thanks.

Kay Clausen WH6AGA
73-1161 Mahilani Dr.
Kailua-Kona HI 96740

Although I am not an amateur operator yet, I would be very grateful for any information on the BC-348-Q, an Army Signal Corps receiver that was used during World War II. I am trying to get one of these going after 40 years of inactivity in a musty, wet basement, for use as a first receiver. I am particularly interested in a schematic and in operation instructions. Does anyone know whether any of this information is available? All I know is that these receivers were for sale as surplus after the war from ads in a postwar radio magazine called *Radio News*. As I said, I would appreciate any information or references from anyone familiar with this piece of equipment.

Steven Lapinskas
University of Lowell
PO Box 2029
Lowell MA 08154

I would appreciate any suggestions on how I could remove the glass lens from an automobile headlight in order to use the remaining reflective surface for solar energy experiments. For safety precautions, I broke the vacuum seal located in the back of the headlight.

Marvin Rosen N3BQA
20 W. Madison St.
Baltimore MD 21201
(301)-685-6308

Has anyone converted the "global" program for calculating the distance between your QTH and any city in the world as described in the December, 1977, *73 Magazine* (page 106) for use with the Radio Shack Pocket TRS-80? The Pocket-80 won't handle 2-letter, or letter-numeric (i.e., AB, 2A) string variables, among other things. Any ideas/help will be appreciated.

Gary Payne KE6CZ
1347 E. Dakota
Fresno CA 93704

I am looking for an CU-286/FRR-33 antenna coupler to complete an AN/FRR-33 radio receiving set. Can someone help me?

Roberto Pieraccini
Via Vittorio Veneto 66
51013 Chiesina Uzzanese
Italy

OSCAR ORBITS

TUNING IN TO OSCAR 8

OSCAR 8 is the only amateur satellite available for everyday communications. Using the satellite for two-way contacts requires a 2-meter signal of about 100 W ERP. This can be achieved either by using a linear amplifier or by erecting a high-gain antenna which is movable in both azimuth and elevation. Such complexities are unnecessary, however, if you simply want to listen to OSCAR 8. In fact, listening to OSCAR 8's 10-meter downlink is a fairly simple procedure and an excellent introduction to the fun of satellite communications. The satellite operates in Mode A (10-meter downlink) on Monday, Tuesday, Thursday, and Friday. The only equipment required is a receiver capable of tuning the high end of the 10-meter band and an omnidirectional antenna or dipole for 10 meters. You will also need some idea of when the satellite is in range. The simple method outlined below will help you determine when to listen for OSCAR 8, and it requires nothing more than a pencil, paper, and a pocket calculator. The method works satisfactorily for all locations in the northern hemisphere.

WHEN AND WHERE

The first step in using the data in the chart of orbital information on this page is to divide a sheet of paper into three columns labeled "Orbit No.," "Time," and "Crossing." Select a day that OSCAR 8 is scheduled to be in Mode A, and write the corresponding orbit number from the chart in your first column. Then get the time and equatorial crossing longitude from the same row of the chart and write them in the second and third columns. You should now have one row of data on your paper, the same data found in the chart for the date you have selected. At this point, you are ready to calculate the equatorial crossing time and longitude for each orbit of the selected day. A pocket calculator will be helpful for this, but even so, the process will be time consuming. We all must make sacrifices in the name of progress!

Now, add 1 to the orbit number and write the result just below the first orbit number. Add 103 minutes (1 hour, 43 minutes) to the original time in row one and write the result in column two of the second row. Finally, add 26 degrees to the longitude in row one and write the result in column three of row two. You should now have two complete rows of data in the homemade table you are constructing. Repeat this procedure, adding 1, 103, and 26 to the most recent numbers in columns one, two, and three until the total in column two exceeds 2400 hours, indicating that you have reached the end of one day's calculations. Whenever the total in column three exceeds 360, simply subtract 360 from the number before writing it into the table. There should be 14 or 15 rows of data in your completed table.

What you have just done is to develop a table showing the orbit number, crossing time, and equatorial crossing longitude for each orbit in the selected day. In essence, you have filled in the gaps in the charts printed in the magazine, which show data for only the first orbit of the day. A new table must be created for each day you plan to listen for OSCAR 8.

We are almost ready to choose a time for listening to OSCAR 8, but you must first determine your longitude. This is easily done by consulting a road map, most of which show longitude and latitude around the perimeter. Now examine your homemade table. Scan the third column, looking for crossing longitudes which are between approximately 10 degrees west of your longitude and 35 degrees east of your longitude. You should find two or three suitable longitudes in your table. When you find them, go across to column two and circle the times corresponding to these longitudes. On the day in question, those are the best times to start listening for OSCAR 8. If you live near the equator, you will begin to hear the satellite a few minutes before the calculated time, while more northerly listeners will hear it after the calculated time.

This is a relatively crude calculation, but it should allow you to hear OSCAR 8 reliably. It is important to remember that the satellite operates on Universal Time (UTC). Thus, when we speak of Monday being a Mode A day, we are referring to Monday UTC, not Monday local time.

WHAT YOU'LL HEAR

The OSCAR 8 10-meter downlink spans the frequency range from 29.400 to 29.500 MHz. A Morse telemetry beacon on 29.400 MHz transmits continuously at 20 wpm, sending coded information about the condition of the satellite. The telemetry consists of several groups of three digits each. Listening for the telemetry beacon is a good way to be sure you are hearing OSCAR 8 and not some other amateur activity on the same frequency.

When the satellite is in range, you will hear many QSOs in progress simultaneously in the 100 kHz that comprises the communications passband. Although satellite users tend to stick to a band plan which calls for CW at one end of the passband and SSB at the other, there is considerable mixing of the modes. OSCAR contacts tend to be short, since the satellite is in range for a maximum of only 20 minutes.

If you have 435-MHz receiving capability, try listening to OSCAR 8's Mode J transponder. Its downlink is 435.100 to 435.200 MHz. Mode J is activated on Saturday, Sunday, Tuesday, and Friday (note that OSCAR 8 is in Modes A and J simultaneously on Tuesday and Friday). The Mode J telemetry beacon can be found at 435.090 MHz.

You may have noticed that Wednesday is not mentioned as either a Mode A or Mode J day. This is because Wednesday is set aside for special experiments and the satellite is not available for normal communications use, although you are welcome to listen to the day's activities.

When listening to OSCAR, you will notice that the frequency of the transmissions from the satellite is constantly changing. This is the famous Doppler shift, caused by the high relative velocity between you and the satellite (thousands of miles per hour!). You will need one hand on the tuning knob almost continuously during an OSCAR 8 pass.

OSCAR represents an exciting opportunity to learn and perfect a new communications technique, and listening will get you started. For more information about amateur satellites, write to the Amateur Satellite Corporation (AMSAT), PO Box 27, Washington DC 20044.—WB8BTH.

ORBITAL INFORMATION

OSCAR 8 ORBITAL INFORMATION FOR NOVEMBER

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
18645	1	0107:45	79.3
18659	2	0111:36	80.3
18673	3	0115:27	81.2
18687	4	0119:18	82.2
18701	5	0123:09	83.2
18715	6	0127:00	84.1
18729	7	0130:51	85.1
18743	8	0134:41	86.1
18757	9	0138:32	87.0
18771	10	0142:23	88.0
18784	11	0003:06	63.2
18798	12	0006:57	64.1
18812	13	0010:48	65.1
18826	14	0014:39	66.0
18840	15	0018:30	67.0
18854	16	0022:21	68.0
18868	17	0026:12	68.9
18882	18	0030:03	69.9
18896	19	0033:54	70.9
18910	20	0037:45	71.8
18924	21	0041:36	72.8
18938	22	0045:27	73.7
18952	23	0049:18	74.7
18966	24	0053:09	75.7
18980	25	0057:00	76.6
18994	26	0100:50	77.6
19008	27	0104:41	78.6
19022	28	0108:32	79.5
19036	29	0112:23	80.5
19050	30	0116:14	81.4

OSCAR 8 ORBITAL INFORMATION FOR DECEMBER

ORBIT #	DATE	TIME (GMT)	EQ. CHOSSING (DEGREES WEST)
19064	1	0120:05	82.4
19078	2	0123:56	83.4
19092	3	0127:47	84.3
19106	4	0131:38	85.3
19120	5	0135:29	86.3
19134	6	0139:20	87.2
19147	7	0000:03	62.4
19161	8	0003:54	63.4
19175	9	0007:45	64.3
19189	10	0011:36	65.3
19203	11	0015:27	66.2
19217	12	0019:18	67.2
19231	13	0023:09	68.2
19245	14	0026:59	69.1
19259	15	0030:50	70.1
19273	16	0034:41	71.1
19287	17	0038:32	72.0
19301	18	0042:23	73.0
19315	19	0046:14	73.9
19329	20	0050:05	74.9
19343	21	0053:56	75.9
19357	22	0057:47	76.8
19371	23	0101:38	77.8
19385	24	0105:29	78.8
19399	25	0109:20	79.7
19413	26	0113:11	80.7
19427	27	0117:02	81.6
19441	28	0120:53	82.6
19455	29	0124:44	83.6
19469	30	0128:35	84.5
19483	31	0132:25	85.5

DX Guide *from page 80*

and WAE Contests, two of the major DX events of the summer months.

The most disturbing part of *The Complete Idiot's Guide to DX,* however, is the inclusion of five pages describing the various sorts of turkeys which inhabit our DX bands. Unfortunately, any DXer finds out about these birds soon enough, and there is no reason to spend this much space airing our dirty laundry and unnecessarily discouraging those who haven't yet found out that the gobble of most turkeys is much worse than their bite. A word of warning would be sufficient; Gregg indulges in overkill in his description of "Amateuris Vulgaris."

We have been assured that the second edition of the book, which should be available shortly, tackles most of these problems.

This book doesn't have all the answers. If you're looking for tail-ending techniques or want to know split-frequency tactics, you'll have to find them elsewhere (preferably by listening to how the big guys do it). But if you want to start out in DXing as painlessly as possible and would like to know at least some of the rules before you join the game, *The Complete Idiot's Guide to DX* will be a very worthwhile investment.■

Micronta *from page 92*

you want to measure (dc volts, ac volts, dc current, or resistance—and a few offer ac current scales). Then you need to select the range within that function, and you might have five or more ranges for some functions. Furthermore, you must have the probe polarity correct for dc measurements or the meter will indicate an error, forcing you to reverse your test probes—a nuisance at best.

The new Radio Shack Micronta LCD Auto-Range Digital Multimeter offers many of the newest DMM features in an under-$100 instrument. A single four-position selector knob allows you to measure dc volts, ac volts, resistance, or dc current with a large 3½-digit floating-decimal-point LCD readout. As you make the measurement, the decimal point moves to the proper position, automatically setting the proper range. You can measure up to 1000 volts on dc, 500 volts rms on ac (accurate to about 15 kHz), dc current up to 200 milliamperes, and up to 2 megohms of resistance. If the test probes are connected "backwards" (reversed polarity), the display shows a minus sign, but the actual readings are unaffected. If you go over-range, the display goes blank except for a "1" on the left side.

A range-hold feature, usually only found on more expensive auto-ranging DMMs, allows you to freeze the decimal point location for additional reading within that range. This saves the time normally required for the meter to seek the correct range. The range-hold feature is enabled by moving the on-off switch to the range-hold position when the desired decimal-point location is displayed. This feature works for ac voltage, dc voltage, and resistance measurements. The current-reading display has only one decimal point location (100.0), and so it appears range-hold would be unnecessary. However, if you go over-range (over 199.9 mA), the decimal point disappears when you come back into range, unless you are in the range-hold condition!

A standard 9-volt battery (alkaline is recommended) powers this DMM, and about 8 milliamperes is drawn from the battery when the DMM is on. A subminiature phone jack is provided for a Radio Shack 65-731 or 273-1431 ac adapter ($4.95, 9 volts dc, subminiature phone plug with positive tip). When the adapter is plugged in, the battery is disconnected. A small "BT" on the left side of the display alerts you to a low-battery condition.

On analog meters, an overload could burn out the meter coil or bend the pointer. Also, most analog multimeters need zero adjustments, and many use mirrors behind the pointer to avoid parallax errors in reading. This DMM has effective overload and transient protection and is precalibrated, so no zero adjustments are required. A miniature 1-Amp fuse is built into the battery compartment to protect the DMM if *voltage* is applied to the probes when measuring current or resistance—a no-no!

The DMM is easy to read, since the digits are 3/8" high. There are four digits, but the first digit is either blank or a 1. Therefore, the maximum reading is 1999, making 2000 the over-range condition. On the voltage and resistance function, the display reads .000 when the unit is turned on and the probes are held together. Therefore, you can effectively read .001 volts (1 millivolt) or 1 Ohm (since the Ohms scale display is kilohms and must be mentally multiplied by 1000). When used to measure dc current, the decimal point is stationary at the 100.0 position, so the lowest current resolution is .1 milliamperes (100 microamperes) and the maximum reading is 199.9 milliamperes.

I found the Micronta Auto-Range DMM very easy to use and easy to read, provided you ignore the decimal point excursions as the DMM seeks the proper range. I was disappointed in the lowest voltage range (2 volts) having only a 1-millivolt resolution. Many recent DMMs have a .2-volt scale, allowing readings down to 100 microvolts. Also, since this DMM has only one current range (199.9 milliamperes maximum), you can't use it for measuring either low microamperes or currents higher than 2 Amps. The resistance scale is limited to 2 megohms maximum, in 1-Ohm increments.

Considering that this DMM includes an LCD readout, the auto-ranging and range-lock features, and overload protection for a comparatively low price, it's still an excellent buy for a general-purpose multimeter. For laboratory use, where high precision is required, you might find an instrument with extended lower ranges necessary.

A rugged gray plastic case, 1-1/8" × 8-7/32" × 4-1/8", houses the approximately one-pound unit. A handy feature is the carrying handle, which swivels down to form a tilt-up stand to hold the DMM at a convenient viewing angle. Test leads are included, but the battery is not. The 12-page manual is easy to follow and includes a complete schematic of the unit. Available from any Radio Shack store or participating dealers as Catalog Number 22-196. Reader Service number 476.■

Daiwa *from page 40*

The switchless, tweakless system is even more useful when pruning antennas or adjusting antenna tuners, particularly when using a solid-state transmitter. As you adjust a tuner, swr can jump way above 3:1, causing the transmitter's swr protection circuits to reduce output power dramatically. Using a typical meter, the reflected power would appear to go down, and you could be tuning for high swr rather than low unless you zero the forward meter every time you tweak the tuner. With the Daiwa meters, no matter how much the power output of your rig varies, you are always looking at an accurate measure of swr.

About the only drawback to the Daiwa meters has been their expense, but that stumbling block has now been removed. There are three compact new meters available, and they are considerably less expensive than their predecessors, which are still available. They are less expensive because they are more limited in the frequency range they cover and offer fewer power ranges. In many applications, these limitations won't make any difference. The new models are the CN520, covering 1.8-60 MHz, the CN540, covering 50-150 MHz, and the CN550, covering 144-250 MHz. Each meter offers two power ranges. 200 and 2 kW at full scale with the CN520, and 20 and 200 Watts with the other two meters. A push-button switch located on top of the meter selects the range. SO-239 antenna connectors are provided on the rear panel. The compact trio did well in the realm of basic performance. Run against a Bird wattmeter, all three meters appeared to be well within the 10% margin of accuracy the manufacturer claims. Although their cabinets are plastic, there wasn't any noticeable increase in RFI floating about the shack when one of the meters was put in-line, and we checked 80-10 meters, six meters, two meters, and 220 MHz.

Conclusions

These meters are small! In many installations the small size will be an advantage—a meter can be squeezed into tiny spaces where nothing else will fit. If your taste runs to RG-8/U or RG-213 for interconnecting equipment, take care to fix the meter in place or you'll find it disappearing over the rear edge of your table, pulled by the weight of the coax.

The cross-needle meter approach to measuring swr is clever yet straightforward and represents a noteworthy advance over the all-pervasive switch and tweak boxes currently found in most of our shacks. For more information, contact *MCM Communications, 858 Congress Park Drive, Centerville OH 45459*. Reader Service number 477. ■

P-310X *from page 52*

pedance is a nominal 50 Ohms. Gain of up to 20 dB is possible, controlled by a front-panel knob over a 15-dB range. The 1.8-54-MHz range is spanned in four discrete segments, selected by a front-panel switch: 1.8-4, 4-10, 10-23, and 23-54 MHz, respectively.

I mentioned the bi-linear feature—when you transmit, a special rf sensing circuit automatically connects the transceiver directly to the antenna, bypassing the preamp. At the end of each transmission, the unit switches back to receive with a slight delay, adjustable from 1/2 to 3 seconds by means of a panel control for various operating modes and operator preferences. This feature makes it unnecessary to be concerned with trying to hook into the transceiver's push-to-talk (PTT) or voice-controlled-transmit (VOX) line to cut the preamp in and out when switching from transmit to receive, or vice-versa. An internal four-transistor circuit takes care of the rf sensing, relay energizing, and variable-delay functions. An "off" position on the delay control not only deactivates the preamp, but also serves to bypass it for those occasions when it isn't needed. An LED on the front panel indicates when the preamp is in-line.

I've alluded to the fact that a receiving preamp may not be a necessary investment for everyone. True, most new receivers and transceivers have excellent sensitivity on all bands, at least when they are factory-new. But after a few years, tubes (if employed) may get weak, circuits go out of tune, noise figures go up—slow processes—but so slowly that one may not realize they are occurring. Hooking up the Palomar or a similar preamp to an old tube-type receiver badly in need of alignment and sitting around gathering dust can be an especially amazing experience.

Even with newer transceivers, performance may be marginal on the top two HF bands—10 and 15 meters. Design compromises are always taken in transceivers and will be further exaggerated as the three new WARC bands are designed into transceivers. The preamp should be particularly effective with those transceivers using the pi-network output of the transmitter section as the receiver's rf stage input. Many such units suffer a pronounced drop-off in sensitivity on 15 and 10, much like their older vacuum-tube brethren. The inclusion of six-meter coverage on the Palomar preamp makes it suitable for pepping up a 50-MHz transceiver as well.

I tried the preamp with a Kenwood TS-180S transceiver and an R-1000 communications receiver, which are no slouches in the sensitivity department. The preamp did not noticeably improve reception on 160, 80, or 40 meters, but did help dig down into the noise for weak-signal DX on the higher bands through 10 meters. This was especially true of the TS-180S on 10. The preamp's inherent rf selectivity was helpful on all bands in reducing signal overload from adjacent or out-of-band signals. This characteristic was very helpful when used with the R-1000, whose slow-recovery agc system occasionally gets bombed with strong signals, and the TS-180S, whose front end occasionally lets through a few spurious, image-like signals.

All things considered, the P-310X did a very creditable job in my shack; in transceive operation, the relay was quiet and positive-acting. Had I had available an old clunker transceiver or receiver on which to experiment, results probably would have been even more impressive. Nevertheless, there were a few minor points that warrant consideration by a prospective purchaser.

It's easy to mistune the unit if one isn't careful. This can result in the image or other spurious frequency ranges being boosted, to the detriment of the desired signal. Tune carefully!

There is no attenuator or

provision for use with a second antenna. The former feature would increase the unit's capability to handle cross-mod and overloading effects, while the latter would add flexibility in connecting, say, a general-coverage receiving antenna without need for an external coax switch. Interestingly, the SWL-oriented receiver preamps (models P-305 and P-308) both include these features; each has a switchable 20-dB attenuator and toggle switch used to select either of two antennas.

An extra rf output for a second receiver would be useful, to allow simple connection of, say, a general-coverage communications receiver and a transceiver to enable the preamp to perform double duty. I use both the TS-180S and R-1000 and have to use a coax switch to take care of this chore. Adding an extra output should be a simple project, as the back panel has space for an extra jack or switch.

Despite the few detractors I mentioned, the Palomar transceiver preamp is a good, dependable, and sturdy unit; it's representative of the generally high quality of the company's accessory product line. Too, the attractive aluminum front panel and vinyl-covered metal case add a good deal of "class." The 2½-pound, 8" × 5" × 3" P-310X is available from *Palomar Engineers, Box 455, Escondido CA 92025.* ■

IC-730 *from page 76*

however, has power to spare. An output level pot located inside the rig's bottom cover was readjusted to increase output from 110 to 130 Watts on 20 meters (as read on my Drake W4 wattmeter). By the time this report appears in print, I will have readjusted that pot for an exact 100 Watts output and be enjoying the rig's margin of safety. The rf power control mounted concentric with the mike gain directly varies output independent of mike or speech processor level. SSB operators who enjoy QRP operation can reduce power output while maintaining full audio. The 730 drives both my Drake L4B and home-brew "classic-kilowatt" amplifier (December, 1978, *73 Magazine*, pg. 226) to their usual outputs.

A large final amplifier heat sink is affixed to the 730's rear, and a twist-blade fan moves air diagonally across the sink whenever the 730 is in transmit mode. The super cooling seems like a mild overkill, as the sink has yet to become noticeably warm. The manual explains that high sink temperature will cause a thermal sensor to increase the fan's speed, and also keep it on during receive (evidently after a 20-minute transmission into a 3:1 swr!). A barely perceptible wind noise was noticed and cleared by removing the fan/sink rear cover. The cover's removal also permits more efficient cooling. Swr shutdown checks showed full output until 2.5:1. At 2.7:1 swr, the output dropped to 70 Watts, and at 3:1, output decreased to 55 Watts.

During CW operations, the transmit signal is shifted approximately 400 Hz. I compensate for that shift by turning the RIT control two divisions lower in frequency. This maneuver was initially plotted using a second receiver to monitor both sides of a QSO conducted with the 730.

A key must be plugged into the 730 in order to transmit a carrier. I bypass this requirement during mobile operation with a direct-shorted phone plug in the key jack.

Bells and Whistles

The 730's digitalized dual vfo's are fully microprocessor-controlled, and the vfo's may be operated transceive or used for split operations as desired. A single reprogrammable memory is provided for each band. The memory is also tunable, with memory release-and-recall returning operation to the originally stored frequency. One can thus operate a net and chase DX on both CW and SSB portions of a band at the same time. Pushing the rig's write button (without pushing the memory button) will sync both vfo's on one frequency when needed (such as initially hunting, spotting, and calling a DXpedition upon their "fire-up"). Another button locks tuned frequencies to prevent accidental knob bumps from changing frequency. The tuning knob's tension/drag is also fully adjustable by a screw accessible through a hole in the rig's bottom.

The 730 also features an internal relative power wattmeter (accuracy varies 15 percent of my W4), a very effective speech processor, and an swr bridge. The controls for these units are located beneath an access cover on the rig's top left area. The front-panel meter is thus used to read S-units, alc, rf output, and swr. The "everything-in-one-box" arrangement can't be beat!

Up/down band scanning is possible via an optional microphone. Since I've yet to locate a "scanning mike," I dug into the 730's manual and schematic for details. I had the rig scanning within 10 minutes! The ability to lean back and tune the rig remotely is great, and I'm now planning a keyboard system for entering frequencies directly into the 730's microprocessor.

On the Air

The 730 received its initial checkout during the 1981 Radiosport Contest, and it performed like a DX champ on both CW and SSB. The barefoot rig performed comparably to my TS-120. Switching on the 730's speech compressor added "7 league boots"—and called for reducing rf drive to my amplifier. The increased duty cycle was quite noticeable on the wattmeter, on the amplifier tube plates, and on pileup-cracking ability.

W4CEC and I recently exchanged rigs for a day to evaluate signals. The 730's transmitted signal is quite clean, with ever-so-slightly more high frequency audio response than a TS-820 or 120 (only apparent through direct comparison and knowing the other person's voice). The speech processor adds punch while producing a barely perceptible change in transmitted audio response.

Mobiling with the 730 is sheer pleasure. The quiet receiver and the noise blanker give me the impression I'm in a different auto (my previous rig showed S7 ignition noise; the 730 shows S2 ignition noise).

Conclusion

The Icom 730 is quite a rig for the money. Its numerous features and state-of-the-art technology reinforce my opinion that a new rig is one of today's best dollar values. Icom offers a fairly extensive line of accessories, including matching power supply, external speaker, linear amplifier, and a mobile antenna. For more information, contact *Icom Corporation, 3331 Towerwood Drive, Suite 307, Dallas TX 75234.* ■

HAM HELP

I am Mrs. Ruth Fleischer, wife of former sergeant Martin Fleischer, formerly stationed at Gunter Field, Montgomery, Alabama, serial #32316245, Squadron C-1, 2131 A.A.F. Base Unit.

My husband was in charge of a radio shop at Gunter Field, Pilot School, Basic, and the airplane wash rack was part of this hangar. On or about July 27, 1943, a fire and explosion occurred, trapping the GI occupants (some of the GIs were hams).

In the process of rescuing these men, and amongst the other disabilities received, Martin lost his hearing. Now that he is totally disabled and unable to follow any substantially gainful occupation, he is trying to establish a claim with the Veterans Administration for his deafness.

We are searching for any personnel stationed at Gunter Field, Montgomery, Alabama, between 1942-1945, so that we may discuss the possible recollection of this accident. They may contact me at the address and telephone number below at my expense.

Perhaps in this endeavor to help Martin, we may be able to help the other GIs he rescued and who were also injured. If you need any documentation that I have for verification of these facts, please communicate with me.

Mrs. Ruth Fleischer
2701 East Utopia Road #110
Phoenix AZ 85024
(602)-867-8092

I recently purchased an old Hallicrafters linear amplifier, Model HT 41. I need to get a copy of the schematics and, if possible, operating instructions. If anyone can furnish these, I will gladly pay costs. Thank you.

Glenn Churchill KA2IOI
1 Meadow Rd.
Hudson Falls NY 12839

I need a schematic for a Navy RBH-2 general-coverage system CNA46188 receiver manufactured by National under its own model number NC156-1. I am willing to pay a reasonable amount for the schematic and manual. Thank you.

Terron
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ARGENTINA	14	7	7	7B	7B	7	14	21	21A	21A	21A	21
AUSTRALIA	21	14	7B	7B	7B	7B	7B	14B	14	21	21	21A
CANAL ZONE	14	7	7	7	7	7	7	14	21A	21A	21	21
ENGLAND	7	7	7	7	7	7	14	21A	21A	21	14	7A
HAWAII	21A	14	7B	7	7	7	7	7B	14	21	21	21A
INDIA	7	7B	7B	7B	7B	7B	14	14A	14	14B	7B	1B
JAPAN	14	14	7B	7B	7	7	7	7B	7B	7B	14	21
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SOUTH AFRICA	14	7	7	7B	7B	7A	21	21	21A	21A	21	21
U. S. S. R.	7	7	7	7	7B	7B	14	21A	21	14B	7B	7
WEST COAST	21	14	7	7	7	7	7	14	21	21A	21A	21

CENTRAL UNITED STATES TO:

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AUSTRALIA	21	14	7B	7B	7B	7B	7B	14B	14	21	21	21A
CANAL ZONE	14A	14	7	7	7	7	7	14	21	21A	21A	21
ENGLAND	7	7	7	7	7	7	14	14A	21A	21	14	7
HAWAII	21A	14	7A	7	7	7	7	7	14	21	21A	21A
INDIA	14	7A	7B	7B	7B	7B	7B	14	14	14B	7B	7B
JAPAN	21A	14	7B	7B	7	7	7	7	7B	7B	14	21
MEXICO	14	7	7	7	7	7	7	14	21	21A	21	14
PHILIPPINES	21A	14	7B	7B	7B	7B	7B	7	14	14	14B	21
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SOUTH AFRICA	14	7	7	7B	7B	7B	7	14	21A	21A	21	21
U. S. S. R.	7	7	7	7	7B	7B	7B	14	21	14B	7B	7B

WESTERN UNITED STATES TO:

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ARGENTINA	21	14	7A	7B	7B	7	7	14	21	21A	21A	21A
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CANAL ZONE	21	14	7	7	7	7	7	14	21	21	21A	21A
ENGLAND	7B	7	7	7	7	7	7B	14	21A	14A	14	7B
HAWAII	21A	21	14	7	7	7	7	7	14	21	21A	21A
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JAPAN	21A	14A	14	7	7	7	7	7	7	7B	14	21A
MEXICO	21	14	7	7	7	7	7	14	21	21A	21A	21
PHILIPPINES	21A	21	14	7B	7B	7B	7	7	14	14	14B	21
PUERTO RICO	14A	14	7	7	7	7	7	14	21	21A	21A	21
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U. S. S. R.	7B	7	7	7	7B	7B	7B	14	21	14	7B	7B
EAST COAST	21	14	7	7	7	7	7	14	21	21A	21A	21

First letter = day waves Second = night waves
A = Next higher frequency may also be useful
B = Difficult circuit this period F = Fair G = Good
P = Poor * = Chance of solar flares; # = of aurora

NOVEMBER

SUN	MON	TUE	WED	THU	FRI	SAT
1 G/F	2 F/F	3 G/F	4 G/F*	5 P/P*	6 F/F	7 G/F
8 G/F	9 G/F	10 G/G	11 G/G	12 G/G	13 G/G	14 G/F
15 G/G	16 G/G	17 G/G	18 G/G	19 G/F*	20 F/F*	21 F/F*
22 P/P #	23 P/P #	24 G/G	25 G/G	26 G/G	27 G/G	28 G/F
29 G/F	30 G/G					

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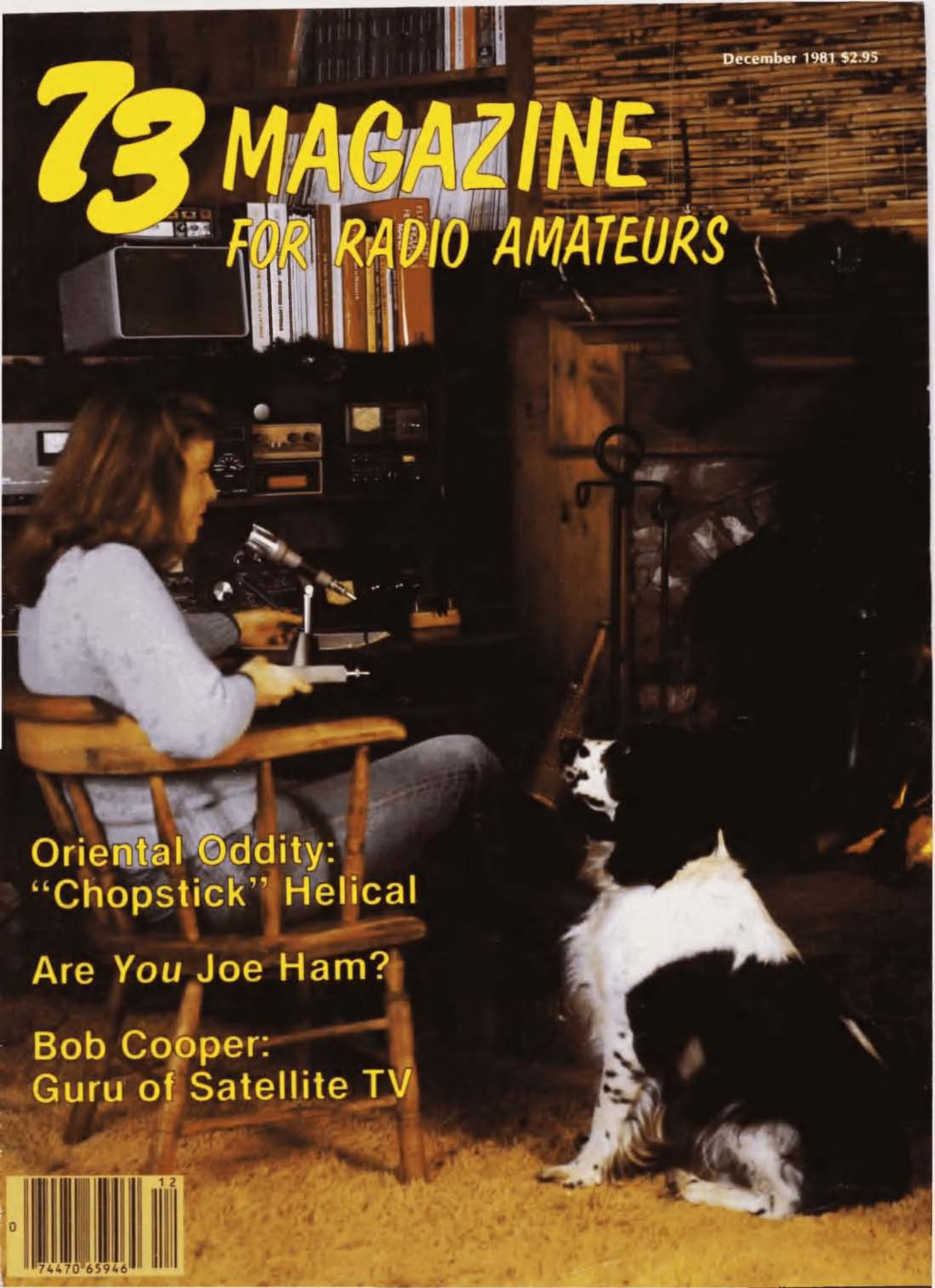
73 MAGAZINE FOR RADIO AMATEURS



Oriental Oddity: "Chopstick" Helical

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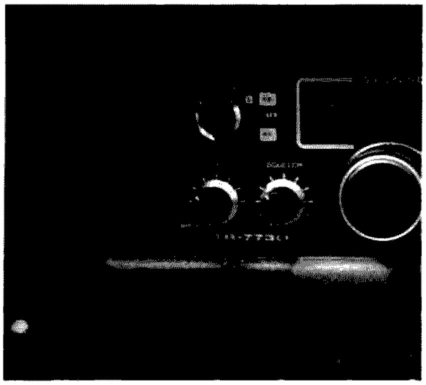

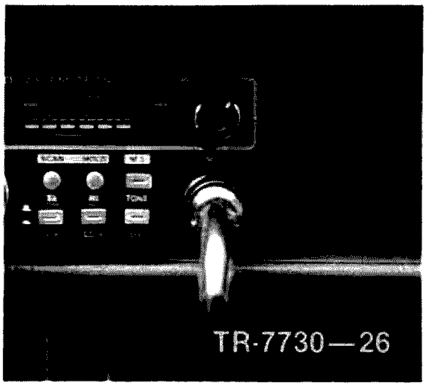

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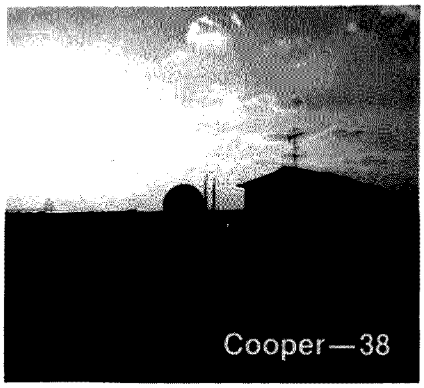


Cooper—38

Cover: Photo by Paul Grupp KA1LR.

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

THE FCC ADVISORY COMMITTEE

In order to keep in closer touch with those being regulated, the FCC has established advisory committees, made up of people in the regulated industries, to work with them on needed regulations. In the amateur radio field, this group is the National Industry Advisory Committee, Amateur Radio Service Subcommittee (NIAC). The group has 17 members, of whom about two-thirds normally attend the yearly or twice-yearly meetings.

The most recent meeting was held at the FCC headquarters in Washington with eleven members present. More of the members are interested and influential amateurs than industry representatives, with the only true industry representatives being me from *73*, John Lindholm from *QST*, Chris Imlay from *QST*, and Alan Dorhoffer from *CQ*.

The recent meeting discussed aspects of getting local government cooperation for emergency communications, possible help from MARS stations, and so on. We had been asked for a report on high-speed transmissions for emergency communications and on the possibilities of developing more amateurs for emergency operations. I made the following report, which you may find of interest.

Amateur Radio Emergency Communications: The Future?

At the last NIAC meeting I discussed the matter of the lagging American technology in electronics. Since that time this has been a matter of continued interest in the general media, with articles in *The Wall Street Journal* and several other well-read publications.

It was my concept that much of the explanation for this increasing technology gap lies in the moribund nature of amateur radio in our country. . . particularly as compared with the vital and growing interest in amateur radio in Japan. I felt that this stemmed from the proposed "incentive licensing" rules of 1963, at which time amateur radio in the U.S. stopped its growth for an eleven year period. Indeed, had our ranks continued to grow at the rate at which they had been expanding from World War II until that time, we would have reached our present amateur population in about 1965.

The result of this has been a serious lack of the most precious lifeblood of amateur radio, the 14- and 15-year-old newcomers. Even the spurt of interest in the mid-1970s which resulted from the national enthusiasm for Citizens Band radio brought in more middle-aged recruits than youngsters. Unfortunately, *these* are not the type of amateurs who decide to dedicate their lives to careers in electronics or communications. Thus we have a rapidly aging group of amateurs, with the large part of them well beyond the age when we would expect them to contribute to the advance of American technology. This largely comes from people in their 20s and 30s, not in their 40s and 50s.

One possible solution to the problem would be to encourage the introduction of amateur radio into as many high schools as possible. This is the age recruit which we need. . . which our country needs. Without this group joining our hobby I feel that America can only face further humiliation at the hands of the Japanese engineers and technicans. Further, should any international conflict develop, we will have to be very sure that the next time we have Japan on *our* side. Indeed, if Japan had introduced the no-code ham license in the 1930s it is possible that the war could have turned out differently. We should remember that Hitler publicly regretted his stopping of amateur radio in Germany and ascribed much of the failure of Germany in the war to the resultant loss of technicians

Since we all agree that another international war is unthinkable and impossible, there is no real reason to even worry about our technical people who might be needed in that instance. Still, that does leave us with a gradual falling behind in business as the Japanese, with their army of engineers and technicians, surpass us in calculators, watches, television sets, video recorders, video players and disks, tape recorders, hi-fi systems, amateur radio equipment, *all* communications equipment, telephones, test equipment. . . and so on.

It seems to me that the further we allow ourselves to fall behind in technology, the more we will fall behind economically. I have visited just about every part of the world in recent months and on every front I find the Japanese firms getting ahead of us. Despite the serious problems our Administration is having in trying to cut down on expenses, it may be time for a White House symposium on this critical situation, with some dramatic measures to tackle the problem.

There have been two major technological revolutions in the amateur radio field in the last twenty years. The first was the introduction of single sideband transmissions in the late 50s, which resulted in a change to that mode for virtually all phone shortwave communications on the amateur bands. . . and its use by the military. The second major technology change was the development of the FM transceiver and repeater which came along in the late 60s and developed through the 70s. Since then, despite great leaps ahead in digital and integrated circuit technology by industry, little change can be seen in our ham bands.

The groups of amateurs working for *73 Magazine* are hard at work on a new technology. This will be introduced on twenty meters, probably on 14,100 kHz, as an on-the-air bulletin board. It is our plan to have a radio transceiver system which will automatically answer queries from other stations on that frequency, sending at first a menu of the available material on the bulletin board.

As an example of how this would work, a station would send a call for W2NSD/1 and sign its call. W2NSD/1 would then respond with a list of options of information. Let's say the inquiring station opts for #1, a current DX advisory. W2NSD/1 would then

W2NSD/1 ON-THE-AIR SCHEDULE DECEMBER, 1981

1	80-40 Phone
8	20 RTTY
15	20 Phone
22	40-20 CW
29	20-15 Phone

On both phone and CW nights, look for us in the first 25 kHz of the General portion of each band. On the RTTY night, look for us between 14.090 MHz and 14.100 MHz. We'll be on the higher band first. Sessions run from 7:00 to 10:00 pm eastern time.

WIN WAYNE'S HAM SHACK PRIZE WINNERS

Congratulations to the following lucky winners of ham gear in our recent subscription promotion!

Grand Prize	Carl F. Bogart WA7JWW/WA7OTR Reno NV	FT-901DM, MLA-2500, System 33, rotator
1st Prize	David A. Behar Seattle WA	TS-700A, Hustler Beam, Bird Wattmeter
2nd Prize	Judith A. Posego N9BKQ Lockport IL	TS-820S
3rd Prize	James T. Douglas K3FHC Washington Borough PA	TR-7800
4th Prize	Gerald I. Miles WA4KJK Nashville TN	Realistic DX-300

come on and send all of the latest information on active rare DX stations, including their known frequencies, schedules, QSL information, name of the operator, and so on. At the end of the transmission the inquiring station would have an option of sending unlisted information for possible inclusion on the bulletin board. This would be received at W2NSD/1 and stored for editing by the operator. It then could be added to the #1 list of information.

Number two might be a list of contests during the next few weeks, with scoring information, where to send logs, where to get full details, and so on. Again, further information could be sent to W2NSD/1 at the end of the bulletin transmission.

Plans are to have lists of hamfests and conventions, the latest FCC releases, proposed rule changes, lists of nets and their frequencies, changes in repeater calls or channels, VHF information, RTTY information, SSTV information . . . and so on.

In addition to encouraging the use of advanced digital techniques over the air, these transmissions would be experimental in nature, helping amateurs develop systems capable of communications via ASCII at 300-, 1200-, and 9600-baud speeds. The response of W2NSD/1 would be set to match the calling speed of bulletin board users. 9600 baud can be sent within the confines of an amateur voice channel and, when you consider that this is approximately 8500 words per minute, it is an efficient means of exchanging information.

Let's carry this on to the next step. How does this have anything to do with emergency communications, the basic function of NIAC? Most of the emergency nets of today are on voice and are incredibly inefficient as far as handling volumes of traffic is concerned. Let's look into the future and see where our high-speed automatic digital communications experiment is taking us.

In a few years we may be using small keyboards on which we will be able to type messages. Indeed, these are already on the market, with the Radio Shack TRS-80 pocket computer selling for $230. Let's imagine that instead of just calling a net control station to send a message, the net calls each station in the net in turn and asks if there is any traffic. With digital calling, this polling of a net could be done in milliseconds, not minutes with endless repeating of callsigns. At 8500 words per minute, the net control could call each participating station and ask for traffic in less than a second. If a message has been typed on the pocket computer, the station would automatically dump it over the air when polled. The control station computer would read the address and pass the message along to the addressee instantly. With a network like this it would be possible to handle thousands of times as much traffic as at present with no losses or errors. Further, links with low-band long-range stations could be set up as part of the emergency network. . . even to linking through satellites via microwave transmissions.

This is not a gee-whiz dream of the future. Everything needed has already been invented, so all amateurs have to do is apply the technology we already have developed in the computer field to radio communications. This should be good for amateur radio in that it will generate a new interest in communicating via this new technology. It will be good for industry in that all amateurs will be wanting new equipment. And it will enable amateurs to provide an emergency communications system far beyond anything imagined a year or so ago.

We are taking the first step with W2NSD/1 in the establishment of the radio bulletin board. We will be asking the FCC for permission to experiment with 1200- and 9600-baud transmissions. We will be publishing a vast amount of information on this

Continued on page 180

Well . . . I Can Dream, Can't I? by Bandel Linn K4PP

"We've discovered a new high-speed way to learn the code! This shot will make you a 25-word-per-minute man immediately!"

Chris Brown KA1D
73 Magazine Staff

Cold Comfort

—an HT to the rescue at fifteen below

One thing was certain. This night would be very cold. As I hunched over my sputtering stove in the fading twilight, melting more snow for drinking water, I wondered how long my HT would continue to perform.

Before I had left on this winter backpacking trip to New Hampshire's White Mountains, friends had told me tales of liquid crystal displays freezing solid, then bursting, at zero degrees Fahrenheit, of fully charged nicads incapable of powering even the receiver portion of an HT at minus ten. Now, at 4:00 pm on this dull and snowy afternoon, the temperature was already minus eight degrees. I knew it would go much lower during the night. The question in my mind was, would the HT quit?

I was hiking alone in these frigid mountains, my only link to the outside world a compact package of imported electronics powered by a pitifully small battery pack. I intended to use my Kenwood 2400 HT to access a two-meter repeater located on a mountaintop eight miles away. In case of trouble, the HT would be my only way of yelling "Mayday."

Suddenly, I was aware of the sounds hanging in the frozen evening air: the roar of my small stove and the sweep of the wind-driven snow. Something was missing. The HT had been quiet for a long time. The reassuring CW ID of the Mount Washington repeater had not broken the squelch for at least half an hour. Preoccupied with stamping out a firm platform in the deep powder snow, setting up my mountain tent, getting the stove going, and making ready for the long night ahead, I had not noticed the HT's silence. Now that silence was overwhelming.

With clumsy, mittened hands I groped through my pack for the HT. I wiped the frost from the LCD readout and was relieved to see it indicating 6.055—the wrong frequency. I had inadvertently depressed the REV button while setting the frequency to 6.655 earlier and was listening on the repeater's input frequency instead of its output frequency. When I restored the switch to the normal position, I caught the tail end of the cheerful CW ID of K1OIQ/R. The repeater was still working and so was my HT. I went back to melting snow and supper preparations as the winter darkness slowly filled my campsite.

This trip had come about as a combination of my interests in winter mountaineering and amateur radio. And, by bringing an HT along, I was able to justify doing something I normally could not justify—making the trip alone. With the HT, I would always be able to reach the outside world and, in the event of trouble, would be able to let someone know where I was. I also thought it would be fun to yack with my fellow hams as I trekked through the Presidential Range in deep winter.

The Presidential Range lies in the White Mountains of northern New Hampshire. This wilderness area provides the most challenging winter hiking and climbing in New England. The region is known for its foul weather and, before the anemometer blew away, the highest wind gust ever recorded on the surface of the planet was clocked at an incredible 231 mph on Mt. Washington's summit. At 6,288 feet, Washington is no giant among mountains. Its reputation as a cruel place in winter, however, is first-hand knowledge to all eastern hikers and climbers who have spent time scuttling across its windswept slopes or scaling the walls of its icy ravines.

My plan was to hike into the national forest south of Mt. Washington, place a high camp at tree line on the Presidential Ridge, spend the night, and then hike down the ridge the following day. I hoped to pass over the summit of Mt. Washington before heading for civilization at Pinkham Notch Camp. I intended to cover a total of thirteen miles in two days, gaining most of my altitude the first day on the four-mile approach up the ridge.

Weather, of course, would play a major role in the success of any plan. The winter of 1980/81 was unusually cold in New England and the weekend I chose for my trip was no exception. I was well aware of the consequences that had befallen those foolhardy enough to be caught high on that exposed ridge in severe winter conditions. Wind-chill factors in excess of −100 degrees were common and, if the weather and winds did not cooperate, my plans would have to change.

I had no success persuading any of my friends to go with me. Perhaps the ominous weather forecasts which predicted snow on Friday night and Saturday with gradual clearing and plunging temperatures on Sunday dissuaded them. In any case, as I hiked along Saturday morning under my fully-loaded, forty-pound Kelty pack, I was glad to be alone. Working my way up through the forest, the only sounds intruding on my solitude were the rhythmic swish of my snowshoes through the powder and the occasional ID of the Mt. Washington repeater.

A Sunday morning self-portrait at fifteen below zero.

The Mount Washington repeater has the widest coverage of any machine in New England. Situated six thousand feet above sea level, it provides reliable communications over a 300-mile, five-state area. Though it shares its mountaintop with TV, FM broadcast, and commercial microwave installations, it has few intermodulation or desense problems.

The machine is privately owned and is open to the public. The only contribution requested from the large number of daily users is good operating practice. The machine is supported by equipment donations from hams in the north country, and maintenance and repairs are carried out by its licensee, Al Oxton K1OIQ and by Bill "Mac" Beal W1PNR. The central role Oxton and Beal play in the machine upkeep and maintenance is the key to its reliability in the harsh mountain environment.

Luckily for the users, both Al and Mac spend considerable amounts of time on the summit of Mt. Washington in the course of their duties as staff members of the Mount Washington Observatory. The Observatory, a non-profit research facility which operates year-round, is rich in folklore and ethereal nocturnal visitors. Rumor has it that at least one ghost is in residence on the summit; on wild nights when the wind is whining, he gives certain Observatory staffers the pleasure of his company. Oxton and Beal are more concerned with repeaters than rumors, however.

Their repeater is a VHF Engineering kit. A scratch-built control system provides tone decoders and interface for the autopatch, audio processing, link to another machine seventy miles away in Concord NH, and auxiliary inputs. Duplexers are by Sinclair and were provided by the Northeast FM Repeater Association. The special Gam half-wave vertical antenna, enclosed in a fiberglass radome, is fed with heliax cable cast off by the neighboring TV station. Transmitter output is 18 Watts, 20 Watts ERP. The repeater is voice-accessed and the trustees encourage users to say nice things when bringing the machine up. The dentist's office "Ahhhhhh" is frowned upon. Normal repeater power is drawn from ac mains, but the machine is capable of running on solar power and has even been run on wind power.

That night there was no shortage of wind for power generation on Mt. Washington. Though it bullied my tent, I was comfortable within the narrow confines of my mummy sleeping bag. Drawn tightly down across my face and around my shoulders, the bag provided a life-sustaining environment. The temperature within the bag was a humid seventy degrees. Four inches away, outside the bag's nylon and fiberfill walls, the temperature was flirting with the bag's minimum comfort rating, fifteen degrees below zero. I had placed two full-length closed-cell foam pads beneath me which provided 1-1/4 inches of insulation from the chilling, hard-packed surface of the snow. While I stayed on the pads, I stayed warm.

In addition to my 6'2" frame, I had managed to stuff a quart of water, the inner liners of my hiking boots, assorted articles of clothing, a bag of GORP (good old raisins and peanuts), my HT, a spare nicad pack, and a headlamp into the bag with me. These carefully chosen items

were the only things that would not be frozen solid in the morning and, as long as I didn't roll over too often, I was totally content.

I had been dozing in the bag for about two hours when the Granite State FM Net was called to order. This public service net handles national and regional traffic in two separate sessions and normally convenes at 7:00 pm on the repeater in Concord NH. Once the net is underway, the Concord and Mt. Washington repeaters are linked, providing coverage of the entire state. For some reason, however, the link was not functioning and, while I could hear the net proceedings from Concord on my HT, I was not able to check in. I wanted to pass a piece of routine traffic to a friend and fellow ham in Bozeman MT who had been a frequent companion on many previous winter trips. Without the link, however, it was doubtful that I would be able to get my traffic through.

Shortly after the net began, net control, N1ALM, briefly left the Concord machine and appeared on the Mt. Washington repeater asking if anyone had outgoing traffic for the net. As I gratefully passed the text of my message to him, we both had to laugh about the propensity we hams have for establishing and maintaining communications between weird locations. Like coral reefs, maximum security prisons, desert ghost towns, or mountainside campsites. Dana's check number matched mine on the first count and while I languished in my sleeping bag, my message began its relay to Montana.

Outside, the weather was deteriorating. The constant swish of built-up snow sliding off my tent and the increasing staccato of the wind did not bode well for the next day's planned route. The exposed ridge, lashed by the northwest wind, would be drifted with new snow making travel laborious and time-consuming. I lay mulling over my plans and reminded myself that the trip was supposed to be fun.

I was almost asleep when the squelch was broken by my own callsign. The gang at W2NSD/1, 100 miles south in Peterborough, was trying to raise me. We had agreed to keep an 8:00 pm sked Saturday evening and at 7:45 pm they were anxiously calling. Most of my fellow staffers were sure I was mad for making the trip in the first place and it was a skeptical and curious group that gathered at the *73* ham shack to hear of my progress.

After assuring them that I was not in a bar somewhere within range of the repeater, I filled them in on what I had been doing since leaving Peterborough. As we spoke to one another across the intervening miles, I imagined their world as it was at that moment: a warm, well-lit, fully-equipped ham shack crowded with friends enjoying themselves. It was very different from the cold, dark world I was in. For a moment, I envied their comfort and comaraderie.

AG1Z was on frequency when I concluded my sked. Willy, an employee of the TV station on the summit of Mt. Washington, volunteered to go next door to the Observatory and get the latest weather forecast for me. It was not good. The forecast called for bitter cold, widely-scattered snow squalls for the next twenty four-hours, and winds gusting to 100 mph. At that moment, it was minus twenty degrees on the summit and winds were gusting to 60 mph. I thanked him, admired his mettle, and then shut down the rig and fell asleep.

Sleep was fragmented and Sunday's dawn came slowly. The orange walls of my tent gradually picked up color as the sun rose behind an icy scrim of fog and blowing snow. I lay awake for a long time in my sleeping bag trying to psych myself up for the inevitable. The hardest part of any winter camping day is leaving a warm sleeping bag and getting into cold clothes, frozen boots, and an icy world. Despite being in my fourteenth hour in my bag, it was easier to lay there pondering the best (and quickest) scenario to follow in getting dressed than to actually get out of the bag and dress.

I snapped on the HT and passed time listening to the idle chatter of other early risers on this frigid New Hampshire Sunday morning. Occasionally, a clipped New England accent would comment on everyone's favorite topic, the weather.

"Ayup Marshall, a might cold here this mahnin. About twenty-five below. Acourse that's on the windy side of the bahn."

As my fellow hams had their second and third cups of coffee, I struggled to get my stove going. Repeated priming finally heated the generator up enough to sustain combustion and soon I too was contemplating the morning's cold over a hot cup of java.

It has snowed heavily during the night and the stubby, frozen shapes here at tree-line were a more appropriate landscape for a hobbit than a ham. The wind-driven snow had sculpted grotesque and beautiful figures during the night as it packed into the scrub growth and pucker brush and fresh drifts covered even the deepest of yesterday's tracks.

Once I was out of my bag, the morning cold kept me moving. Standing in one place for any period of time invited the relentless advance of the cold up through my boots and into my body. To keep warm, I busied myself with breaking camp—a reluctant sleeping bag was forced into its small stuff sack, dirty pots left to freeze were chipped clean of breakfast remnants, and my tent was folded and forced into my pack.

The weather was as forecast. Clouds and blowing snow swirled around me as I wrestled my pack onto my back. As soon as I had it on, the HT I had carefully zipped into a side pocket came alive. N1AHN, a friend I had spoken with the previous day, was calling to check on my progress. John was ten miles away in the village of North Conway. After a short chat with him, I moved off into the storm feeling good that a local was around and interested.

Conditions deteriorated

The winter landscape—more fit for a hobbit than a man.

with each foot of altitude I gained. By the time I was above the last of the scrub, it became obvious to me that I would not be able to continue the traverse. The poor visibility meant that I would be walking compass azimuths on that wild ridge and, should I have to backtrack, would be walking directly into the full force of the wind. Frostbite was a definite possibility and as I stood with my back to the gale, peering down the ridge, I had to remove my metal-frame eyeglasses because they were drawing heat out of my skin so rapidly that my cheeks and temples were losing sensation. My windpants and anorak hood drummed wildly in the wind, and through the tunnel vision of my wool balaclava, I saw a landscape no sane person would inhabit.

I couldn't resist moving a short distance down the ridge and breaking out the HT for a quick test, however. I lifted six distant repeaters from my high point and, as each one came up, I announced that KA1D/portable, Presidential Ridge NH, was listening. Thankfully, no one took the opportunity to chat, and I rapidly retreated toward the relative security below tree line.

While breaking my way down the trail, I managed to raise a friend and let him know of my change in plans. Ken W1NFE was located in Bretton Woods, a small hamlet at the foot of the mountains. We agreed that I would let him know when I was safely back at the trail head. I skied, slid, and slipped the four miles off that ridge thinking of hot showers, hot food, and cold beer. In a few hours, I was down.

The temperature at the trail head was minus fourteen, but it was warm when compared with the cold I'd felt up on the ridge. I flopped my Kelty on the

Swirling clouds and wind-driven snow on the Presidential Ridge.

snow and began fumbling through its labyrinthine pockets for my car keys. As I listened for what I thought would be the final time to the ID of the Mt. Washington repeater, it occurred to me that my Kenwood 2400 HT was one of the more reliable companions I have had the pleasure of hiking with. It didn't freeze up and performed well under less than ideal conditions.

Unfortunately, I was not out of the woods once my hike was over. I twisted the key in the ignition and after a few lethargic turnovers, the engine fired to life. I smugly congratulated myself for the care I had taken in tune-up and battery maintenance while I habitually glanced at the oil pressure gauge. My smugness disappeared when I saw it resting on zero. I anxiously let the engine idle for ten seconds, twenty seconds, a long minute. The gauge never moved. Worse still, the tappets were growing gradually noisier. Apparently, my adventure was just beginning. I shut the engine down and sat in the cab with a sick feeling growing in the pit of my stomach. As I went through the mental gymnastics of what could be wrong, the inside of the windows began to frost up, enclosing me in an icy, translucent cave.

I ruminated on the situation for several minutes when that most noble of human traits, blind optimism, took hold. I simply said to myself, "This can't be happening. I'll just start this thing up and all will be well." So, I did and it wasn't. The oil pressure remained zero while the engine clattered away alarmingly. I admitted to myself that I had a problem.

Sitting in the sub-zero interior of a disabled vehicle thirty miles from the nearest garage with night coming on gets old quickly. The images of hot showers and hot food I had conjured up hours earlier on the trail were still fresh in my mind and I resolved to somehow escape the developing debacle. Then it dawned on me: For the first time in nearly twenty years of hamming, I had—if not an emergency—at least a large bummer on my hands which could be minimized by ham radio. I reached for the mobile rig, but before I could turn it on it occurred to me that I should be using the HT instead. This was the kind of situation I had brought it along for in the first place and it seemed fitting to use it to extricate myself now.

My first call was to W1NFE. Ken was the closest and he answered almost immediately. After I gave him a brief description of my problem, he took the situation in hand. A tow truck was reluctantly dispatched—no small accomplishment on a country Sunday afternoon. The cheapest motel in town was alerted to expect an unexpected guest and a few restaurant recommendations soon followed, too.

To say that the village of Twin Mountain was deserted when the tow truck pulled me in is an understatement of considerable proportion. Besides the garage man and me, only a few scroungy dogs roamed the windswept streets. Nothing could be done for the van that night, so I hoofed off toward the motel that Ken had suggested. One other guest was in residence, he too a victim of car trouble. After we commiserated briefly, I made a few phone calls to find all the area restaurants closed. I then went upstairs to settle into the stillness of my room, littering it with layers of damp clothes and thawing wool knee socks while I munched on the remnants of my trail lunch. Then I headed for the shower.

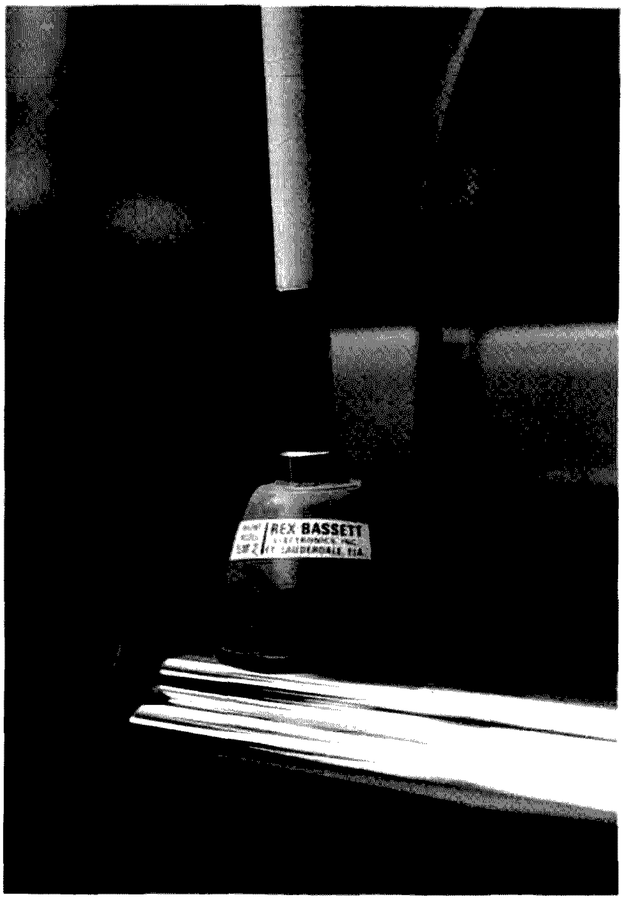
Sitting on the edge of the bed afterwards, flushed with the warmth of a very long shower, I resigned myself to an early and uneventful evening. I lavishly kicked the room's thermostat up another notch and stretched out on the bed waiting for something tolerable to appear on the only channel the rabbit-eared TV would receive. To my amazement, the phone rang.

W1NFE had tracked me down and was calling to invite me to share dinner and spend the evening with him and his family. At that moment, the world suddenly looked brighter. Ken soon arrived and we headed out to dinner in the twenty-below night, listening to the familiar voices on the Mt. Washington repeater. ■

Paul S. Grupp KA1LR
73 Magazine Staff

The Rex Bassett TLM-2 Mobile Mount

—banish your fear of flying



The Rex Bassett TLM-2 mobile mount, with a VAC-20 antenna.

HF mobile operation is near and dear to my heart, and I am always in search of better ways to cope with the necessarily large and bulky equipment. One of the biggest problems seems to be mounting the antenna. Whether you use the ubiquitous Hustler system, the Rex Bassett antennas, or motorized wonders like Cubic's, you need something to mount it on that will support the considerable load the antenna presents while motoring down the highway. The mounts offered by the manufacturers are rarely confidence-inspiring. Mechanical integrity and protection of the coax connection are the primary areas that need attention.

The TLM-2 mount from Rex Bassett solves the problems in both areas, as long as your antenna fits a standard 3/8-24 mount. Best of all, it doesn't require a band around the bumper (which won't fit many small cars). The mount resembles an inverted teacup, with a thick gray finish applied. All hardware exposed to the elements is stainless steel. On the bottom of the mount is a threaded SO-239 connector. A single hole is drilled through the bumper or rear deck, and the mount is screwed down with hefty hardware and a thick rubber washer. Once installed, this mount isn't going anywhere—it's rock solid! The SO-239 connector on the other side of the mounting surface is also an important advance. If you mount the antenna on the rear deck of your car, problems with water-logged coax are a thing of the past. Installed on the bumper, the coax will need some sort of protection from the elements. I have used Coax-Seal (available at most dealers) with great success.

Rex Bassett's antenna products have acquired a reputation for intelligent design and rugged durability. The TLM-2 mount continues that tradition. For more information, contact *Rex Bassett Electronics, Inc., 1633 N.E. 14th Avenue, Fort Lauderdale FL 33305.* Reader Service number 476.■

Reader Service for facing page ↙81→

D. N. (Kit) Kittrell K5KL
703 Serenada Drive
Georgetown TX 78626

Update Your CW Music Keyboard

—play it again, Sam

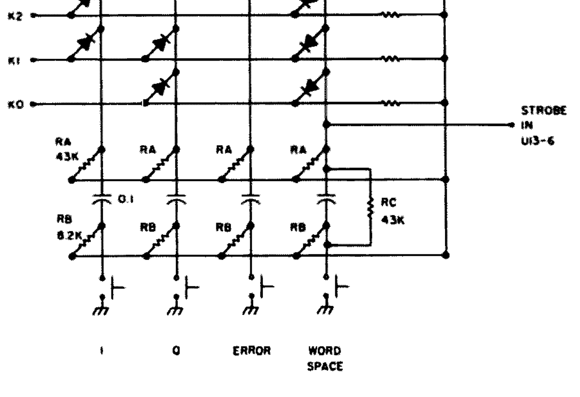


Fig. 1. Wiring diagram for modified diode matrix. R_A and R_B values are not critical; however, a large deviation will cause erratic operation. R_C prevents truncated characters should other keys be struck while the space bar is down. Resistors—¼ W; diodes—1N914/1N4148; capacitors—0.1 disc.

Considering operational features versus IC count, cost, and ease of construction, the Morse keyboard designed by Crom WB9WRE is one of the best keyboard bargains available (*73 Magazine*, February, 1979, p. 84). The author suggests several options, and the design readily accommodates others. One such option, to make typing easier, is described in this article.

I found the basic keyboard awkward to operate because of the key-interlock feature which disables all other keys while one is depressed. Although other keys may be struck, nothing will come out—and that was my problem: striking the next key too soon resulted in omitted characters.

The answer is n-key rollover. With n-key rollover, second, third, etc., keys may be struck while the first and/or succeeding keys are still held down, yet code will go out in perfect sequence (the capability exceeds the demand).

The technique used by Horowitz W1HFA for his Compucoder (*QST*, June, 1975), two resistors and one capacitor in each keyswitch lead, was adapted for this modification, as shown in Fig. 1. Essentially, the functional difference between the original WB9WRE diode matrix and the modified one is the duration of the key-switch input. The static, or rest, condition of data buses K0-K7 and the strobe input is high in both cases. When a key is struck, diodes in the key-switch line take selected data buses low to form the 8-bit binary code representing the character keyed. One or more of the low data buses take the strobe input

low, firing the strobe which loads the FIFO.

The work of the keyswitch is now complete. In the original version, the keyswitch provides a direct ground which retains the 8-bit code on the data buses and holds the strobe input low, preventing reset until the key is released. Conversely, there is no direct ground path in the modified version. The keyswitch discharges the capacitor, sending a negative-going pulse to form the 8-bit code and trigger the strobe. When the negative-going pulse is complete, the data buses and the strobe input revert to the static (high) state and are ready for the next keystroke. The depressed key is inert until released; after release, the capacitor recharges and the key may be used again (there is no discernible delay).

Foolproof key debouncing is a bonus feature of this modification. The keyswitch panels I used were removed from old computer terminals that had individual magnetic reed-switch modules mounted on rails. Some of the switches, outwardly identical to all others but used for special or dual functions, caused sporadic character iterations. I tried numerous strobe pulse widths, and even a 555 wired as a one-shot, without result. A partial cure, effective for some but not for all of the aberrant keys, was finally achieved using capacitor conditioning on the strobe-input line. These keying anomalies completely disappeared after the keyboard was modified.

With due respect to WB9WRE, it's a matter of opinion whether his—or any other—keyboard makes CW music; some would say that only a bug in the hands of an expert can do that! Music or not, this keyboard will play a better tune after this simple modification.■

Photo A. Aluminum angle stock bolted to the sides supports aluminum top, bottom, and rear panels. The top was painted with epoxy spray enamel; clear epoxy protects the transfer lettering on the keys and controls. The digital display is for the QRQ, QRS digital speed indicator. (See article by W7BBX, 73 Magazine, June, 1980, p. 50).

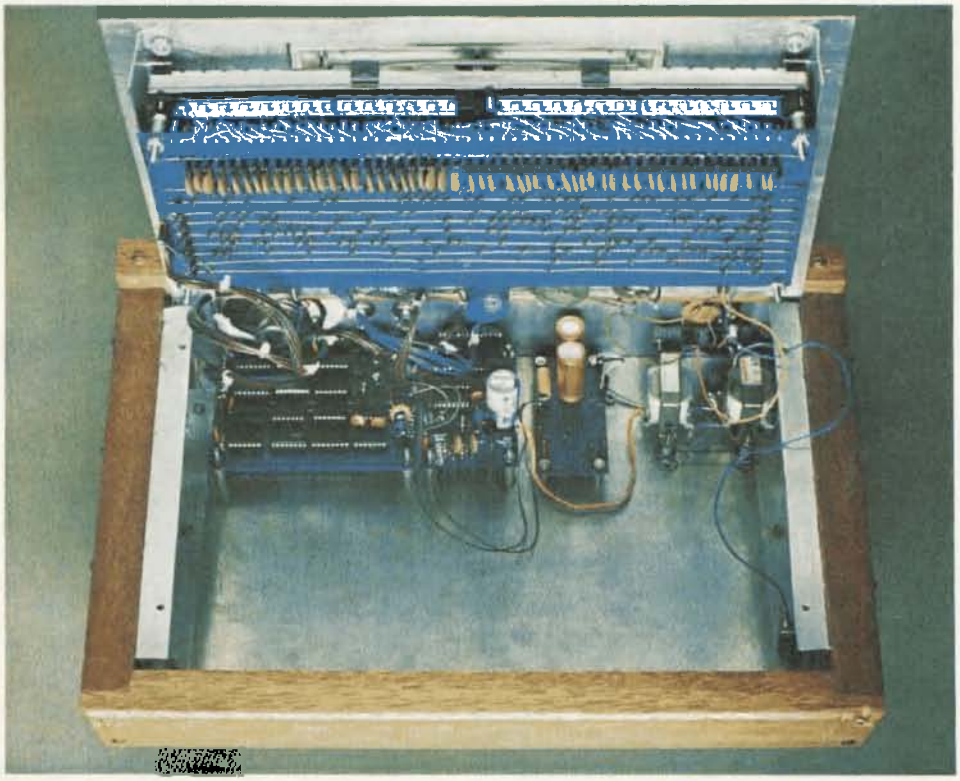


Photo B. The n-key rollover components are at the top of the diode matrix. Vector T-44 Miniwrap posts are used to support the data buses and to terminate keyswitch leads. The keyboard logic, speed meter, and regulator boards are below. All interconnections are made with single row headers.

Reader Service for facing page ✓54→

Paul Grupp KA1LR
73 Magazine Staff

The Kenwood TR-7730 Transceiver

—let's get small!

Time was, if you had a small car and wanted to put a synthesized two-meter rig in it, you either cultivated a sadistic disregard for your passenger's knees or got yourself one of the two rigs on the market with a compact separate control head. The new Kenwood TR-7730 is part of a trend that will change all that. Measuring a mere 2″ high, 5.75″ wide, and 7.75″ deep, it will fit in the smallest of cars without usurping precious legroom and is even compact enough to fit in the extra radio slot located in the console of many newer cars. One might suppose that a great deal was sacrificed to cram everything into such a small package. Surprisingly, this is not the case. Without further ado, let's take a tour of what the TR-7730 has to offer.

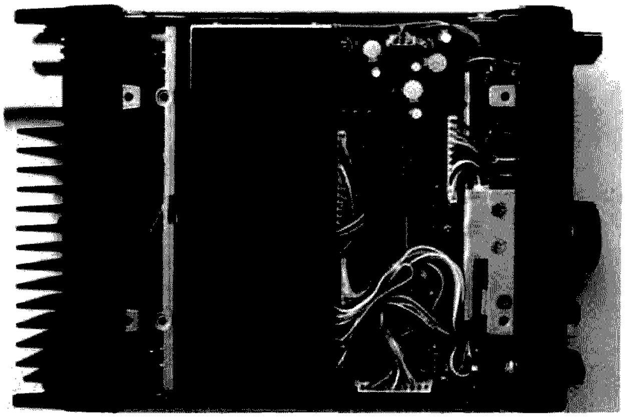
The Features

Starting in the upper left-hand corner of the front panel, we find the memory channel selector and two square push-buttons—one marked "M" and the other marked "MR". The "M" button loads the frequency shown on the digital display into one of the five memories. This frequency can later be recalled by pressing the "MR" button and choosing the desired position on the rotary selector. On memories 1-4, the transmitter offset is set with the switch on the far right-hand side of the front panel. Memory 5 programs both transmit and receive frequencies, allowing access to repeaters using non-standard splits.

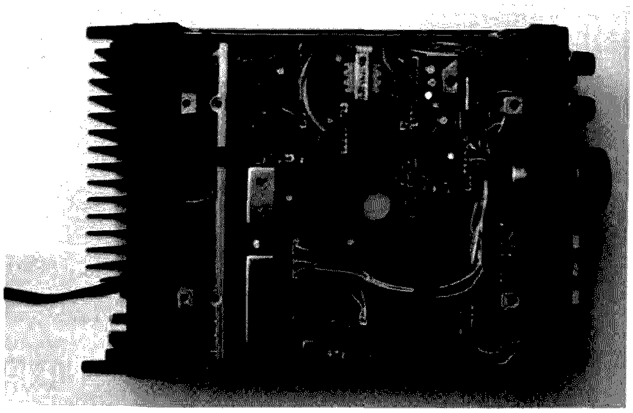
Beneath the memory controls are the combination power switch and volume control and the squelch. Directly to the right of these is the main tuning knob, which steps through the band in a similar manner to the knob on the TR-9000.

Just to the right of the main tuning knob is a switch which selects either 5- or 10-kHz steps with each click of the main tuning knob, a high/low power selector, and an on/off switch for a user-installed CTCSS encoder. Directly above these are three switches associated with the scanning circuitry. Pressing the "Scan" switch starts the 7730 scanning up the band. It will stop on any signal that breaks the squelch and resume scanning when the signal drops. If you hold down the scan button continuously, the rig scans at twice the normal rate. If you wish to remain on a frequency, press the PTT switch on the mike or the "Hold" button on the front panel. Pressing the "MS" switch scans the five frequencies programmed into

The Kenwood TR-7730.



Top view of the Kenwood TR-7730.



Bottom view of the Kenwood TR-7730.

the memories. The scan and hold switches work in both the band- and memory-scanning modes. The up/down switches on the microphone function only in the band-scanning mode.

All displays are of the LED variety. There is a bar-graph S/rf-meter similiar to that on the TR-7800, although the display on the TR-7730 seems to be less prone to flickering. Above this are three LEDs. The one on the far right lights to indicate that a repeater offset has been selected, the middle when the unit is transmitting, and the left when a signal that breaks the squelch is present. To the left of this is the main frequency display.

Most of the rear panel is dedicated to a heat sink for the final amplifier. In a cluster on the left side are the antenna connector, power cable, speaker jack, and a three-prong jack for a memory backup power supply.

Big Rig Performance

Kenwood wisely avoided compromise in the rf stages in their down-sized rig. The transmitter and receiver stages are strikingly similar to those in the TR-7800. Space was saved by shrinking the control circuitry, replacing some discrete components in the audio chain with ICs, and simplifying the final stage. Specifications are virtually identical for the two rigs. Sensitivity is rated at better than .5 uV for 30 dB S/N. Selectivity is spec'd at 12 kHz at 6 dB down and 25 kHz at the −60-dB point. In the high-power mode, our unit exceeded its rated 25 Watts at all frequencies between 144 and 148 MHz. Output in the low-power position is continuously adjustable, making it easy to match the rig to amplifiers requiring only 10 Watts or so of drive. As with most commercial rigs, the deviation level was set slightly high for the close-talking most hams use to improve signal to noise in a car, but was easily readjusted.

In actual use, the TR-7730 is a champ. It worked perfectly the moment it came out of the box. Both transmit and receive audio have the usual Kenwood characteristics—high fidelity with no sacrifice of intelligibility. The squelch is extremely sensitive and seems to latch up resolutely, without the mushiness encountered on many rigs. The controls are thoughtfully shaped and located—most of us should have *no* trouble putting the TR-7730 through its paces in a dark moving vehicle. The bar-graph S-meter, which first struck me as being a gimmick of questionable utility, turned out to be extremely useful. It's a lot easier to read at a glance than a D'Arsonval movement.

The only thing more enjoyable than using this rig is deciding where to install it! It's so small that the possibilities are almost endless. After considerable debate, I removed the AM radio from my Dodge Colt's dashboard and cut away the plastic faceplate with a fine-toothed saw and a couple of files. I didn't know whether or not the rig would actually fit until the faceplate was completely cut away. Behind the dash I found two metal braces, offering plenty of support. The fit is so tight that I didn't have to screw the rig down. I connected the remote speaker jack to the in-dash speakers supplied with the car.

Not for the squeamish, an in-dash or console installation can nevertheless be extremely satisfying. I used to enjoy having my car look like a mobile NASA control center, with rigs hanging everywhere, but I get even more pleasure from the clean setup I now have. If you decide to try an in-dash installation, just be sure that there is plenty of air circulation available. Inadequate cooling can kill a rig.

I used the Kenwood MC-46 DTMF mike, and I must admit I have a love/hate relationship with it. On the plus side, it has all 16 tones, which is useful, and the audio quality of the condensor mike element is unquestionably superior to the mike packed with the rig. On the negative side of the ledger, the mike is small! It took me a couple of days to learn how to handles it without inadvertently pushing one of the buttons on the pad. The hang-up hook resembles those on other microphones I own, but it is slightly smaller, so it won't stay put in either of the mike holders in my car. The small size no longer bothers me, but I am still looking for something to hang the mike on when I am not using it. My advice is to check out the mike carefully before buying, and if it seems too small to cope with, pick up a Kenwood MC-45. You'll need to rewire the mike connector, but the 45 is a solid, full-sized microphone, sure to please the most ham-handed ham! The MC-46 has some nice features, though, and is probably well worth the effort required to get used to it.

Nothing is perfect, of course, and the TR-7730 is *no exception*. I found three relatively minor things I would like to see improved. First, the main frequency display is anything but easy to read. No doubt the location I chose for the rig

Continued on page 196

Dr. Ben C. Butcher N6AVU
9541 Duke Drive
Westminster CA 92683

Joe Ham: The Consumer

—do you fit the mold?

In spinning the dial across the various amateur bands, it is not unusual to find a QSO concerning radio equipment. A typical QSO might be as follows:

" I am running a Satellite TS6 with a Pacific Kilowatt 2 linear amplifier. My antenna consists of stacked verticals, 33 elements, up about 100 feet. I also have a Demosthenes speech processor . . ."

It appears that there is much interest in the types of radios and accessories being used as well as the reason for purchasing specific radio products. Although there have been many formal studies concerning consumer behavior, the radio amateur as a consumer has been neglected.

The purpose of this article is to present some exploratory research findings on the influence of consumer behavior on the buying habits of radio amateurs.

Methodology

The data in this study were gathered from questionnaires sent to 300 radio amateurs in each of the ten United States call areas. The amateurs were selected by random sample from the *1980 Radio Amateur Callbook*. The sample included amateurs from each of the fifty states, divided into three license class classifications—General, Advanced, and Extra. Two amateurs were taken from each class for each state. The study was primarily limited to HF SSB radio equipment.

The HF SSB Radio

An important part of the study dealt with the types of HF SSB radios owned by the radio amateur, age of radio, where purchased, and purchasing influences. The following is a list of HF SSB radios, including manufacturer and model number, that were most fre-

Purchased	Number of Amateurs (%)
1 year (or less)	23
2 years	20
3 years	14
4 years	10
5 years (or more)	33
Total	100

Table 1. HF SSB radios—when purchased.

Source of Purchase	Number of Amateurs (%)
Local Franchised Dealer	52
Mail-order	32
Another amateur	10
Other (includes factory, swap meet, hamfest)	6
Total	100

Table 2. Where radios were purchased.

Reasons for Purchase	Number of Amateurs (%)
Reputation of dealer (including service)	40
Price	44
Store personnel	10
Other (includes availability, location of dealer, etc.	6
Total	100

Table 3. Reasons for purchasing radio from dealer, etc.

Reasons for Purchase	Number of Amateurs (%)
Reputation of Manufacturer (Including quality)	45
Features of the radio	40
Convenience in operation	12
Other (includes American-made, prestige, size, performance)	3
Total	100

Table 4. Reasons for purchasing a particular brand of radio.

Purchasing Influences	Number of Amateurs (%)
Advertisements	42
Friend (Amateur)	31
QSO	15
Store display	10
Other (includes store salesman, family, used in contest)	2
Total	100

Table 5. Other purchasing influences.

quently mentioned in the survey*: Collins KWM2; Drake TR4C, TRF; Heathkit HW-101; Icom 701; Kenwood 120S, 520S, 820S; Swan Astro 150, 102BX; Ten-Tec Triton IV, Omni A,D; Yaesu FT-101, 101E.

It is interesting to note that only 25% of the amateurs surveyed had solid-state radios. The reason for this is probably because of the age of the sets. Table 1 indicates that although 33% of the amateurs have had their sets for 5 years or more, 23% have purchased new radios within the past year.

Types of Antennas	Number of Amateurs (%)	Reasons for Purchase
Triband yagi beam (3 elements or more)	48	Efficiency and gain. Work all bands. Best value for money.
Dipole	22	Low noise. Fits limited space.
Vertical	10	Low profile. Good construction.
Quad	10	Better DX.
Monoband yagi	7	
Minibeam	2	
Longwire	1	
Total	100	

Table 6. Antenna systems and reasons for purchase.

Why A Specific Radio Was Purchased

The buying environment is an important part of consumer behavior. Not only *where* a purchase was made, but *why* it was made are basic factors to consider.

As shown in Table 2, most of the amateurs bought their radios from either a local franchised dealer or by mail-order. The reasons for this are illustrated by Table 3. It can be observed that the reputation of the dealer, including service, and price are considered to be the prime reasons for buying a set from a particular place.

As discussed previously, the reasons *why* an amateur purchases a particular radio are important factors to consider in consumer behavior. Table 4 indicates that the reputation of the manufacturer, quality, and features of the radio are important elements considered by the amateur when purchasing an HF SSB radio.

Additional factors that influence an amateur's buying habits are illustrated in Table 5. It is interesting to note that 42% of those surveyed felt that advertising played an important part in influencing their final purchasing decision. Additional purchasing influences include friends (31%), QSOs (15%), and store display (10%).

Antennas

There are probably more on-the-air discussions concerning antenna systems than any other piece of amateur equipment. The purchase of an antenna, therefore, is an important factor to consider in relation to amateur buying habits. According to Table 6, the triband yagi beam appears to be the antenna most purchased by radio amateurs. 48% of the amateurs surveyed used this type of antenna. Table 6 also indicates the reasons *why* a specific antenna is being used.

Radio Accessories

An important part of amateur purchases includes radio accessories. The most popular accessories being used by the amateur are linear amplifiers, speech processors, audio filters, tuners, and keyers. Other accessories include monitor scopes, frequency counters, phone patches, and computers.

Occupations

Occupation is a basic index of social behavior. The results of the study show that people from all walks of life are presently enjoying the hobby of amateur radio. The occupations of radio amateurs as given in the survey include those shown in Table 7.

Conclusion

As previously discussed, this survey should be considered merely as exploratory in nature. The study was limited by the size of the sample obtained. This, however, is only a beginning in looking at the radio amateur as a consumer. ■

Journalist-Poet	Veterinarian
Architect	US Army (Captain)
Salesman	Astronomer
Computer Programmer	Auto Mechanic
Asst. V.P. Operations (Railroad)	Photographer
Engineer	US Air Force
Lawyer	Housewife
Real Estate Broker	Plant Manager
Florist	Telephone Installer
Electronics	TV Broadcast Engineer
Post Office Department	Marketing Product Manager
US Navy	US Coast Guard
City Government (Administrator)	Musician
Business Executive	University Professor
Teacher (1st Grade)	Glass Blower
Accountant	College Baseball Coach
Dentist	Clergyman
Retail Bicycle Store Manager	Farmer
Social Worker	Retired
Research (Medical)	

Table 7. Occupations of hams.

*It is not the purpose of this article to rate any one manufacturer's product over another. Also, not all sets mentioned in the study are listed; only those radios that were most frequently mentioned are given here.

Bob Cooper: Profile of a Pioneer

Editor's Note: In just three decades, television has won the hearts and minds of American society. *Newsweek Magazine* reports that the "average family member spends more than seven hours a day tethered to the tube." Innovations like community antennas, cable TV, and now reception directly from the satellites have nurtured our passion for video. Perhaps you prefer an evening of rag-chewing on 75 meters or chasing DX on the low end of 20 to watching the one-eyed monster—even so, you can't deny the impact that television has had on everyone's lives.

Tim Daniel N8RK
73 Magazine Staff

Six meters is open. My little portable SSB rig is hooked to a jury-rigged VHF TV antenna and I'm copying stations as far away as Florida. As I tune across the band, I find a pileup that rivals anything you hear on 20 meters. Eventually the furor dies down and I hear a weak but copyable signal:

"This is VP5D; the name is Bob and my location is Providenciales, one of the Turks and Caicos Islands."

The voice goes on to say that this is not a DXpedition, but rather a permanent station, so if you don't work it today, there will always be another chance.

VP5D is Bob Cooper, also known as W5KHT. When Bob is not handing out reports on six or ten meters, he is likely to be pursuing another form of electronic magic. Bob, you see, dreams about making high-quality, universally-available television a reality.

Cooper is the father of home satellite television. In just five short years, Bob ushered home reception of satellite TV from being a five-figure investment to the point where you can assemble a complete system for about $2000. Along the way, he wrote dozens of articles, including one for *73*, he had a column in *QST*, and he received coverage in publications like *Mother Earth News* and *TV Guide*. Coop's fame extends beyond the written word; he has appeared on Japanese TV news and more familiar programs like "PM Magazine."

To trace Bob Cooper's attachment to video, we have to go back to the infancy of commercial television. The Cooper family lived just far enough away from the nearest station to make reception a difficult task. As a youth, Coop combined his ham-radio-based knowledge of electronics with an enthusiasm for the growing world of TV. After all, building beams and preamps for VHF TV was not too different than home-brewing gear for six meters.

Bob's college training in broadcast journalism eventually led him to the cable TV industry where he was involved with the publication of trade magazines. When the satellite TV era began, Bob was already the veteran of the original TV explosion and the development of cable TV.

Coop's first exposure to satellite TV came at a cable TV trade show in 1975. Soon after, he began to work putting together a system of his own. By scrounging in the true ham radio fashion, he was able to build one of the first home satellite TV receiving systems for far less than the $25,000 asking price.

Along the way, Bob met other pioneers like Stanford University professor Tay Howard W6HD and Bob Coleman K4AWB who were working towards the same goal. Since new equipment was so expensive, these trailblazers relied on surplus units or, failing that, they home-brewed. There were no plans to follow, no kits to buy—only imagination and patience.

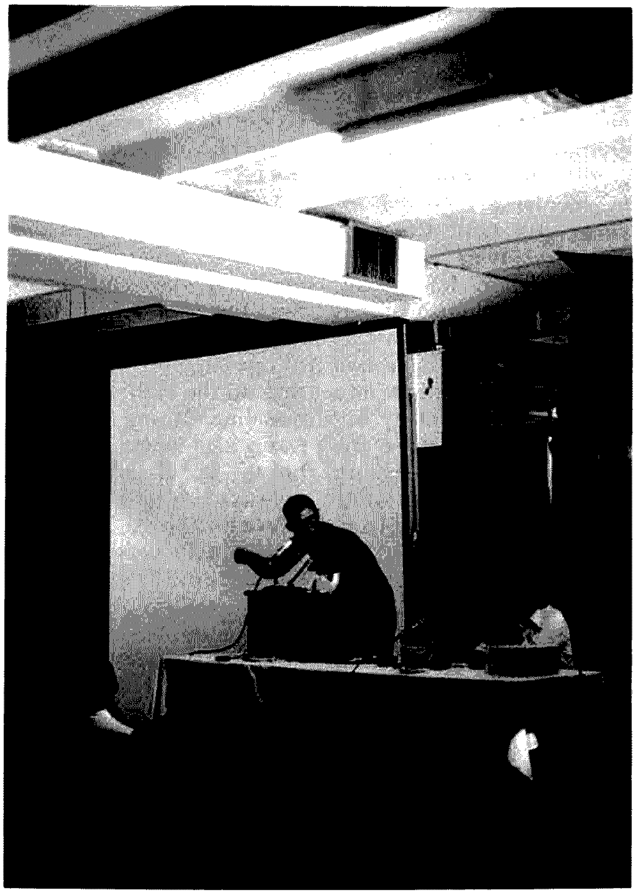
What Bob and a handful of other experimenters were accomplishing was of only passing interest to the professionals in the satellite TV field. The industry was content to keep satellite TV veiled in mystery and expense. Cooper, realizing the potential for the mass appeal of home satellite television receive only (TVRO), decided to go public. He did it in a big way. The *TV Guide* article in October, 1978, and subsequent coverage on the CBS Evening News alerted millions of people about the new technology.

Overnight, Coop was besieged with thousands of inquiries. He had created a demand which he is still striving to meet three years later. In those early days, there was no gear aimed at the home market. Before long, garage industries, often started by hams, sprang up. It was (and still is) a seller's market and anyone with a background in electronics had a tremendous advantage.

A digest for satellite TV enthusiasts, publishing manuals, and sponsoring seminars turned into a full-time endeavor and Bob made the plunge, committing all his talents to the

Bob VP5D.

Bob utilizes his extensive knowledge of the broadcast and cable TV industries to make high-quality TV a reality, despite the remote location. To Bob's left is a vertical interval switching unit which allows him to change signal sources rapidly, without any glitching. The monitor displays a computer-generated time, weather, and community information report. This is just one of the several ways that West Indies Video offers a local flavor to its programming.



The thrice-annual Satellite Private Terminal Seminars (SPTS) are sponsored by Bob Cooper. They offer an outstanding way for both hobbyists and dealers to find out the latest information about this dynamic industry. Approximately 1000 persons gathered at the August, 1981, seminar in Omaha. They had the opportunity to listen to such experts as Steve Gibson, who has combined the technology of computers and satellite TV for some very exciting results.

young industry.

The early days were not all milk and honey. The first Satellite Private Terminal Seminar (SPTS) in Oklahoma City was almost cancelled. A last-minute court hearing decided that the freedom to share information superceded a cable TV supplier's desire to keep the subject a mystery. (The legal questions that surround the satellite TV explosion are just beginning to see a thorough airing.)

Cooper was in on the growth of the industry from the start. *Coop's Satellite Digest* has become the favorite source for update information about the technology and the satellites themselves. How-to manuals, priced from $30.00, sell briskly. The thrice annual SPTS events are attracting over a thousand participants who gladly pay the $150 admission price. Coop had started the wave rolling back in 1978 and he managed to climb on top for a very successful ride. He let others manufacture the equipment, sell the dishes, and install them. His bag is information, something that a young industry can't live without.

New Beginnings

In 1980, the stage shifted from Oklahoma to a small, unknown island in the Caribbean. Just as the home satellite TV industry began to gain momentum, Coop pulled up stakes and moved his family to Providenciales, part of the tiny nation of Turks and Caicos. Besides donning a new callsign, VP5D, Cooper was on the brink of yet another video revolution.

The Coopers fell in love with the serene, isolated beauty of the Turks and Caicos on a vacation visit. It became harder and harder to return home on subsequent visits, so Bob and his wife Susan began thinking about making the island their new home. The prospering monthly magazine, manuals, and seminars gave the Cooper family the independence to choose a life in a home alongside a deserted beach, far from the hustle-and-bustle blacktopped world that most of us know. Bob was more than willing to escape the day-to-day hassles of being an industry leader so that he could concentrate on writing and video work.

The turning point came when Coop presented the plans for his new home to the island officials. Their curiosity about the satellite dish (doesn't everyone have a dish in the backyard?) led to a proposal that Bob share his signals with the rest of Providenciales. Cooper, who was familiar with the long, involved TV broadcasting license procedures in the US, was easily convinced. There were no existing rules for television broadcasting in Turks and Caicos. Being the first to attempt such a project meant that Bob would be able to write the book as he went.

The first priority, after moving to "Provo," was getting West Indies Video off the ground. A 16-foot dish was erected to catch program material relayed through SATCOM F1. The satellite downlink receiver provides a baseband video signal that modulates an "STL" (studio-to-transmitter link), in this case, a low-power transmitter on channel 7. The STL signal is aimed at a pair of yagis located on Provo's highest point, Blue Hill. From this "mountaintop" location, the signal is translated to be broadcast on channel 4 with 8.5 Watts of output power.

From the project's beginning there was a dual challenge. Establishing a reliable, high-quality TV ser-

vice is a major task by itself. Compounding those headaches are the drawbacks that accompany life on a remote island. Just about everything you and I take for granted has to be shipped in, involving a lot of expense and time. Commercial air service is spotty, barge traffic infrequent, and mail delivery takes three weeks, if you're lucky.

Many families have had the misfortune to move into a half-finished home, but how many have faced the challenge of setting up house in a TV station while the workmen are still hammering and sawing? The construction of a real home took a back seat to finishing the station. The control room doubled as an office, while the sound stage served as a bedroom for the two Cooper children.

The system on Provo evolved in stages. At first, the remote transmitter was powered by automobile batteries that required weekly recharging. Later, a solar-cell array took over, reducing the visits to once a month.

Until programmable switching equipment is installed, someone must be present in the control room every time a change in the program source is made. When Bob is gone, this task falls on his twelve-year-old son, Kevin VP5DX.

Except for the fact that only one channel is available, Turks and Caicos viewers are watching television like the premium cable channels available in the US.

Unlike most American television, West Indies Video has no advertising. During early stages of operation, the company is giving away the service. Because of the large expense of setting up the station and the poor advertising potential, Coop is planning to scramble the signal and charge a monthly fee for a decoder.

With 750 subscribers spread over seven islands, West Indies Video has chosen to use an addressable scrambler. After payment is received, the decoder will be activated for another month by a burst of digital transmissions. No money, no TV.

The islands' version of the Nielsen ratings is the phone calls that Bob and his family receive from dissatisfied viewers. Anyone wanting to invoke the wrath of an entire nation can do so by stopping broadcast of wrestling and boxing on Friday and Saturday nights. The most frequently heard complaint is that programs are not available 24 hours a day. It seems as though TV has taken the people of Turks and Caicos from being bored and isolated to being entertained and informed.

The low-power television (LPTV) concept which Cooper has proven in Turks and Caicos shows great promise for revolutionizing TV in the United States. The FCC is now allowing communities to enjoy specialized (educational, regional, religious, commercial) programming broadcast by 10- to 100-Watt UHF and

This is the site of the Cooper family's dream come true. Soon after this photo was taken, work began on a second building that will separate their home from the studio.

August 14, 1981

Dear Satellite Enthusiast,

We all have different dreams and aspirations. For the Cooper family, it had long been our hope that we would one day be able to move, permanently, to some quiet, out-of-the-way Caribbean island where our children could be raised to be self-sufficent, productive young people and where we could, as a family unit, make real and useful contributions to the development of "our island."

Very few people have ever heard of the Turks and Caicos Islands. A country with around 7,000 total population is not often in the headlines. Many maps do not show us to be here; the popular Caribbean tourist guidebooks seldom notice that we exist. Those that do mention us often make the incorrect assumption that the Turks and Caicos are an extension of and a part of the southeastern Bahamas.

Getting here is very difficult. Mail service is extremely poor; telephone service is only slightly better. But within 30 days of our arrival here, the Turks and Caicos had live (satellite-delivered) television. There was no national sport prior to our arrival; now, due totally to satellite television, professional wrestling is the national spectator sport. Nobody here had ever seen or heard world leaders before; they had never seen a baseball game, a play, or a movie. They had no idea what Sesame Street was, or where it was. They had never heard of James Bond or Barbara Walters. They were as far removed from the 20th century as a people could be.

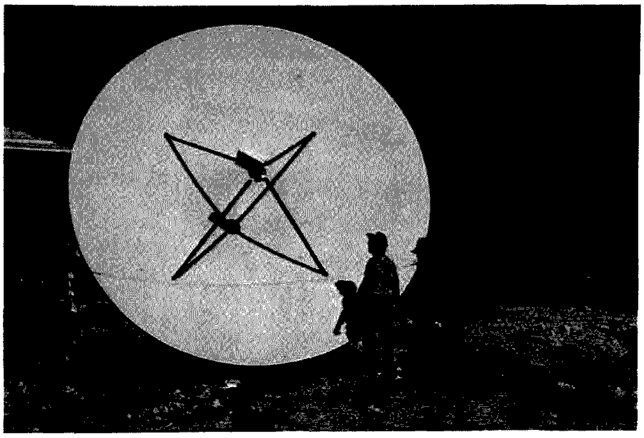
We take the responsibility of providing high-quality television to our country very seriously. We spend as much or more time making careful program selections as we do working out the intricate technical parameters of building a high-quality electronic service.

Satellite television can, in varying forms and shades, do much the same thing for areas closer to you than the Turks and Caicos, as it has done for our country. The satellite service has changed the complexion of the world in just a few short years. In the next five years, we will see such dramatic improvements and expansion of service that our efforts today will seem very primitive by reflection.

This is *the growth field* of the 80s and beyond. This is where the most exciting opportunities of your lifetime are to be found. The opportunities in this young field are totally unlimited. You can do anything you want to do, if you carefully learn the basics, carefully plan each step, and carefully select where and how you will do it.

Welcome to the 21st century. And if you are ever down our way, stop in and say hello to us on the shores of Grace Bay! We are the third satellite antenna on the left.

Bob Cooper



It takes a big dish to pull in studio-quality signals in the Turks and Caicos Islands. Bob, on the left, is with W2NSD/1 and WA1KPS.

VHF stations. Satellites will be the popular, low-cost way to distribute the video and audio to the local LPTV stations. Owning and operating these stations will not require the investment that accompanies one of the full service stations.

Ham radio operators have a long history of pioneering and popularizing new methods of communication. Concepts like single sideband, and now satellite television, have been transformed from expensive and complex mediums into something that is easily understood and affordable.

For individuals like Bob Cooper, radio is accompanied by "magic," whether the challenge is receiving a 4.0-GHz satellite signal or a pileup on six meters. ■

Satellite Channel Guide

—part II

Numbers in parens immediately following programming description indicate *audio subcarrier(s)* used for that particular service.

WU WESTAR 1 (99° W)
Polarization: All Horizontal

TR—1(1)	**Occasional Transmissions**—sporting events, news, and network feeds (6.2/6.8) **The Transtar Network** (est. mid-Oct., 1981)
TR—3(5)	**Occasional Transmissions**—sporting events, news, and network feeds (6.2/6.8) **PET** (Penthouse Entertainment Television)—adult-oriented programming (est. Oct. 1, 1981)
TR—5(9)	**Selec TV**—STV feed: first-run movies, concert specials, & sporting events (6.8) **Occasional Transmissions**—sporting events, news, & network feeds (6.2/6.8)
TR—6(11)	**Occasional Transmissions**—sporting events, news, & network feeds (6.2)
TR—8(15)	**PBS** (Public Broadcasting)—schedule A programming (6.8)
TR—9(17)	**PBS** (Public Broadcasting)—schedule B programming (6.8)
TR—11(21)	**PBS** (Public Broadcasting)—schedule C programming (6.8)
TR—12(23)	**PBS** (Public Broadcasting)—schedule D programming (6.8) **PBS Occasional Feeds** (6.8)

ATT/GTE COMSTAR 1/2 (95° W)
Polarization: ODD—Vertical; EVEN—Horizontal

TR—1	**Occasional Transmissions**—teleconferencing, sporting events, news, & network feeds (5.8/6.2/6.8)
TR—2	**Occasional Transmissions**—teleconferencing, sporting events, news, & network feeds (5.8/6.2/6.8)
TR—4	**Occasional Transmissions**—teleconferencing, sporting events, news, & network feeds (5.8/6.2/6.8)
TR—6	**Bravo**—performing and cultural arts programming (6.8 stereo)
TR—7	**NCN** (National Christian Network)—religious (6.8) **Escapade**—"R"-rated sex and action-oriented movies only
TR—9	**Occasional Transmissions**—teleconferencing, sporting events, news, & network feeds (5.8/6.2/6.8)
TR—10	**Occasional Transmissions**—teleconferencing, sporting events, news, & network feeds (5.8/6.2/6.8)
TR—13	**Home Box Cinemax** (East)—time-structured HBO (6.8) **Occasional Transmissions**—remote feeds (5.8/6.2/6.8)
TR—14	**Occasional Transmissions**—teleconferencing, sporting events, news, & network feeds (5.8/6.2/6.8)
TR—15	**Occasional Transmissions**—teleconferencing, sporting events, news, & network feeds (5.8/6.2/6.8)
TR—17	**TBN** (Trinity Broadcasting Network)—religious (6.8)
TR—18	**Home Box Office** (East)—first-run movies, sports, & entertainment specials (6.8) **Occasional Transmissions**—remote feeds (5.8/6.2/6.8)
TR—19	**Occasional Transmissions**—teleconferencing, sporting events, news, & network feeds (5.8/6.2/6.8)
TR—21	**Occasional Transmissions**—teleconferencing, sporting events, news, & network feeds (5.8/6.2/6.8)
TR—22	**Occasional Transmissions**—teleconferencing, sporting events, news, & network feeds (5.8/6.2/6.8)
TR—24	**Occasional Transmissions**—teleconferencing, sporting events, news, & network feeds (5.8/6.2/6.8)

Audio Services on COMSTAR 1/2

TR—7	**Family Radio Network** (East) (5.8) **Family Radio Network** (West) (7.7)

WU WESTAR 3 (91° W)
Polarization: All Horizontal

TR—2(3)	**Hughes Sports Network**—sports events feeds (6.2/6.8) **Occasional Transmissions**—sporting events, news, & network feeds (6.2/6.8)

TR—3(5) **XEW-TV,** Mexico City—Mexico's leading network station (6.2)

TR—5(9) **Occasional Transmissions**—sporting events, news, & network feeds (6.2/6.8)
Private Screenings—sexploitation "R"-rated movies (6.2)

TR—6(11) **CBS** Network Contract Channel—live/taped network feeds (6.2/6.8)
CBS Cable Network (est. 10-12-81)

TR—7(13) **Robert Wold Communications**—occasional transmissions: sporting events, news, & network feeds (6.2/6.8)
HTN (Home Theatre Network)—quality G and PG movies (6.8)

TR—8(15) **SIN** (Spanish International Network) (6.2)

TR—9(17) **SPN** (Satellite Program Network)—variety entertainment (6.8)

TR—10(19) **ABC** Network Contract Channel—live/taped network feeds (6.2/6.8)

TR—11(21) **CNN** (Cable News Network) Contract Channel—news & sporting events feeds (6.2/6.8)

TR—12(23) **Occasional Transmissions**—sporting events, news, & network feeds (6.2/6.8)
EWT (Eternal Word TV Network)—religious (6.8)
Studio "B" (Academy of Health Science)—medical (6.8)

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Satellite Television Glossary
—part I

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Active Device. An electronics component made using transistors to amplify or control a signal. See *Passive Device (next issue).*
Adjacent Channel Interference. Signal distortion because other signals in nearby frequencies are not properly filtered. A bandpass filter allows only the selected frequency band to pass through it removing adjacent channels.
AFC (Automatic Frequency Control). A satellite TV receiver feedback circuit which prevents the tuning oscillators from drifting away from the center frequency of the selected channel due to temperature change or other instabilities. A phase-locked loop demodulator usually provides an AFC output back to the LO.
AGC (Automatic Gain Control). A satellite TV receiver feedback circuit which controls the gain (amplification) of the i-f amplifiers so that the signal input to the demodulator will be constant, despite incoming signals of varying strength from different satellite transponders. AGC can be overridden by a manual gain control to make signal strength measurements in most receivers.
Alignment. The process of tuning (or tweaking) a circuit to compensate for the approximate tolerances of the components during assembly, using test equipment.
AM (Amplitude Modulation). An easy method of transmitting program signals on a carrier frequency where the relative strength (amplitude) of the carrier is made proportionally equal to the amplitude of the program signal. AM is simpler but more susceptible to noise than FM. Satellite TV uses FM for both audio and video modulation, but the user's TV set takes the satellite TV receiver's output and detects the video as AM, the audio as FM.
ANIK 1. A Canadian TV satellite operated by TELSAT. It has 12 transponders in the vertical format only and is located at 104 degrees west longitude on the geostationary orbit belt.
ANIK B. A Canadian TV satellite in the ANIK series located at 109 degrees west longitude. It has 12 vertical transponders.
Aperture Efficiency. The ratio of captured signal to the theoretical maximum for a given dish antenna/feed combination. The design goal is 100% aperture efficiency, but most TVRO dishes perform at only 50-80% to attain low noise characteristics and ease of construction. Some VHF/UHF antennas, on the other hand, can approach the 100% goal with an array of reflective elements.
ARO (Audio Receive Only). Small dish antennas used by radio networks for music and news programming distribution from TV satellites (mostly WESTARS). Dishes 2 meters and smaller have been considered by radio broadcast stations.
Artwork. A printed circuit design term which describes the printed circuit pattern of etched and conductor surfaces on a PC board.
Attenuator. A passive device which causes a known insertion loss in the signal transmission line. It is commonly used to prevent a very strong signal from overloading a receiver. They are also used as test equipment and in VHF/UHF broadcast reception to eliminate weak ghost signals.
Audio Subcarriers. The sound in a TV satellite composite signal is encoded in a narrow portion of the

video carrier, usually a high-fidelity FM signal at 6.2 or 6.8 MHz as measured after the main signal has been demodulated. Other satellite subcarriers can carry digital and text information as well.

Azimuth. Compass direction from due north measured in degrees clockwise, True north can be found by sighting the star Polaris at night, or by applying a local correction for magnetic deviation to a compass reading.

Azimuth-Elevation Mount. An inexpensive movable dish antenna mount and aiming system. It works like an oarlock where one pivot allows rotation in the horizontal plane about the azimuth angle from due north. The other pivot is the elevation above the horizon. This mount can be more difficult to aim than a polar mount. See *Polar Mount (next issue).*

Balun. An impedance-matching passive device located between a 75-Ohm coaxial cable and a 300-Ohm device, such as a TV set or VHF/UHF antenna.

Bandpass Filter. A type of electronic frequency filter which severely limits signal frequencies above and below the selected frequencies, preventing adjacent channel interference. Satellite TV receivers use these also to remove noise from around the edges of the selected channel, usually 30 MHz wide.

Baseband. This is the output signal of a video camera, videotape recorder, or satellite TV receiver before remodulation (so that it can be viewed on an ordinary TV set). A signal in a satellite TV receiver goes from 4 GHz through the downconverter to become i-f and then through an FM demodulator to become baseband. American NTSC TV bandwidth is 4.2 MHz at baseband.

Beamwidth. The beamwidth of a dish antenna is the angle of sky which can be illuminated (picked up or sent out) by the dish. Within that arc satellites can be seen from the TVRO dish. Large dishes have narrow beamwidths which reduce noise from its sides. Small dishes have wider beamwidths and are noisier, but easier to aim.

Bias. That part of an amplifier circuit which provides power for a transistor and supplies the energy for its output signal. On an LNA, the bias circuits are on a separate PC board.

Bipolar. A type of silicon transistor used in LNAs and other high-frequency, low-noise devices. They are superior in noise quality to ordinary transistors but are inferior to FETs, especially GaAsFETs.

Black Box. An engineering abstraction in which a device is considered only for its effect, not for its construction. Naive users can treat satellite TV components as black boxes until they are ready to learn more about them. They need to know only what they require and how to hook it together.

Blanking Pulses. That part of a video TV signal which for an instant blanks out the screen, enabling the electron beam to fly back to the start of a horizontal line or vertical frame. This is wasted time as far as information transmission is concerned and some methods for multiplexing data channels into a TV picture use the vertical blanking interval.

BNC Connector. Easy to lock coaxial cable fittings which interface signals in the i-f portions of a satellite TV receiver. They work well in the 70-MHz range.

Breadboard Circuit. A prototype of an electronic circuit in which changes are easily made, facilitating construction and debugging of the design.

Broadcast Satellite. A form of international frequency allocation where only the uplink stations are identified (licensed). See *Fixed Satellite for comparison.*

C Band. A loose military designation for 3.7-4.2-GHz microwave frequency band used for the downlinks of satellite TV signals. Wavelengths are between 8.10 and 7.14 centimeters (3.19 and 2.81 inches).

C/N (Carrier to Noise) Ratio. The ratio of the carrier strength and noise strength measured in dB. The higher the C/N, the higher the S/N and quality of the resulting TV picture. Above 11 dB is superior, above 7 dB is good, and below that the picture quickly becomes extremely noisy. See *also S/N (next issue) and FM Improvement (below).*

Cable TV. See *CATV below.*

Carrier. A strong signal occupying a communications channel which is modulated (AM, FM, etc.) to transmit program information. In an abstract sense, the carrier transports the program material from the transmitter to the receiver.

Cassegrain Antenna. A folded beam antenna which enjoys the advantages of a long focal length (high aperture efficiency and gain) without the disadvantages of lengthy and awkward feed supports. The subreflector is hyperbolic in cross section and is precisely adjusted to concentrate the incoming microwave fronts to a feedhorn located at the center of the dish. If the subreflector is elliptical in cross section, the antenna is also called Gregorian.

CATV (Community Antenna Television). Commonly known as cable TV, it has a central antenna tower (VHF/UHF/FM) together with a satellite TV dish antenna and captures high-quality broadcasts for subsequent sale through a signal distribution system, typically using coaxial cables to each home.

CCIR (International Radio Consultative Committee). A division of the ITU (International Telecommunications Union) which formulates international standards for radio communications, including the pre-emphasis and de-emphasis of satellite TV signals in a receiver.

CITT (International Telegraph and Telephone Consultative Committee). A division of the ITU (International Telecommunications Union) which formulates international standards for telegraph and telephone communications including uplinks and downlinks of satellite TV. See *also CCIR.*

Channel. A frequency band allocation which defines the limits of the contained broadcast carrier signal. In the USA, channels are allocated by the FCC.

Chip. An integrated circuit or section of a silicon wafer.

Chip Capacitor. A leadless capacitor small enough to be soldered directly on microstrip or stripline microwave PC boards. They must be used instead of ordinary capacitors because the leads would alter the inductive characteristics of the circuit. They are used to build LNAs.

Chroma. That part of the video signal which contains the color information.

Circular Polarization. Right- or lefthand screw sense of microwave signal polarization used by INTELSAT. A hybrid mode feed should be used to avoid the 3-dB

loss with standard linear (vertical and horizontal polarization) feeds.

Circulator. See *Isolator.*

Close-Captioned TV. A text service for the hard-of-hearing TV audience which decodes a text subcarrier and displays it at the bottom of the TV frame on the accompanying video picture. It does not interfere with the standard audio FM subcarrier.

CNR (Carrier to Noise Ratio). See *C/N.*

Coaxial Cable. A signal transmission line that is made using a center conductor separated from a shielding cylindrical outer conductor by a dielectric, usually polyethylene, sometimes air, in a low-loss application.

Commercial TVRO. A strong dish capable of withstanding hurricane force winds, an LNA with a lengthy MTBF (Mean Time Between Failures) and good noise figure, a drift-free, low-distortion receiver, and a high-quality modulator, all operating at a 3-dB margin above the receiver's FM threshold. This system supplies programming for sale through MATV or CATV distribution.

Common Carrier. An operator or lessor of satellite TV transponders which in turn leases them to other parties or transmits programming for others without controlling or owning the content. 4-GHz satellite TV is not legally a broadcast service and the FCC does not make the satellite TV common carriers (RCA Americom, Western Union . . .) abide by the constraints of broadcasting law.

Comparator. In an FM demodulator using a phase-locked loop (PLL), this is the electronic component which compares the phase relationship of the input signal with the signal from the tracking local oscillator (LO). The output signal from the comparator is proportional to the phase error between the two input signals and is used to control the LO.

Composite TV Signal. This is a combination of video picture, color, audio, and synchronization information.

COMSTAR I. An American satellite which can carry video but is operated by the telephone company, AT&T. Since it is underutilized, eventually it will carry more video. It has 24 transponders, 12 which are vertical linear polarized and 12 which are horizontal linear polarized. It is located at 128 degrees west longitude.

COMSTAR II. An American satellite, second in the COMSTAR series, which has leased 11 transponders to RCA for cable video programming. It also has 24 transponders and is located at 95 degrees west longitude.

COMSTAR III. An American satellite, third in the COMSTAR series, which like its sisters can be expected to carry more video programming in the future. It also has 24 transponders and is located at 87 degrees west longitude.

dB (decibel). A ratio expressed logarithmically which allows easy calculation of losses and gains. Two signals, S1 and S2, can be compared using dB according to the following equation: $dB = 10 \log (S1/S2)$. Often S2 is a known reference level. If a signal is 3 dB over the reference, then it is twice as strong; if it is -3 dB under the reference, then it is half as strong.

dBi. Decibel gain of an antenna over a reference antenna.

dBm. Decibel power of a signal over a 1-milliwatt reference.

dBW. Decibel power of a signal over a 1-Watt reference.

De-emphasis. A selective restoration of the high-frequency end of a satellite TV channel within the satellite TV receiver. This is performed after the FM carrier is demodulated to baseband. *See also Pre-emphasis (next issue).*

Detector. A demodulator circuit in a receiver which extracts the program signal from the carrier.

Dielectric. An electrical insulator which can carry an electric field when near a conductor. It is used to make transmission lines, microwave PC boards, and capacitors.

Diplexer. A section of waveguide which joins two microwave signals in an uplink Earth station.

Dipole. An active antenna element located in the feed which collects the concentrated satellite TV signal and conducts it to the LNA. It is called a probe in this case.

Directional Coupler. In an MATV or CATV signal distribution system, this passive device drops a signal line for a subscriber's TV set from the main trunk line. It is a superior performance signal splitter from the high level (strength) trunk line.

Discrete Components. Unlike an integrated circuit (IC), in this assembly technique each part is built separately and then assembled.

Discriminator. An FM demodulator circuit in a satellite TV receiver.

Dithering. See *Energy Dispersal Waveform.*

DOMSAT (Domestic Satellite). Distinguishes US and Canadian satellites from INTELSATs.

Double Conversion. This downconversion technique converts from 4 GHz to the final i-f (typically 70 MHz) in two stages instead of just one, so that potential image noise from the first mixer stage is eliminated. *See also Single Conversion (next issue).*

Downconversion. The process of converting the 3.7-4.2-GHz microwave signal down into a frequency range in which signal processing components are less expensive. Typically, this is a VHF frequency of 70 MHz.

Downconverter. A microwave part (consisting of local oscillators (LO), mixers, and bandpass filters) which accomplishes downconversion. This is the front end of a satellite TV receiver.

Downlink. The communication path from a TV satellite to its ground (Earth) stations.

Duroid. The brand name of a microwave printed circuit board specified in many LNA and downconverter plans. Mostly D-5880 226-127 from Rogers Corp. has been used.

Dynamic Range. The weakest through strongest signals that a receiver will accept as input. Signals which are too weak cause excess noise and signals which are too strong cause overloading and possibly modulation distortion.

East Coast Feed. Satellite TV programming scheduled for the convenience of US east coast viewers (Eastern Time Zone).

EIRP (Effective Isotropic Radiated Power). A measure of the relative strength of the satellite TV signal ex-

pressed in dBW. The USA ranges from 30 in Florida to 37 dBW at boresight in the midwest. Home satellite TV reception becomes much less expensive at 34 dBW and above. Footprint maps showing relative signal strengths in EIRP are filed at the FCC and ITU before the TV satellite is launched.

Elevation. Angle above the horizon measured in degrees. Zero is the horizon and ninety degrees is directly overhead. Elevation angles are used to aim the dish antenna at a TV satellite.

Energy Dispersal Waveform. This is a triangular-shaped signal at 30 Hz synchronized with the vertical blanking interval in the TV signal from the satellite which ensures that the signal will average its power out over the whole channel, even when just the carrier is present. This waveform is removed by the receiver after FM demodulation.

Etched PC Board. Acid is used over a mask (artwork) to dissolve away excess copper conductor leaving a conductor pattern on the PC board.

F/D. Focal-length-to-diameter ratio of a given dish antenna. Generally higher ratios yield better aperture efficiencies, but may be more susceptible to sidelobe noise.

FCC (Federal Communications Commission). The US agency which regulates communications, including satellite TV.

Feed. The antenna feed is a section of shaped waveguide which correctly collects the dish's reflected microwave signal and conducts it to the LNA's probe. Generally, a feed is uniquely designed for each dish antenna type.

Feed. A programming term which means a stream of programming material, for example, in the process of transmission over the TV satellite. Examples of its usage are: sports feed, east coast feed, and network feed.

Feedline. Coaxial cable running from the LNA to the satellite TV receiver.

FET (Field Effect Transistor). A low-noise, high-frequency transistor amplifier which has a current source, gate, and drain. The gate is a voltage-controlled resistor which regulates the power flowing from the source to the drain.

Field-Strength Meter. A CATV and TV test device used to measure power levels on a transmission line or VHF/UHF antenna.

Fixed Satellite. A form of international frequency band allocation where all the sending (uplink) and receiving (downlink) stations are identified. This is the current status of the 4-GHz TV satellite system. *See also Broadcast Satellite above.*

FM Improvement. The potential noise reduction in an FM signal due to the demodulation process in a satellite TV receiver. This figure is at most 38.6 dB and is attained above the FM threshold. Below this point it rapidly drops from 37.6 dB. Above threshold: S/N = C/N + 38.6 dB.

FM Threshold. An input signal level which is just enough to enable the demodulator circuits to extract a good picture from the carrier. With test equipment, static threshold is the point at which S/N drops more than 1 dB from the straight graph line: SN = C/N + 38 dB. Typically, FM threshold is 7-8 dB in a satellite TV receiver with threshold extension.

Footprint. A signal strength map showing the EIRP contours of equal signal from a TV satellite transponder on a given part of the Earth's surface.

Frequency Agile. This is a feature of satellite TV receivers which enables them to tune in all the 12 or 24 channels from a satellite. Receivers sold without this feature are dedicated to one channel and can be tuned by switchable crystals.

Frequency Coordination. A service which uses computers and a USA database to resolve potential or existing conflicts between various users of the same 4-GHz microwave band. The long-lines (long-distance) division of the Bell networks uses 4-GHz microwave towers throughout the USA. A TVRO looking in the direction of a transmitter may be jammed unless shielding can be used.

Frequency Modulation (FM). A method of transmitting program material which is more interference-free than AM. The frequency of the carrier signal is made proportional to the amplitude of the program signal.

Frequency Reuse. *See Polarization (next issue).*

Front-to-Back Ratio. The ratio in dB of the antenna gain in the forwards direction to the antenna gain in the rear direction. It is a measure of the noise potential from the rear.

G/T (Gain over Noise Temperature). A TVRO measure of quality expressed in dB. The higher this figure, the better the system. It can be improved by increasing gain or by decreasing the system noise. G/T (degrees Kelvin) = antenna gain/log (antenna noise temperature + LNA noise temperature).

GaAsFET (Gallium Arsenide Field Effect Transistor). This low-noise device, although expensive, is used in the highest quality LNAs. The term is pronounced gasfet.

Geostationary. Dubbed the Clarke Orbit in honor of Arthur C. Clarke who first described it. This circular orbit above the equator is precisely the altitude at which any size satellite will revolve around the Earth once every 24 hours. From the ground below, it thus appears parked in space overhead, and from above, one-third of the Earth's surface can be seen. TV satellites are separated by 4 degree intervals on this orbit to avoid mutual interference 38,000 km (22,300 miles) high.

Ghost. One or more dim copies in a TV picture caused by reflected VHF or UHF broadcasts. Also called multipath distortion, this is not present in satellite TV signals because extremely directional dish antennas are used.

GHz (Gigahertz). The standard abbreviation for billions of cycles per second. 3.7-4.2 GHz is the microwave frequency band allocated for satellite TV in the USA.

Global Beam. An INTELSAT antenna downlink pattern covering a third of the Earth's surface. They are boresighted at the middle of an ocean to provide service to nations all the way around the ocean basin.

Guard Channel. Unused portions of the frequency spectrum which are located between program channels to prevent adjacent channel interference.

Harmonics. Spurious signals produced by an oscillator circuit which occur at integral multiples above the resonant frequency of the oscillator. They appear

like overtones on a single piano note. They can cause design problems in a receiver circuit unless proper filters are used to remove unwanted harmonics.

HBO (Home Box Office). The most popular pay-TV network which is distributed on SATCOM F1.

Headend. The point on a signal distribution system where UHF/VHF/FM and satellite TV signals are captured, combined, and fed into the system.

Hemispherical Beam. An INTELSAT antenna downlink pattern consisting of two overlapping spot beams to cover a hemisphere.

High Pass Filter. A circuit which features high impedance for relatively low frequencies and low impedance for high frequencies, in effect blocking the low-frequency component in a signal. *See also Low Pass Filter and Bandpass Filter.*

Horn Antenna. A type of satellite TV antenna which is shielded against sidelobe interference. The incoming signal is reflected 90 degrees into a cone-shaped feedhorn. They are much more expensive than a dish antenna of the same aperture.

IC (Integrated Circuit). A solid state complex device which is mass produced on single silicon chips.

I-f (Intermediate Frequency). For satellite TV receivers, this is usually 70 MHz and is the frequency at which most of the signal processing takes place because the design is simplified and 70-MHz parts are less expensive than 4-GHz equivalents.

I-f Strip. A PC module which amplifies and filters the output signal of the downconverter in a receiver and inputs it to the FM demodulater. Its gain is controlled by the AGC circuit.

Image Noise. When a signal is downconverted using a mixer and LO, noise can be passed through the system that is on the mirror image frequency from the selected channel with the LO frequency as the point of symmetry. Subsequent bandpass filters remove this noise in double-conversion downconverters. A preselector filter in single-conversion receivers does the same thing.

Impedance. The relative ease with which signals pass through a device or conductor measured in Ohms.

Impedance Matching. The design of a signal interface such that the signal transmitted through it is maximized and the reflected signal is minimized. Standard impedance for LNAs is 50 Ohms and for satellite i-f circuits 75 Ohms. Most signal distribution systems interface at 75 Ohms impedance.

INTELSAT. International (primarily non-communist) satellite agency whose member nations lease transponder capacity on its satellite system. It provides at least some TV in all parts of the world, but signal EIRP is often quite less than US domestic satellites.

Isolator. A device which is a one-way valve for microwave signals which prevents stray receiver signals from leaking out past the LNA onto the antenna. It also facilitates the design of the LNA by impedance matching the feed probe to the first LNA amplifier stage. Most LNAs have an isolator attached between the CPR-229 feed flange and the main amplifier box.

Kelvin. The scientific temperature scale which measures thermal noise characteristics of microwave devices. Performance improves with decreasing noise temperature. 0° K equals −273 degrees Celsius and −459 degrees F. The Kelvin scale starts at absolute zero and is graduated like the Celsius scale.

Launch Vehicle. A NASA term for the rocket used to place satellites in orbit. For TV satellites this is usually the Delta, although the Space Shuttle will take over this job in the 1980s.

Level (High or Low). In communications, level means the same as amplitude or relative strength.

LO (Local Oscillator). A closely-connected frequency source which is typically controlled by a resonating crystal or by an input voltage. *See also VCO and VTO (next issue).* They are a major component of downconverters and demodulators in receivers.

Lobe. An area of strong reception in a graph of antenna gain versus angle off boresight. In highly directional dish antennas, the front lobe is high gain and the side and back lobes are much weaker.

Look Angle. Pointing angles for aiming an antenna at a TV satellite for a given site. This term is also used when referring to antenna elevation alone. It is important when considering possible site obstructions or extra antenna noise due to a low elevation (look angle).

Low Pass Filter. A circuit which features high impedance for relatively high frequencies and low impedance for low frequencies, in effect blocking the high-frequency component in a signal. *See also High Pass Filter and Bandpass Filter above.*

Luminance. That part of a video signal which controls the brightness of the image on the TV screen.

Reader Service for facing page ✓74→

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TVRO Receivers: The Inside Story

—Satellite Central, part II

Getting 4-GHz signals down to watchable video is no easy feat. Noted satellite TV pioneer Paul Shuch N6TX once observed that there are perhaps as many receiver designs as there are receiver designers. Despite the fact that satellite TV is new, we've already experienced at least two generations worth of improvements in receiver design philosophy. Both methods employ your garden-variety superheterodyne conversion principle. But that's about the only similarity.

The major hassle is dealing with the microwave signal itself. The components are either too expensive and hard to get or they are incredibly fragile and roll over and turn belly up when you approach them with a soldering iron! So the logical solution is to convert the troublesome 4-GHz signal down to something we can massage with parts we can understand, like coils and capacitors rather than pea-sized chip caps and PC board traces that are alleged to be tuned circuits! There will be plenty of time for that later. For the time being, let's just get our feet wet.

Referring to Fig. 1, we have a typical dual-conversion receiver design. This is the "classic" or "by-the-book" method used by most commercial firms today. A voltage-tunable local oscillator (LO) mixes with the incoming 4-GHz signal down to a 400- to 1200-MHz first intermediate frequency (i-f). This is in keeping with the spirit of a textbook approach of selecting an i-f about one-tenth of the incoming signal (the "divide-by-10" rule). After some needed amplification, the signal is mixed again down to what is known as baseband (because we're done with conversion), amplified even more, and then detected with either a PLL or discriminator circuit. Baseband is generally 70 MHz, an industry standard.

So Much For Basics

The key points worth noting here are conversion to a lower frequency where we can crank in lots of easy-to-find gain . . . and sticking to the rules. But why do that? Well, conversion makes a lot of sense. After all, the incoming signal may very well be around −50 to −60 dBm at 4 GHz and a 564 PLL detector chip wants something quite different before it will deliver pictures.

But who made the rules about dividing by 10 and that nonsense? The guys that got there first, of course. They did some arithmetic and made a discovery of some importance. A single-conversion design has problems if you chose a first (and only) LO just 70 MHz from the desired signal. You get down to baseband a lot quicker, but you get something else in the bargain . . . the image signal as seen in Fig. 2.

Remember from last month's Satellite Central that the satellite band (3.7 to 4.2 GHz) is 500 MHz wide. So even an LO spaced some distance away, whether above or below the

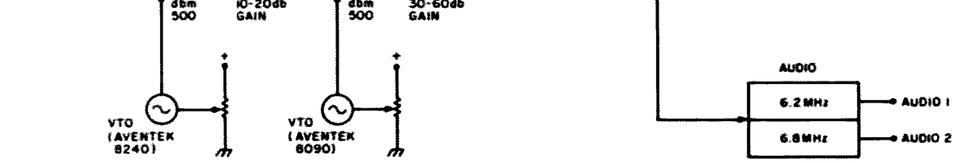

Fig. 1. Dual-conversion design. The first VTO mixes with the downlink signal into the first i-f amplifier. The second VTO is fixed. Gain distribution may vary in different designs. The 70-MHz bandpass filter must be flat in the passband for best results.

desired frequency, can still convert an undesired image signal to baseband.

Now you could filter out the image on the front end, but you would have to make the filter track with the LO to remove all images as you tuned. At these frequencies, a tracking filter is no easy beast to tame. So rather than wrestle with the problem, receiver designers such as Stanford professor Taylor Howard W6HD adopted the dual-conversion philosophy and proceeded to knock 'em dead with the first low-cost TVRO! The design has become a sort of standard of this new industry with several manufacturers duplicating it piece by piece, even to the last resistor, probably because Howard made his complete design available to anyone.

An Interesting Turn of Events

As an historical note, Howard designed his receiver with available components. The key word here is "available." While you could indeed call Avantek and order an 8240 voltage-tuned oscillator (VTO) or call Vari-L for a DBM-500 mixer, you also could sit around and tear pages off your calendar while waiting for delivery! I had time to traipse all over California scouting up surplus dishes as the clock ticked away.

Clearly, something had to be done. Several amateurs, most notably Robert Coleman K4AWB, made an interesting discovery. Not only were surplus mixers lying around, but single conversion could be made to work! A quick doodle with pencil and paper suggested it might be worth the trouble.

If we want to receive transponder 17 on SATCOM 1, its frequency is 4040 MHz. Setting the LO down 70 MHz, to 3970 MHz, will indeed pull transponder 17 into our 70-MHz i-f, but also the image frequency as well, which is 70 MHz below the LO. Now it happens that's dead-on transponder 10 at 3900 MHz. So it can't possibly work! Or can it? We know that RCA and COMSTAR birds have 24 transponders. And we also know that the odd-numbered transponders (such as transponder 17) are vertically polarized. But if the even transponders are horizontally polarized (such as transponder 10), then our receiving antenna will be cross-polarized to the interfering signal and hopefully ignore it!

So it appears that single conversion does indeed work despite the prospects of image noise. There is a limit. As a rule, cross-polarization may only reduce the image signal 20 dB, but recent efforts at image-reject mixer design and a new tracking filter eliminate this annoyance, as seen in Fig. 3.

Baseband At Last

Nearly all of the foregoing problems are a result of wideband FM video detection circuitry not working too well at high intermediate frequencies. However, it can be made to work. A few manufacturers have designed excellent discrete PLL circuits that work at 700 MHz, making signal conversion a piece of cake. But 70 MHz remains as the i-f most used at the moment.

As I mentioned before, quite a few receiver designs utilize a 564 PLL detector chip at the end of the 70-MHz i-f chain. The problem here is that the 564 is rated to only 50 MHz. Still, a handful of 564s will always yield several that work at higher frequencies, depending on the source. But a drastic improvement is 564 operation can be had by cleverly dividing the 70-MHz i-f signals by two with a cheap JK flip-flop chip like a 74LS112 and operating it at 35 MHz!

Other detector designs in use today are quadrature detectors and linear discriminators. They offer advantages and disadvantages when compared to the PLL. While the PLL offers excellent performance at receiver threshold and below, it takes second place to the discriminator and quadrature-type detector when signals are well above threshold. Remember from last month that we must try for a carrier-to-noise ratio of about 10 dB or better for clear pictures. (That translates to at least a 12-foot dish and a 120° LNA for most locations in the USA.) Still, you don't need nearly as much gain for a PLL as you do a discriminator.

To work properly, the discriminator must see a signal that is amplified well into limiting. This is the main reason why quality receivers look bad compared to cheapy models when tested on marginal systems.

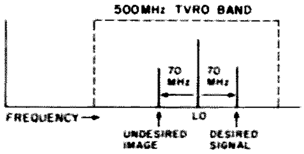

Fig. 2. An in-band LO can produce an undesired image signal. Luckily, this image is cross-polarized to the desired signal. It's not enough for perfect pictures, so other methods are necessary to ensure adequate image rejection.

SATELLITE TV HAM NET!

Tune in Sundays at 1800 GMT on 14.311 MHz for the Satellite TV Net. Lindsey Riddle W5JG in New Orleans is Net Control. Then Ken Rae WB0POP takes the reins at 1900 GMT. You'll be amazed at what you can learn in just an hour or so.

But just cranking up the gain is not enough, as some experimenters will tell you, because not all i-f amplifiers will limit symmetrically. A weak location or a smaller dish can still be made to work, thanks to the PLL.

But suppose you've dug deep into your pocketbook and found enough money to allow you to build your system so it operates well above threshold? Then the discriminator or quadrature detectors really shine because the PLL can sometimes break up an other-

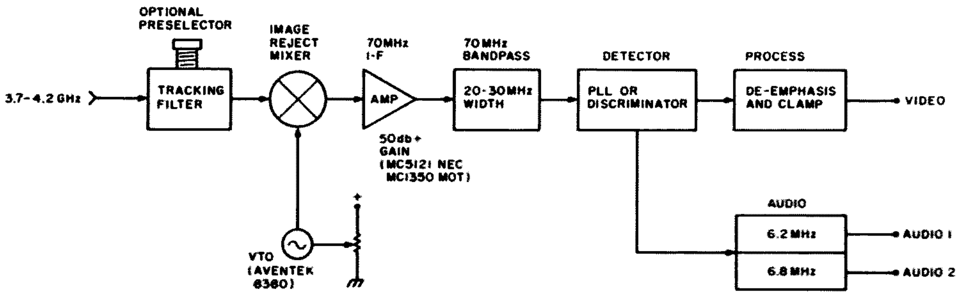

Fig. 3. Single-conversion design. The problem with single conversion is that an image signal can be detected. Tracking filters and clever image-reject mixer design can reduce the image by 20 dB or more. A good high-gain LNA will overcome mixer losses in this design.

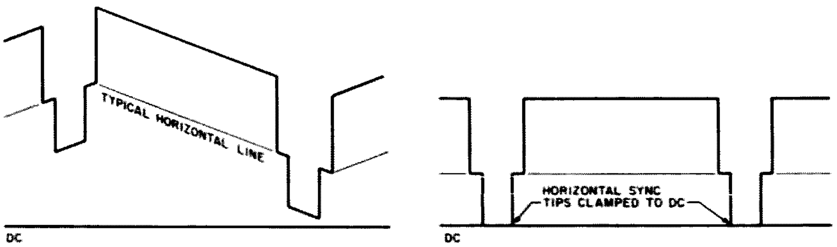

Fig. 4. (a) Video demodulator output showing video riding on energy dispersal wave. (b) Energy dispersal wave eliminated by dc clamp circuit.

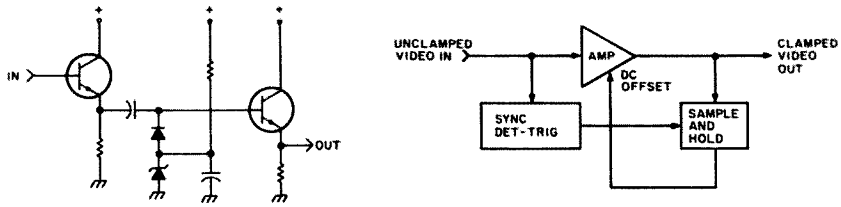

Fig. 5. Typical diode clamp circuit used in economy receivers vs. feedback clamping taken from voltage samples of the video signal during the sync pulse interval.

wise fine picture when tracking wide deviations. You see an annoying streaking effect in the video. Tweaking the bandwidth can help to cure this problem.

Now if the PLL works pretty well at the 35-MHz reduced i-f, you might wonder what would happen if we divided again and again down to nearly dc. Perhaps the only problem with that idea is that we bump into Carson's rule along the way. Simply stated, the practical bandwidth of a frequency modulated signal should be equal to twice the sum of the maximum frequency deviation and the highest modulating frequency. If we know the typical frequency deviation as 10.75 MHz, then twice the highest modulating frequency (how about 5 MHz for video?) when added to this deviation yields a projected bandwidth of 31.5 MHz. Actually, it could be more if we lay in a 6.2-MHz or a 6.8-MHz sound subcarrier. Bandwidth = 2 (10.75 MHz + 5 MHz) = 31.5 MHz.

Watching Intelligent Noise

Okay, how wide an i-f is necessary? It really depends on your carrier-to-noise ratio (C/N). If you have a small dish in a weak footprint, you may very well be at threshold or below. A wide i-f bandwidth will only make matters worse because you will appear to be seeing more noise than video. While our eyes tend to integrate enough to discern intelligence, nice and clear pictures are what we really want. If you worked out the downlink equations we discussed last month, you well know that restricting the bandwidth by more than Carson's rule can make a big improvement in C/N. But there is a limit.

The problem then is to figure out how to squeeze a wide car into a narrow garage! If we don't mind scratching the chrome, we can just barely get it in. Likewise, we can reduce the i-f bandwidth to 17 MHz or so and have viewable video, but at the expense of the finish on the pictures. More importantly, the carrier-to-noise ratio may improve enough to make the pictures very watchable. That is until you wonder what happened to the definition and why the frizzy effect when flat color fields are transmitted. Clearly, there is a limit to bandwidth restriction. Whatever was out there at those wide deviations is gone now!

You can reduce the distortion somewhat if you turn down the color and watch everything in black and white, but that's taking a giant step backwards. In fact, you might just as well turn down the sound, too, because all you'll hear is the sound of birdshot being dropped on a cookie sheet! Nothing takes the place of a large dish and a good LNA . . . nothing.

Beyond Detection

The sound channel is easy to detect. It is merely an FM subcarrier that may be 6.2 MHz or 6.8 MHz. Most receivers are equipped to receive both inasmuch as detection for each subcarrier can be done in a single consumer TV sound section IC such as the CA3065. As a rule, 6.8-MHz subcarriers are used on RCA/SATCOM birds, while 6.2-MHz subcarriers are found on Western Union/WESTAR birds. Nothing is standard, so a switchable or tunable sound subcarrier detector is necessary.

Other subcarriers may be located above video on some transponders. Background music and slow-scan services as well as data transmissions can be found. We will be sure to look at methods of recovering these signals in future installments of Satellite Central.

Satellite TV signals are pre-emphasized according to a CCIR curve. This amounts to a 10- to 12-dB boost on the high end of the video. An LC network smoothes the curve back out as well as wiping out the sound subcarriers before further video amplification.

Fig. 4(a) shows the output of a typical detector after de-emphasis. Notice the unclamped video appears to be riding on a triangular wave at the frame rate. This is known as the energy dispersal waveform and is mixed in at the uplink transmitter. It is simply a way to keep the main carrier moving during the unlikely loss of video. That way, every microwave link in the country on that frequency doesn't get sprayed with an interfering carrier from space. As a practical matter, it's quite the other way around. In any event, a clamp nails the energy dispersal waveform down to dc in Fig. 4(b) and we have clean video. If this waveform is not removed, the picture will flicker at the 30-Hz rate.

Some TVRO receivers have modulators in them so the detected video and sound can be fed directly to a TV set. Others may only have a one-volt audio and video output. While a cheap TV game modulator can be used to get the picture into channel 3 or 4 of your TV, the results leave much to be desired. Sometimes it's simply the result of poor design. But poor shielding is the likely culprit. The modulator output

manages to find a way back into your 70-MHz i-f chain (remember that channels 3 and 4 would fall into the i-f bandpass of 55-85 MHz). The solution is to skip the re-modulation process and feed the audio and video into a quality TV monitor or a regular TV modified for audio and video input. On the other hand, an effortless method is to simply feed the TVRO receiver into a video tape recorder and use its internal modulator!

Obvious Differences

While price may be the major obstacle to designing an ideal receiver, experience with the problems you're likely to encounter runs a close second. As we learn more about what can and can't be done, we can make adjustments to our thinking and our design. For example, the VTO used in most receivers is a real hassle. You have 500 MHz worth of tuning spread over about a 270-degree twist on the pot. That's a lot for manual tuning (over 470 standard broadcast bands!), so afc is needed, if not for sheer operator ease, then for the very small amount of drift you'll likely encounter. Fancy receivers use a synthesizer and eliminate the problem. That takes more parts, which adds to the price . . . but not too much if you do it yourself!

You can sometimes discern a quality receiver design from an economy version by observing how well the energy dispersal clamp circuit functions. While simple receivers use a simple diode clamp, more expensive (and better designed) versions employ voltage feedback methods such as seen in Fig. 5.

By far the most interesting difference in receivers today is the concept of splitting them up into pieces as some economy-minded manufacturers have done. This eliminates the need for expensive coax to carry the 4-GHz signal from the LNA to the receiver. They simply mount the mixer, VTO, and first i-f at the dish and run the lower i-f to the house on RG-59. Some really clever LNA manufacturers are building the whole works into a single LNA and downconverter, calling it an LNC!

Tricks Worth Trying

If you want to try your hand at receiver design, go ahead with the certain knowledge that much of the foregoing works well enough to be a good point of departure for your own design fantasies. Microwave genius Steve Birkill G8AKQ, of Sheffield, England, downconverts into a broadbanded UHF TV tuner. He does the first conversion to UHF at the antenna so that RG-59 can be used rather than the expensive 4-GHz stuff. The UHF tuner then performs the second conversion down to an i-f the PLL can handle.

The cost of tuners like Steve's is around 25 bucks. Some of the newer varactor tuners are very broadband except for a coil in the last stage. A few moments of work are all that's necessary to modify the stage for the wide bandwidth needed for good pictures. Does the idea sound interesting? Then how about following the tuner with a very cheap TV IC amplifier chip such as the MC1350 for your i-f amplifier? And if you don't like that PLL, then why not use an MC1357 FM quadrature detector chip instead? Rex Rhoads, an engineer with RCA, has done it with excellent results. By the way, the construction cost of his entire receiver using this very conventional circuitry (no secret chips or tricks) is way under $100!

The time is right for you to join in the fun of receiving TV from space. If you have a question regarding the topics we cover here, feel free to drop me a line (letters only, no calls please). Sorry, I can only answer mail that is accompanied by an SASE.

You can find out more about receivers by reading two back issues of *73:* November, 1979 ("The Satellite TV Primer," Bob Cooper) and December, 1979 ("Low-Cost Receiver for Satellite TV," Paul Shuch). ■

The Nelson Parabolic TVRO Antenna Manual
by Nelson Ethier
reviewed by:
S.F. Mitchell WA4OSR and Richard Christian WA4CVP

As the foreword in the *Manual* states, author Ethier has no formal microwave training, but "he is an excellent student of obscure textbooks and an avid do-it-himselfer. . ."

The Nelson Parabolic TVRO Antenna Manual starts with a general discussion of parabolic dish design and describes the relative advantages of a parabolic antenna over the spherical antenna. These advantages include the fact that the focus never changes and that the entire surface works to collect the signal. A brief review of noise, noise measurement (dB and degrees K), calculation of antenna gain, wavelength, and formulas to find parameters follows. Nelson then gives the arguments for different focal ratios and the reasons why he selected an f/d (focal point to diameter) ratio of 0.375.

Very detailed treatment is given to the calculation of the parabolic curve for his antenna. The formula and a method of laying out the curve on graph paper is presented along with a table with the curve calculated in one-half-inch steps for a 10-foot dish with a .45 f/d ratio or a 12-foot dish with a .375 f/d ratio. These calculations are very simple and can be done on a calculator with a square root function.

The most informative part for us was the section on choosing the antenna to suit the needs of a particular site. A brief discussion of the significance of the carrier-to-noise ratio (CNR) and an example of its calculation gives you an idea of the type of picture quality you should be able to obtain at your location.

The material between page 11 and the *Manual*'s end on page 31 is devoted to the actual construction of a 12-foot parabolic antenna, feed, feedhorn, and polar mount. The antenna is built on a form which must be fabricated with plywood and fiberglass rods. The form is constructed and covered with 0.020 sheet aluminum which must be cut and formed. Fiberglass is then applied to the back of the aluminum. Reinforcing ribs of wood and urethane are then added and a second layer of fiberglass is applied. The finished antenna appears to be quite sturdy. Although no estimate of the antenna's cost is given by Ethier, we estimate that it would cost between $750 and $1000 and require as much as two months of steady work to complete.

Pages 23 to 29 describe the fabrication of the feed, feedhorn, and mount. The feed itself is an aluminum tripod bolted to the rim of the dish. It appears that this system, which involves using an antenna rotator to turn the horn, may put undue stress on the feed assembly.

Overall, we feel that the *Manual* gives a lot of good information, but it gives very little that we haven't seen elsewhere. The best part of the manual is the first ten pages where antennas and system requirements in general are discussed. The actual construction of the antenna may not be practical since a commercial antenna can be as cheap, if not cheaper. *The Nelson Parabolic TVRO Antenna Manual* is well worth $15.00, but at the $30.00 cover price we feel that it is very expensive. *The Nelson Manual* is available from the publisher, Satellite Television Technology, PO Box G, Arcadia OK 73007.

This review is reprinted from *'Lite News*, PO Box 973, Mobile AL 36601.

Reader Service for facing page ✓331→

The Ace Portable Synthesized VHF Receiver

—for those times when listening is enough

Karl T. Thurber, Jr. W8FX
317 Poplar Drive
Millbrook AL 36054

The sight of a 2-meter handie-talkie (HT) strapped to the belt has long become a telltale sign that the wearer is an amateur radio operator—whether it be at a hamfest, on the street, in a public place, or wherever. There's no question that the personal two-way portable has revolutionized amateur radio with a "go-anywhere" mobility and convenience that was unheard of just 8 or 10 years ago.

Nevertheless, there are times when even the smallest of amateur HTs are a bit much to tote around. In many situations, sporting an obvious HT marks one as a nut, freak, or fuzz and can even set one up for a ripoff. Frequently, it's not absolutely necessary to be able to transmit; a small monitor receiver may do the trick. What is, in fact, needed in many situations is an ultra-small, programmable, synthesized monitor that is truly of pocket-sized dimensions.

A few years back, the Henry Radio Co. took a giant step forward in this area by marketing a line of low-cost pocket receivers, available in several models: a VHF-high band scanning radio, a 12-channel nonscanner, a two-channel VHF-high monitor/paging receiver, and a single-channel UHF receiver. These four radios, available with accessory continuous tone-controlled squelch system (CTCSS) and two-tone decoders, filled a variety of needs as monitor or pager receivers for hams, volunteer firemen, auxiliary police, civil defense personnel, and the like. The sets, with sensitivity typically in the range of 0.8 microvolts for 20-dB quieting and including an internal nicad pack, were not only shirt-pocket size, they were small enough to fit in the palm of the hand. Their main drawback, common to all such fixed-tuned, crystal-controlled receivers, was the fact that they were just that, *fixed tuned*, meaning that additional (expensive) crystals were required for expanded frequency coverage. For example, in the case of a 12-channel VHF receiver, $60 worth of crystals at $5 a shot would be required for full utilization. The same technical developments in frequency synthesis that caused the crystal-controlled HT to go out of favor have had almost the same effect on monitor receivers such as these, as

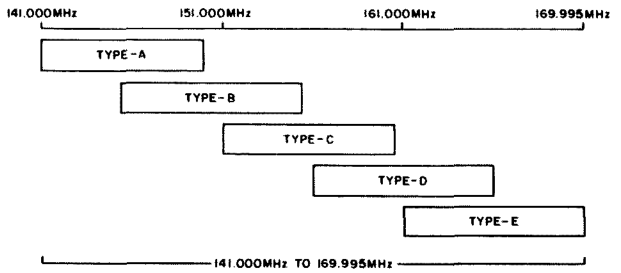

Fig. 1.

well as mass-market police and fire monitor table radios and scanners of the type made by Bearcat, Regency, and Radio Shack.

A recently introduced VHF FM PLL synthesized monitor, the AR-22, manufactured by AOR, Ltd., of Tokyo and sold in the US by Ace Communications, Inc., of Tustin CA, has effectively harnessed the new technology and made practical a wide-range VHF communications receiver in a coat- or shirt-pocket package. The new radio, which is 5¼" H × 2½" W × 1" D, weighs but 7.1 oz. (200 grams) with the battery pack installed. The AR-22 is designed specifically for applications where people on the move must reliably monitor transmitted VHF signals, even under adverse conditions. The AOR unit is capable of covering the VHF frequency spectrum from 131.000 MHz to 179.995 MHz and is offered in five discrete ranges emphasizing monitoring requirements of different radio services including amateur, police, government, marine, railroads, etc. As can be seen from a look at Fig. 1, the two receiver configurations of most interest to amateurs are Type A, covering 141.000 to 149.995 MHz, and Type B, covering 146.000 to 154.995 MHz. The maximum frequency coverage of each set is listed as 8.995 MHz with little or no degradation of performance at the band edges.

Designed for FM reception, the radios feature PLL frequency systhesized, dual-conversion superhet circuitry with low-noise CMOS logic to cover the 8.995 MHz range specified, in 5-kHz increments.

The direct frequency readout enables positive

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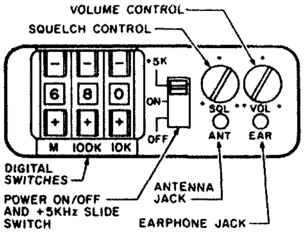

Fig. 2.

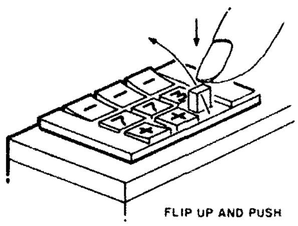

Fig. 3.

frequency control without the battery drain introduced by LEDs or LCDs.

The two most significant digits are factory-programmed. For example, in the Type A (2-meter) receiver, the base is 140.000 MHz; this does not require reprogramming. As indicated in Fig. 2, the third, fourth, and fifth digits are individually controlled and set by the three-section digital thumbswitch on the radio's top panel. The slide switch allows for 5-kHz reception increments—this feature allows the receiver to monitor the exact transmitted frequency or to be set for standby at a predetermined frequency. The receiver is set to the desired frequency using the (+) or (−) flip-up push-button located adjacent to the digit to be changed—the button is simply flipped up (+ or −), then pushed down to set the desired frequency (see Fig. 3).

The receiver's specs are impressive and are, in fact, comparable to good amateur HTs. Claimed sensitivity is 0.2 microvolts EIA for 12 dB SINAD, with an audio squelch sensitivity of 0.2 microvolts. The radios incorporate what the manufacturer calls "electric stage tuning" for nearly 9-MHz-wide coverage. As such, the input and rf stages of the set are tuned electronically by variable tuning diodes which are inserted into each stage to obtain maximum sensitivity as well as maximum selectivity and out-of-band spurious and image signal rejection. Adjacent channel rejection is spec'd at ±12.5 kHz at 60 dB down, while spurious and image attenuation is about 50 dB. Frequency stability is excellent, within ±10 ppm (parts per million) over the operating temperature range of −10 degrees C to +60 degrees C.

The physical construction of the little unit is very sturdy. The set is designed and tested to operate under adverse, knockabout conditions. The high-impact ABS plastic case housing protects against physical shock, while the double-sided glass-epoxy printed circuit board ensures a tight ship inside.

Audio output is sufficient, considering the physical size and power limitations imposed. Rated audio output power is 100 mW into an 8-Ohm load at 10% THD (total harmonic distortion); power consumption is but 25 mA with receiver squelched, rising to 100 mA at the rated 100 mW audio output level. The internal battery furnished is a rechargeable 4.9-volt, 225-mAh nicad pack.

For a refreshing change, there are no accessories that must be purchased to achieve acceptable and convenient operation. Included are a wall-type charger for charging the 225-mAh nicad battery pack, the pack itself, standard 7" and mini (4") helical (rubber duck) antennas, a 20" wire lead antenna, and an earphone. The only optional accessories offered by the manufacturer are a leather carrying case and vehicular charger.

The set's full set of specs is given in Fig. 4. How did the little radio perform on the go?

We selected the "B" model, which covers 146.000 to 154.995 MHz, for purchase. This choice allowed us to cover both the populous top 2 MHz of 2 meters, plus a 7-MHz chunk of the adjacent public service and commercial bands, allowing bonus coverage of local police, fire, highway, paging, mobile radiotelephone, and taxicab frequencies. The radio's battery was found fully charged upon receipt (in use it takes about 10 hours to fully charge the radio with the set turned off). The fact that the battery was charged allowed us to check out the radio's performance within a few minutes of unpacking it. When used with the standard-size (7") rubber duck antenna, we found reception to be entirely adequate from medium- to high-level signal sources, actually about equivalent to that expected of the typical amateur HT when using a rubber duck antenna. Reception on the smaller (4") mini-duck was, predictably, not as good, but represented a good space-saving compromise when receiving strong local signals. The 20" wire lead antenna did not seem to offer any improvement in reception over the larger rubber duck.

Technical Data

Frequency Range	131.000 MHz to 179.995 MHz
Maximum Frequency Coverage	8.995 MHz with no degradation of performance
Receiving Mode	Frequency Modulation, 16F3
Receiver System	PLL frequency-synthesized dual-conversion superheterodyne
Usable Sensitivity	0.2 uV EIA 12 dB SINAD
Audio Squelch Sensitivity	0.2 uV at threshold squelch, adjustable
Selectivity	Adjacent channel rejection ± 12.5 kHz) greater than 60 dB
Spurious and Image Attenuation	Less than 50 dB
Frequency Stability	Within ± 10 ppm over the operating temperature range
I-f Frequencies	1st 10.7 MHz, 2nd 455 kHz
Audio Output Power	100 mW into 8-Ohm load at 10% THD
Power Consumption	25 mA at receiver squelched 100 mA at 100 mW audio output power
Operating Temperature Range	− 10° C to + 60° C
Battery	Rechargeable nicad battery pack, 4.9 volts and 225 mAh
Physical Size	5¼"(H) x 2½"(W) x 1.0"(D) without knobs
Weight	7.1 oz. (200 grams) with battery pack
Frequency Selection	3 digits of digital push switches and slide switch
PCB	Double-side glass-epoxy printed circuit board
Housing	High-impact ABS plastic case

***Specifications subject to change without notice.**

Fig. 4.

Frequencies were easily and rapidly punched in using the three digital push switches and slide switch (for 5-kHz split-frequency operation). The volume and squelch controls, located behind the earphone and antenna jacks, respectively, on the top of the radio, are very small and were very difficult to operate with the antenna and/or headphone plugs installed. Fortunately, for most purposes, these controls can be set and forgotten except for occasional minor adjustment. Audio quality was excellent and was of more than adequate volume for most applications; there was no trace of case vibration even at high audio levels.

Other than the minor inconvenience caused by the size and placement of the two top-panel controls (volume and squelch), no significant drawbacks were noted in operation. The synthesized feature was found to be very handy, for the same reasons that practically the only HTs sold today are synthesized models. All that seems to be missing is a scan feature, LED or LCD frequency display, and a belt clip—all, perhaps, in the next model. The one real disappointment we noted was in the instructions, which bordered on the unreadable. Fortunately, the radio's operation was straightforward and didn't require resorting to the instructions—usually a last resort, anyway, to most hams! No schematic diagram was supplied.

The little radio fills a real need for an inexpensive, frequency-agile portable monitor receiver; at $150, it represents a worthwhile investment. For more information, contact Ace Communications, 2832-D Walnut Ave., Tustin CA 92680. Reader Service number 478. ■

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Paul Danzer N1II
2 Dawn Road
Norwalk CT 06851

Beginner's Guide to Antennas

—not just for Novices

For a number of years I have been teaching a ham radio licensing class on a more or less regular basis, and as many instructors have found, the class itself is only a start.

As the students receive their licenses, they invariably return with a set of questions which point out the difficulty of translating the knowledge, newly won, into practical use. The following conversation has been repeated dozens of times and is aimed at the universal problem of selecting and erecting an antenna for a new ham station.

Question: I just received my license and got a good buy on an allband rig. I am out of money, don't have much time, and want to get on the air as quickly as possible. What antenna and what bands should I start with?

Answer: Put up a 40-meter dipole. This will give you a chance to make a large number of contacts, day or night, weekday or weekend. In addition, you can load it up on 15 and work DX if the sunspot cycle is in a favorable position. See Fig. 1.

Q. Can I use insulated wire?

A. Sure—as long as you remove the insulation at the point where you connect the feedline. Also, make sure that the wire you select does not stretch. If it does stretch, you will have to keep cutting the wire back to the proper length periodically. Your best bet is to buy copper-coated steel wire. The copper gives you good conductivity and the steel core keeps it from stretching.

Q. I have a roll of "thin" coax (RG-58 or RG-59). Can I use it instead of buying the more expensive RG-8?

A. In the HF ham bands (80 through 10 meters), as long as you have a fairly short feedline run, say, 100 feet or less, you won't notice any difference.

Q. Gotcha! We learned that the feedline impedance should be 70 Ohms for a dipole and some of these coax cables have a 50-Ohm impedance. Can I still use them?

A. Again, for short runs of feedline in the HF bands, there will be no noticeable difference. The swr might be a tad higher, but this won't make any difference. Just one caution on coax: You can buy some relatively inexpensive coax that was originally sold to undiscriminating and unsuspecting CBers. It normally costs half or 2/3 of the cost of brand-name coax, and as you can guess, there is a good reason for the lower price. Be suspicious. Cut away a short section of the outside insulation and see how much of the inside insulator is covered by braid. If there are large spaces and you can see a good part of the inside insulation, be careful. You may be invit-

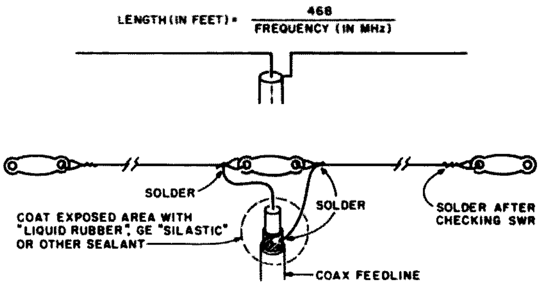

Fig. 1. For 40 meters at 7.125 MHz. L = 468/7.125 = 65.68', or 65' 8".

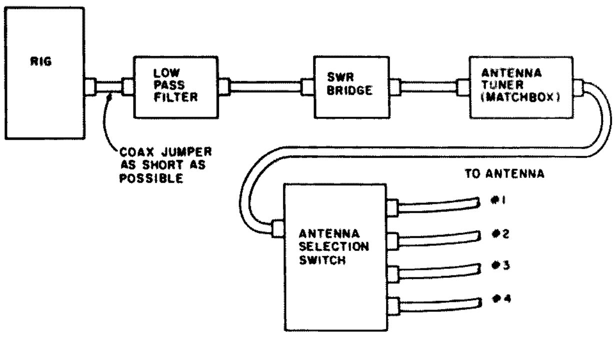

Fig. 2.

ing problems if you decide to use it.

Q. But what about the swr? Can I operate with a 2:1 or 2.5:1 swr?

A. Well, for many years the most popular ham antennas used an swr of 5:1 or 10:1. These antenna/feedline systems used open-wire line, and the key here is low losses in the feed. If your rig will operate with a high swr, there is no reason to fight to get the swr down to the nice round value of 1:1 as long as the loss in the feedline is low. Again, in the HF bands with short feedline runs, an swr of 3:1 won't affect your signal at all.

Q. Will my rig operate with a 3:1 swr?

A. Most rigs with tube finals will, as long as you don't keep the key down for long periods. Solid-state finals are a different problem. Most have swr protection, which means they sample the swr and reduce their power if the swr goes too high. Given a choice, I would try for an antenna with a low swr. But if it means spending 5 minutes tuning up every time I QSY (change frequency), I would accept the higher swr in the interest of convenience and extend the life of the finals by not keeping the key down so long tuning.

Q. What about antenna tuners? In fact, I have read about tuners (matchboxes), low-pass filters, swr bridges, and coax switches. They are all connected to the rig. In what order do you connect them and why?

A. See Fig. 2. Start at the coax jack of the rig and connect the low-pass filter with as short a coax jumper as possible. This means that harmonics will be attenuated before they have a chance to run around long pieces of coax and possibly radiate. Next in line is the swr bridge, since you are interested in matching the rig to whatever follows. The tuner is the next item, followed by the switch and the antennas themselves. Thus, you select an antenna with the switch, utilize the tuner to make the antenna and feed look like an acceptable load, and monitor the swr (and relative power out) with the bridge.

Incidentally, it might be a good idea to make up a tuning chart for each of the frequencies you use. Write down the frequency, settings of the controls on the rig, settings of antenna tuner controls, and antenna selected. When you want to QSY, simply set all controls as shown on the chart, and then tweak them to get maximum power out and minimum swr. Normally, if you operate all over a band, you don't have to log these settings any more than each 50 or 100 kHz on 80 and 40, every 100 or 200 kHz on 20 and 15, and 500 kHz on 10.

Q. I live in a small valley surrounded by hills. Are there any special precautions I should take in selecting an antenna?

A. On 80 and 40, a dipole, inverted vee, or longwire will work fine. However, on 20, 15, and 10, you might *not* want to pick a very high gain beam or quad. A really good beam or quad radiates at a low angle, almost horizontally, and will simply pump your precious rf into the hills. Antennas such as the popular triband beams have to sacrifice some of this low-angle characteristic in order to operate on three bands. As a result, more of the rf is sent up at a slightly higher angle (up to perhaps 40 degrees, or so) and this will probably top the hills around you. Alternately, seriously consider tilting the beam or quad so that it radiates up to clear the hills.

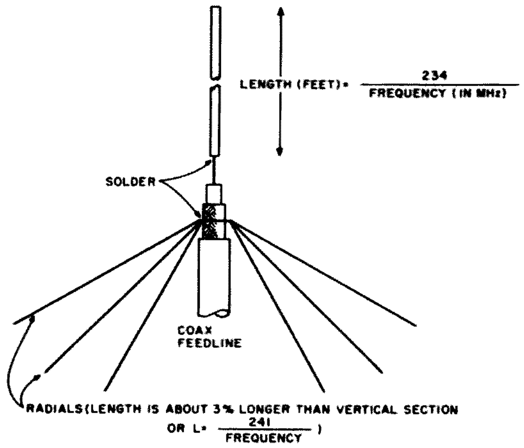

Fig. 3.

Q. I can't put up a big antenna. I don't have the space or my XYL/husband or neighbors would object to a big tower. How about one of these vertical antennas? See Fig. 3.

A. Verticals, especially full-size verticals, work fine. But they do require radials. Each radial is about a quarter wavelength long, and while you would like over 100 radials, you should have as many as you can put up for each band you will operate. I suggest 2 each as a minimum on 80 and 40, and 4 each as a minimum on 20, 15, and 10.

Q. But I thought verticals were good where you don't have much space?

A. They will work with only the coax feed acting as a single radial. However, they work much better when you add radials cut to the proper length, and they work best when you have a very large number of radials. Every experienced ham has a story of how he worked DX on a 10' wire hanging out the window. But for the most consistent and best results, verticals need radials, and lots of them.

Q. What about mobile whips? Can I mount one on the house and use it? Cars don't have radials.

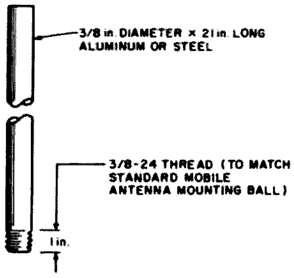

Fig. 4.

A. On a car, the metal body is used as the ground plane in place of radials. In addition, this sort of antenna system is from 2% to 15% efficient. The physical limitations of a car make us accept this loss, but you can do much better at home.

Q. Speaking of cars, I still have a standard mobile mounting ball on my car that I used to use for my CB antenna. Can I use it for a 2-meter FM rig?

A. You will have some loss and you will probably never get the swr down really low, but you have two choices. First, you can buy one of the commercial 2-meter antennas which mount in the standard mobile ball thread. These are 5/8 of a wavelength long but have a loading coil which makes them look like 3/4 of a wavelength. This is an odd number of quarter wavelengths, so the input imped-

ance is about 60 or 70 Ohms and you can use the old mount and coax feeder. You also can take an aluminum or steel rod, cut to about 20 inches, and thread the lower inch to match the thread in the ball (Fig. 4). You now have a quarter-wave vertical again using the old ball mount and coax feeder.

Q. As long as we are salvaging CB antennas, surely on 10 meters I can use the 27-MHz Loudengrabber V that I have mounted on my roof.

A. You probably can use it on 10 with an antenna tuner, but it might be less efficient than simply replacing it with a 10-meter vertical. If you want to try an experiment, connect it to your 2-meter FM rig. It might make a real nice (and quick) vertical for 2m. But don't try this unless your 2-meter rig has swr protection in case the swr turns out to be very high.

Q. One final question: I have a wire which I used to listen to the ham bands before I got my license. It runs out the window, over the roof, under the apple tree, and about 10′ above the ground around the garage. If I use an antenna tuner, can I make do with this wire?

A. We would all like 90′ towers and large array antennas. Most hams have to make do with what they have without structural steel work. Sure, you can use the wire, as long as it is high enough so no one can touch it while you are transmitting. Generally, you want any antenna to be as high and in the clear as possible. But if you can only run a short wire, use it. It will work and you will have many hours of good contacts. ■

The Daiwa Infrared Wireless Microphone

—is the mike cable obsolete?

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If you're still fumbling with microphone cables that get entangled in auto steering wheels and gearshift levers or continuously drag papers off the home station desk, Daiwa Industries has a new item worthy of investigation—a cordless infrared microphone. Reflecting shades of both Star Trek and James Bond, the infrared mike adds a refreshing freedom to "confined" activities in both mobile and home setups (although the system is primarily designed for mobile operation). While this little gem might be considered by some to be of questionable utility, I found it one of the most logical and useful items available in many moons. The only problem I've encountered is deciding which rig should be connected to the infrared mike system. Imagine being able to move around your home desk or in your auto while using a small mike clipped to your shirt front or pocket, and you'll surely agree the mobility of a cordless mike opens many new possibilities for enjoyment of your radio equipment.

How It Works

The Daiwa infrared mike system is composed of 3 items: the microphone, the infrared beam sensor, and the control unit. Activating the microphone's push-to-talk switches on the mike's circuitry and the infrared-emitting LEDs which carry information to the small sensor unit. Output from the sensor goes to the processor unit, which connects to the rig's microphone input.

The infrared ray is not directly visible, indicating operation in the mid- to far-infrared range of approximately 2 to 15 microns (a micron is one-millionth of a meter). I suspect the sensor unit's front cover also acts as a tuned filter for the specific infrared range used, since cigarette light, match or flame flicker, flashing LED readouts, etc., are completely ignored by the sensor. Some elaborate ray-modulation tricks may also be employed, but a schematic diagram wasn't available for studying the system when my early unit was acquired.

Only three connections are required for the system, and it's ready for use. First, 12 volts dc is applied to the controller; second, the sensor is plugged into the controller; third, the controller's output is plugged into the station's transceiver. The system is shipped with a 4-pin connector wired for Kenwood rigs, but it can be quickly rewired or replaced as necessary. A drop-in charger for maintaining the mike's small internal battery is included in the controller unit's left side, while audio processing circuitry is located in the unit's right side.

The charger's operation is fully automatic with a single LED indicating functions. The LED illuminates when the mike's depleted battery is being charged. The LED begins flickering approximately one time per second when the battery approaches full charge, and it extinguishes completely when the battery reaches full charge. Since the charger then switches off, the mike can be left in its socket until the next time it's needed. This means that in a mobile installation, the mike can be left in the controller's case overnight for worry-free recharging and storage.

The infrared mike's effective working range is between 3 and 5 feet, as measured from LEDs to sensor. This distance is substantially more than necessary for mobile installations, since the sensor's suggested mounting place is above the windshield's indoor rear-view mirror. Audio quality of the infrared mike is extremely good; my unit actually sounds better than the factory mikes supplied with the rigs with which it's used (Kenwood, Yaesu, and Comtronix). Each time the infrared mike's push-to-talk switch is keyed, a piezoelectric beeper in the controller chirps softly to indicate proper operation of the system.

Using the Infrared Mike

Since this "liberated microphone" doesn't reflect the common sensation of being in direct-wired contact with its associated transceiver, we suggest initially using it with the home setup or a small audio amplifier before using it mobile. This will allow you to become familiar with mike sensitivity, maximum sensor-to-mike working range, etc. I used the transmitter

monitor in my FT-901DM for this purpose. If your rig doesn't feature a speech monitor, mike operation can be monitored through the use of a stereo amplifier or transistor radio (tune radio off stations, and connect controller's mike output wires between the volume control wiper and ground; one "side" of the volume control is usually connected to ground also).

My home setup operation with the infrared mike was so enjoyable that I postponed mobile use for a couple of weeks. The infrared sensor was stuck to my wall-mounted speaker which was positioned substantially lower and approximately twice the distance of Daiwa's suggested top-of-windshield moulding strip location. The system worked great, but the mike had to be held vertically and "talked across" because of the low-mounted sensor. On-the-air comparisons reported the mike sounds as good or better than my time-proven Shure 526 or Yaesu mike. Since an in-shack television reacts wildly when my 2-kW amplifier is going full bore, I expected problems with the cordless mike. Fortunately, however, I was pleasantly surprised. The mike performed magnificently . . . and I could enjoy the flexibility of moving anywhere around the operating desk without the ties of a mike cable.

Mobiling with the Infrared Mike

The true pleasures of a cordless mike operation were realized when I mated the unit with my 2-meter mobile rig. The infrared sensor was placed above the inside rear-view mirror while the controller was mounted with adhesive pads (supplied) to the transceiver's bottom. I could move anywhere within the (full-size 1981) car's interior and conduct smooth QSOs in a very enjoyable manner. Bright sunlight, unusual reflections, and temperature variations had no effect on the system. The microphone worked as flawlessly as a wired mike. A slight amount of wind noise was noticeable when a window was open or the air conditioner was operating at maximum. Loud noises outside the auto occasionally modulated the rig, emphasizing the need for Daiwa's optional F-4 windscreen. Since the system's audio processing circuitry doesn't skimp on output level, the windscreen is definitely beneficial for mobile operations.

Summary

The Daiwa infrared mike system is one of the most enjoyable accessories I've used with an SSB or FM transceiver. The unit's versatility and relatively low cost are particularly attractive, since it allows one to enjoy a touch of class without a drastic financial outlay ($79.95; 4 optional windscreens, $7.95). My only complaint on the whole system is the somewhat flimsy push-to-talk switch on the mike (it's also a push-on/push-off, unless you have a light touch). The switch hasn't given any problems, and I'm not considering modifying it—I'm merely finicky. I'm quite impressed with the sincerity and creditability of MCM Communications, the U.S. distributor for many Daiwa products. They seem committed to caring for their customers. For more information, contact *MCM Communications, 858E Congress Park Drive, Centerville OH 45459.* Reader Service number 477. ■

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What's It All About, ASCII?

—RTTY technology update

Authors' note: Since this article was prepared in early 1980, our experience has been that most stations that have computers also have dual-mode originate/answer modems and do not require the modem translator at the repeater. They transmit with their modem in the Answer mode and switch to Originate for receiving. This makes all data on both the input and output appear at the 2025/2225-Hz tone pair which is suitable for simplex operation. Also, since the 300-baud speed of the 103 modems is no better than we can do over the phone, our current activity is the collection of Bell 202 compatible modems that operate at up to 1200 baud. These modems are becoming available on the surplus market and require no modification for operating half-duplex over the radio. They were chosen because they use the same familiar FSK as both the 103 and RTTY modulators but at a 1200/2200-Hz rate.

On March 17, 1980, the Federal Communications Commission (FCC) permitted the use of the American Standard Code for Information Interchange (ASCII) in the Amateur Radio Service.

Specifically, the FCC permitted US radio amateurs to transmit:

- ASCII as defined in the United States of America Standards Institute (ANSI) Standard X3.4-1968.
- Speeds up to 300 baud between 3.5 and 21.25 MHz using F1 emission.
- Speeds up to 1200 baud between 28 and 225 MHz using F1, F2, and A2 emission.
- Speeds up to 19,600 baud on frequencies above 420 MHz using F1, F2, and A2 emission.

The above permission was contained in the FCC's Third Report and Order under Docket No. 20777. It represents a significant step forward and marks the beginning of a new era of data communications on the ham bands. Possibly, it will play a part in a marriage of personal computing and amateur radio. It is not as permissive as some had hoped for in order to be able to experiment with speeds higher than those permitted and to transmit other codes, including some not yet devised. We look forward to additional action by the FCC along these lines to liberalize the rules on digital transmissions in order to permit true experimentation in the Amateur Radio Service.

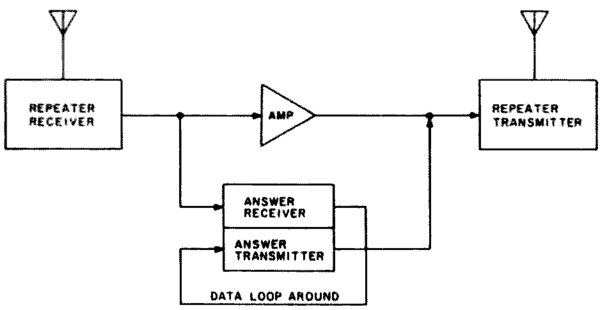

Fig. 1. Addition of an answer modem at the repeater with its received data echoed to its transmitter allows multiple users to send and receive data using only originate modems at their stations.

Outside the United States, the use of radio teleprinter codes other than Baudot (otherwise known as the Murray code or the International Telegraph Alphabet No. 2) varies from one country to another. Many have no regulatory mandate for the use of the Baudot code in the first place. Amateurs in other countries with import or monetary restrictions may have difficulty obtaining modern equipment employing ASCII. In Great Britain, amateurs can use any radioteletype (RTTY) code defined by documents of the International Radio Consultative Committee (CCIR), according to a Home Office interpretation obtained by the Radio Society of Great Britain.

In September, 1978, Canadian amateurs were given permission to transmit computer data in packet form on frequencies above 144 MHz under a new class of license called the Amateur Digital Radio Operator's Certificate. Canadians have subbands 221.0 to 223.0 and 433.0 to 434.0 MHz reserved exclusively for packet transmissions.[1, 2, 3, 4]

While ASCII was originated in the United States, it is well on its way toward becoming the world standard computer and RTTY code. It also is known as International Standard 646—ISO code (Reference 2)—and International Telegraph Alphabet No. 5. Like the Morse code, variations of ASCII exist for the alphabets of other languages including Cyrillic, Kata Kana, Arabic, Hebrew, Greek, and special letters used in Scandinavian languages.[5] As in the US, it is a sure bet that radio amateurs in other countries will be among the first to use personal computers. Many industrialized countries have home computer stores. So, it is only a matter of time before everything falls into place for the marriage of amateur radio and computers on a worldwide basis.

As soon as ASCII became "legal" in the US, a number of amateurs went on the air to try out the new mode. In the Washington DC area,

most radio amateurs involved with computers had equipped themselves with modems (modulator-demodulators) for communication on the phone lines. Baudot operation on 2 meters had been dead for about a year in anticipation of the FCC's ruling. Eighteen stations were ready to go during the first hour that ASCII was allowed; 14 stations made successful two-way ASCII contacts. We have heard scattered reports of 2-meter ASCII activity from other areas of the country. On the high-frequency (HF) bands, a number of stations were on the air using 110-baud ASCII on the RTTY frequencies. Many amateurs who wanted to get on ASCII as soon as possible did not want to reconfigure their stations *until* the details of the FCC ruling were known. We hope to see them on the air soon.

Technical Standards

Comments on Docket 20777 on file in the FCC public reading room indicated that the writers favored three basic approaches, divided almost equally. About a third said the *bandwidth* should be limited. Another third suggested that *speed* be regulated. The remaining third took the FCC to task for trying to regulate something best left to self-policing amateurs. The FCC decided to regulate *speed*. On other particulars, the respondents suggest that the FCC forget about specifying the parity bit because home computers tend to ignore it. They recommended making both synchronous and asynchronous transmission legal to permit experimentation. Finally, they recommended that the bit order be from the least to most significant bit according to common practice.

You will note that there are no restrictions imposed by the FCC on use of the parity bit, the number of stop bits, the use of synchronous or asynchronous transmission, the bit order, the maximum frequency shift for F1 emission, or the modulating tones for F2 or A2 emissions. These matters are open to experimentation and will evolve according to the needs and preferences of amateurs.

For starters, most amateurs will completely ignore the parity bit. In many cases, stations will transmit a parity bit, but the receiving stations will not process it. However, some agreement on the use of the parity bit is desirable because this feature can help reduce transmission errors. The number of stop bits will likely be 2 for 110 baud and 1 for 300 baud and up. Two stop bits are needed by a number of ASCII printers which operate at 110 baud.

Most amateurs will use asynchronous transmission to begin with because of the availability of asynchronous equipment. Synchronous ASCII transmission is an interesting area for amateur experimentation. The bit order is likely to remain least significant bit to most significant bit. Frequency shifts and modem tones for amateur ASCII transmissions are unlikely to settle down for quite some time. Amateurs presently are using modems of the type used for Baudot RTTY and those designed for telephone line communications between computers.

On the phone lines, the data communications convention for personal computers is to use a modem which uses Bell Telephone 103/113 standards. This permits serial, asynchronous, full-duplex communication at speeds up to 300 baud on the telephone line. It uses audio frequency shift keying (AFSK) FM with frequency assignments as shown in Table 1.

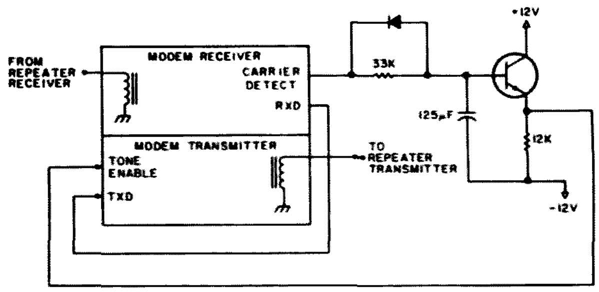

Fig. 2. An RC combination with an emitter-follower slows down the carrier-detect signal from the receiver so that at least 4 seconds of carrier are required before the modem transmitter is activated.

Bell 103/113-compatible modems are available for personal computers in several different forms. One is the originate-only modem, the cheapest type, which is all one needs to originate calls to other computers. Originate-only modems use the "Originating End" tones given in Table 1. Another is the answer-only modem for computers which never make outgoing calls. The third variety is the originate/answer modem which can handle calls either way.

Separate for the moment the modem function from that of coupling to the telephone lines. The least expensive route is to use an acoustical coupler which mechanically connects to the telephone handset. Home-brew acoustical couplers can be made from small transistor radio speakers and spray-can plastic caps. A direct connection to the telephone lines can be made by means of an FCC-approved telephone data coupler, which is considered a must for modems with answering capabilities.

These modems and data couplers are now readily available to home computerists and will, no doubt, have an impact on the standards to be employed by radio amateurs. The extent to which this will replace existing amateur radio FSK keyers and converters or tuning units (let's just call them modems) deserves some thought.

HF ASCII RTTY

It seems likely for two reasons that there will be a mixture of ASCII and Baudot on the HF bands for a while, using existing RTTY modems. One is that some of the non-US amateur RTTYers find it difficult to obtain ASCII gear initially. Another is that the average HF RTTYer has hundreds of dollars invested in a good modem designed to copy through the noise, interference, and fading encountered on HF. HF RTTY modems are far better in this respect than most Bell 103/113 modem designs. So, it would be a step backward to ditch a well-engineered HF RTTY modem in favor of one designed for use on the telephone line. Nevertheless, some 103/113-type modem operation on the HF bands is to be expected, and the 200-Hz shift employed might not be too difficult to live with.

RTTY modems such as

Function	Originating End	Answering End
Transmit	1070-Hz space	2025-Hz space
	1270-Hz mark	2225-Hz mark
Receive	2025-Hz space	1070-Hz space
	2225-Hz mark	1270-Hz mark

Table 1. Bell 103/113 modem frequencies.

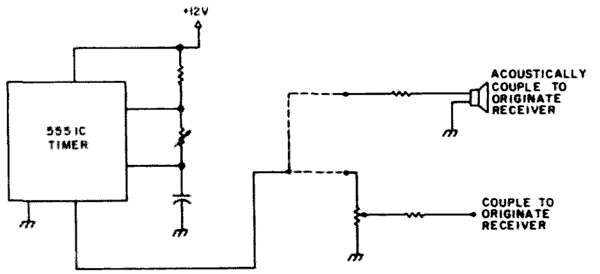

Fig. 3. A 555 oscillator at 2225 Hz can be used to fool an originate modem into thinking it is connected to an answer modem so that it will enable its transmit tones while operating half duplex. This is not required if a minor change inside your originate modem can be tolerated.

the ST-6 can be modified easily to handle both existing RTTY tones of 2125-Hz mark and 2295-Hz space and 103/113 tones by retuning audio filters. Clearly, a contest of wills and pocketbooks is in the offing before this incompatibility is resolved. Our feeling is that the old 170-Hz shift should be kept for those stations still running 60-wpm Baudot and that 200-Hz shift will be used for 110- and 300-baud ASCII.

ASCII RTTY via OSCAR Satellites

OSCAR satellites present a special problem for RTTYers for either ASCII or Baudot. The managers of the satellites do not like any type of FM (such as FSK) to be used because the signal has a 100% duty cycle. They prefer lower duty-cycle signals that are keyed on and off in order to keep overall loading on the satellite within reasonable levels. Thus, any RTTY modem for communications via OSCAR satellites should be capable of on/off keying. Because of noise characteristics, for equal results a good on/off-keying RTTY demodulator needs to be a bit more sophisticated than its FSK counterpart. For the 1980s, an on/off keying capability will be a must for RTTY modems.

VHF/UHF ASCII RTTY

In contrast to HF and OSCAR RTTY, we expect to see ASCII with Bell 103/113 tones dominate VHF/UHF RTTY. This seems fairly certain because of the decline in Baudot RTTY activity on the VHF/UHF bands in recent months.

As noted earlier, the cheapest way of communicating with a computer is to use an originate modem. Manufacturers' surplus originate modems are available for as little as $25. This works fine if the originating station connects with another station which has an answer modem. Another look at Table 1 will convince you that two originate modems cannot talk to each other. The same is true of two answer modems. Those with originate/answer modems can talk to anyone; indeed, this is the case with many computer owners.

Modem Translator Experiments

A scheme was needed to make two originate modems compatible. The solution: placing a modem translator at the WD4IWC/R 2-meter repeater which serves the Washington DC area RTTYers and amateur radio computer enthusiasts. Just as the repeater operates on two *radio* frequencies to translate incoming signals to the correct output frequency, the translator modem changes incoming *audio* tones from originate modems into answer modem tones on the repeater output. As a result, all originate modems listening to the repeater output are able to copy all signals.

The advantages of this scheme are:

- Uses exactly the same modems as used over telephone lines.
- Requires no special, unique hardware.
- Eliminates the need for the more expensive answer modems at all stations.
- Regenerates data at the repeater, realizing some improvement in signal-to-noise ratio.
- Does away with the problem of who is originating and who is answering, which normally is needed in duplex modems.

Implementation: Hardware installation was fairly simple. An answer modem initially was connected as shown in Fig. 1. The lines required to the repeater were an audio tap off the receiver and a tap into the transmitter audio line. The received data line coming out of the modem receiver was then echoed back into the modem transmitter so that an exact replication of all data present on the repeater input was reproduced on the repeater output.

The only other signal required is an *enable* signal to tell the modem when to initiate its transmit tones. This was done in the initial installation by simply taking the received data *carrier-detect* line, delaying it up to five seconds with an emitter-follower and a capacitor, and using that to drive the transmit enable line of the modem transmitter. With the resetting diode shown in the circuit of Fig. 2, any momentary loss of carrier would reinitialize the five-second turn-on delay, thereby preventing the transmit tones from coming up on anything but a valid signal. The controls as described above make the modem an autonomous device requiring nothing but power and the two audio connections.

Controls: Later, additional control circuitry was added to disable the function entirely. This is needed during periods of experimentation with other types of modulation on the repeater and to aid repeater troubleshooting. A final refinement was to use the data carrier detect to open up the repeater audio line between the receiver and transmitter. This ensures that noise on the signal received at the repeater is not added to the transmitter output.

Installation: To minimize repeater maintenance problems, the answer modem described here was packaged in modular form. A separate ac power supply was included in the module.

One Hitch: There is a minor problem with the scheme described here due to the manner in which commercial originate modems operate. Many originate modems wait for the receipt of the answer carrier before the originate-transmit tones are enabled. This is done by sampling the receive carrier-detect line in the originate modem and looping it back to the originate-transmit enable. This feature poses no problem for a station while receiving because it will hear the answer tones being transmitted by the repeater. But, on transmit, since the receiver is most likely disabled, the originate modem will not hear the answer tones. Fortunately, this is a wiring change only for those individuals who are using surplus or home-brewed gear. They can wire the modem-transmit tones to come on only when the radio transmitter is keyed on. For the casual user who has a nice expensive com-

mercial modem that should not be attacked with the soldering iron, there is another way to coax a modem into originating tones first. A simple switch inserted into the carrier-detect line to enable or disable this function is a solution. Another one is to use a 555 timer in an oscillator circuit to generate 2225-Hz tones to fool the modem into thinking it is on line. These tones may either be hard-wired or acoustically coupled into the modem during transmit to enable the originate transmitter. A possible circuit is shown in Fig. 3 and can be constructed for less than $2.

Conclusions

FCC approval of ASCII will be a boon to amateur radioteletype activity, especially on the VHF/UHF bands. It should help not only to get back some RTTYers who drifted off to play with computers, but also to stimulate some computerists to become hams.

The repeater modem translator described above has been in place since March, 1979. It is an inexpensive way to permit use of existing originate-only modems. ■

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See List of Advertisers on page 162

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The Radio Shack Pro-2002 Scanner

—a look at the Shack's latest

When any manufacturer bills a new rig as the "ultimate scanner," naturally I'm skeptical. I've seen several of the new synthesized receivers which are promoted as being capable of receiving everything under the sun. They're usually rehashed versions of the lower-priced rf packages with some gingerbread knobs and switches added for color. These units are almost invariably full of bugs and prone to breaking down about one week after the warranty expires, so when Radio Shack announced the introduction of their new microprocessor-based scanner, I viewed it with anxious, but cautious, optimism.

The Realistic Pro-2002 is Radio Shack's latest addition to its line of scanners and is a replacement of the Pro-2001. It is cosmetically similar to its predecessor, being housed in the same-dimension case, but this is where the similarity ends. The 2002 is a totally new concept for Realistic and contains several features unique in scanner technology. The rig is microprocessor-based and all functions are accessed via the 30-key front-panel keyboard. It covers the 30-50 MHz VHF-low, 108-136 MHz aircraft, 138-174 MHz VHF-high, and 410-512 MHz UHF bands. Fifty channels may be stored in five banks of 10 each, as well as five search ranges, with individual delay, lockout, and priority options. Volume and squelch rotary controls are large and conveniently located. Logging indicators are provided for easy return to a desired setting. A 12-hour digital clock with am/pm indicator is becoming a standard feature in programmable units and is present on the 2002. Other useful functions are selectable scan/search speeds, directional search, scan and manual controls, external speaker, antenna, and tape-out jacks. A 120-V-ac cord is built in and a jack for 12 V dc is provided along with cables and mobile mounting bracket.

Due to the complexity and uniqueness of the Pro-2002, I will attempt to cover its features and functions individually rather than collectively.

Frequency Coverage

The 2002 has one of the most enviable frequency repertoires in the scanner industry. Bands covered are 30-50 MHz in 5-kHz increments, 108-136 MHz in 25-kHz increments, 138-174 MHz in 5-kHz increments, and 410-512 MHz in 12.5-kHz increments. That's a total of 4000 low-band, 1120 aircraft, 7200 high-band, and 8160 UHF channels, or 20,480 discrete frequencies! Notice that among these bands are included 138-144 and 410-420 MHz ranges, used by the US Government, which cannot be directly received by any other commercially available searching synthesized scanner.

Searching/Scanning Functions

A maximum of 50 channels may be programmed into the memory of the scanner. Channels are programmed into the unit via the 30-key color-coded front-panel keyboard and are stored in banks of 10 channels. These banks may be selectively scanned or locked out during scanner operation by using the appropriate bank-select key(s). Banks are labeled 10, 20, 30, 40, and 50. For example, bank 30 would contain channels numbered 31 through 40. In addition to storing channels to be scanned, these bank-select keys also perform double-duty as keys for selecting search ranges. Up to five ranges may be programmed into positions S1 through S5.

Both the speed and direction of the searching may be controlled. To initiate a search, the user enters the lower and upper search limits of the desired range and selects either the upward or downward direction. Direction may be changed at any time during the search. Search speeds of 3 or 8 channels/second may be selected by using a toggle-action push-button control. Once programmed, search ranges remain memorized even when the unit is turned off or unplugged, provided the 9-V-dc backup battery is installed. Ranges may be selected or locked out using the bank/search-select keys. If two or more search ranges are programmed and locked in, the microprocessor will search through all ranges sequentially. For example, if range S1 is programmed to search 154-158 MHz and range S2 is programmed to search 453-456 MHz, the unit will begin to search at 453 MHz after it has finished 154-158 MHz. If any other ranges are programmed and locked in, the searching will continue through these other ranges. Upon searching the last range in the sequence, the unit will repeat the search beginning at the first range. If only one of the five ranges is programmed, searching will repeat over this range only.

Scanning is controlled by using keys labeled scan, manual, delay, priority, and lockout. Manual channel selection may be achieved by either stepping through the channels with the manual key or by selecting a particular channel with the digital keyboard.

Lockout serves to eliminate a particular channel or channels from the scanning repertoire. Delay is used to add a three-second delay onto selected channels after a transmission is received and prior to the resumption of scanning. The priority key is used to assign priority status to one of the scanner's 50 channels. When a channel has been given priority, this frequency is sampled once every three seconds, for a period of 100 milliseconds, regardless of other scanner activity. If a signal is received during the priority sampling, the receiver immediately switches to this frequency for the duration of the message.

The scan rate is selectable at either 3 or 6 channels/second. For a rig with up to 50 channels to sample, this is too slow. Ideally, the rates should be selectable at either 15 or 20 channels/second. With the existing scan rate, however, I've found it to be practical to scan no more than 20 channels (two banks) at one time.

Miscellaneous Features

The digital readout display is comprised of seven-segment green LEDs and provides information concerning whether the unit is in the scan, manual, search, or program mode, if a channel is programmed with a delay or lockout, if the unit is in the priority mode, and which is the priority channel. Also indicated are which channel/search banks are active or locked out, channel numbers, and a seven-digit frequency readout.

The frequency display also doubles as the readout for the digital clock, indicating hours, minutes, and seconds. The clock, which operates in the 12-hour mode, requires continuous ac or dc current to operate. Should power be interrupted or cut off, the display continuously flashes "E00.00.00" until reprogrammed with the correct time. The clock cannot be programmed to automatically turn the scanner on or off at a desired time; it isn't a clock-radio.

Should the user desire to conserve power when operating the scanner from a battery, a switch is provided on the rear panel to disable the clock. The clock may be displayed anytime simply by pressing the clock key.

In order to stop the rig during the search mode, a monitor key is provided. This control also places a particular frequency from the search range into a special memory for future reference or transfer to one of the scanner's regular channels.

A mobile mounting bracket is provided in order to permit installation in a vehicle. A unique three-wire dc power cable is also included, consisting of black, brown, and red leads. The black cable is connected to negative ground and has an in-line connector for easy removal of the scanner. Red is connected to +12-V-dc continuous power source, and the brown lead is connected to +12-V-dc accessory fuse box terminal. (The purpose of the second +12-volt connection is for memory retention and clock circuits.)

A single external antenna terminal is provided, which is a decided advantage to the dual VHF/UHF inputs on previous Realistic models.

Rf Comments, Specifications

While the scanner is designed with both AM detection and FM quadrature detector, the two circuits do not function simultaneously on all bands. FM signals are received on all bands except the 108-136 MHz aircraft range, which is only received in the AM mode. The AM detector does not function on any frequency outside this band.

The Radio Shack Pro-2002 was added to its Realistic line of scanners this year and is a replacement for the excellent Pro-2001. While the 2001 covered only the conventional VHF-high/low and UHF bands (FM only) with 16 channels, it did so with overall sensitivity and audio clarity superior to the Pro-2002. On the specification sheets, both are listed as having the same sensitivity for VHF-high/low and UHF bands. In operation, however, the 2002 cannot receive and reproduce signals with the same clarity as its predecessor. Moreover, when field tested in mobile operation, the Pro-2002 had a high amount of static and ignition noise. Under the same conditions, the Pro-2001 received very little such interference. Another disturbing point is the reception of images and interference in the VHF-high band, especially in metropolitan areas with heavy signal density.

It is unfortunate that, with all the features the Pro-2002 includes, the rig doesn't have a better rf package inside. If its receiver circuitry performed as well as that of its predecessor, the Pro-2002 would be superb. Nevertheless, the unit's frequency coverage alone places it in a category by itself, and VHF-high band sensitivity is very good.

Should Radio Shack choose to re-manufacture the Pro-2002 and improve the VHF-high image rejection, UHF sensitivity, and scanning/searching rates, the results would be truly appreciated by serious monitor enthusiasts. Such a revamping was done by Radio Shack under similar circumstances with the DX-300 communications receiver.

The Pro-2002 programmable AM/FM scanning receiver is available from *Radio Shack, One Tandy Center, Fort Worth, TX 76102*. Reader Service number 479. ■

Carl C. Drumeller W5JJ
5824 NW 58 Street
Warr Acres OK 73122

An Easy L-Meter

—you'll need a frequency counter

The measurement of small values of inductance often is difficult without specialized (and expensive) equipment. If, though, you have a frequency counter, a handful of commonly-available parts, and a bit of ambition, the undertaking is much simplified. If you have a simple calculator, the math takes only seconds.

The idea is not mine. It came from William Huffman N5CC, who asked me to prepare an article on the subject. Bill built the ancillary device to be used with a counter. The design is straightforward and its construction should present no problem. A glance at Fig. 1, which shows the schematic wiring diagram, will reveal a simple Colpitts oscillator.

This oscillator, which should have excellent short-term stability and good long-term stability, needs only the usual care in construction. The two fixed capacitors, constituting the combination reactance-dividing network and capacitance portion of the LC circuit, should be silver-mica or, preferably, polystyrene, for best stability.

As built by N5CC, the oscillator sits in a 12.5 cm × 8.75 cm × 7 cm (5″ × 3″ × 2.75″) cabinet. The Radio Shack 270-251 will give you room to spare. Internally, the 9-V battery shares space with oscillator components. Externally, the front panel holds a push-to-make momentary-contact switch and a pin jack for bringing out the rf signal. On top is a pair of binding posts for attaching the inductor to be measured.

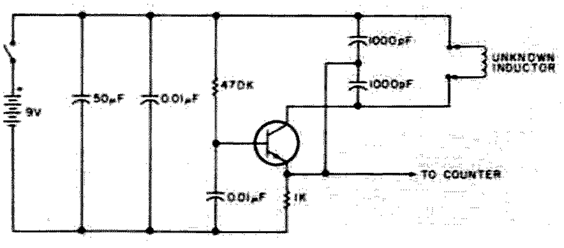


Fig. 1. Colpitts oscillator. Any high-beta NPN transistor should prove to be a reliable oscillator over a wide frequency range.

To use it, connect a counter to the rf output pin jack. Then calibrate the oscillator.

If you have an inductor of known value, this is a one-shot action. However, if you don't (and most of us don't), you can do a fairly accurate job by averaging a number of marked inductors. That's what I did. My hellbox delivered up a number of rf chokes marked 47 μH and 56 μH. In turn, each of these was attached to the inductor terminals and the resultant oscillator frequency was measured by the frequency counter. By presuming an accurately marked inductor, one can compute a presumed value for the internal capacitance of the oscillator circuit.

Average a stack of these and you have a figure that quite probably is reasonably accurate.

Here are the simple mathematical steps to follow in the computation of internal capacitance:

$$4\pi^2 f^2 LC = 1$$
$$C = 1/4\pi^2 f^2 L$$
$$C = 1/39.478 f^2 L$$

Let an inductor marked 47 μH be attached to the oscillator and the resultant frequency be recorded (in MHz). Presume it to have been 1.032 MHz. Then, to have capacitance ascertained in picofarads, CpF = $1/39.478 \times (1.032)^2 \times 47 \times 10^{-6}$
$= (1 \times 10^6)/39.478 \times 1.065 \times 47$
$= (1 \times 10^6)/1976$
$= 0.000506 \times 10^6 = 506.$

Repeat this operation for a number of marked inductors and then average the results. In my case, the average was very close to 500 pF, which seemed to be a

reasonable value considering the components in the oscillator circuit.

Going back to our original formula and using f in MHz, L in Henrys, and C in picofarads, we see that:

$L_H = 1/4\pi f^2 C$
$L_H = 1/39.478 f^2 500$
$L_H = 1/19739 f^2$
$L_H = 0.0000506/f^2$.

Now let's put an inductor marked 56 µH, 5%, in the oscillator. Its frequency measured 0.9648 MHz. Dropped into the formula:

$L_H = 0.0000506/(0.9648)^2$
$L_H = 0.0000506/0.9308$
$L_H = 0.0000543$
$L_{\mu H} = 54.3$

If we presume the inductor was correctly marked, the accuracy of the formula is confirmed. All you need to remember for future measurements is one concise formula:

$L_{\mu H} = 50.6/f^2_{MHz}$.

There are a few precautions to be observed. The lead from counter to oscillator affects frequency, so it should be precisely the same from calibration to use.

The developer, N5CC, recommends that several oscillators be used for enlarging the range of inductors to be measured. His prototype, which has 1000-pF capacitors in the LC circuit, works best in measuring low-value inductors. He suggests the use of 10,000-pF capacitors for inductors in the 1-mH to 1-H range.

Note that the accuracy of inductor measurement hinges upon two factors: the accuracy of the frequency counter and the precise knowledge of the calibrating inductor. The former should present no problem, but finding an inductor of an exactly-known value is not easy! Take consolation in the fact that its use is required only once! ■

✓See List of Advertisers on page 162

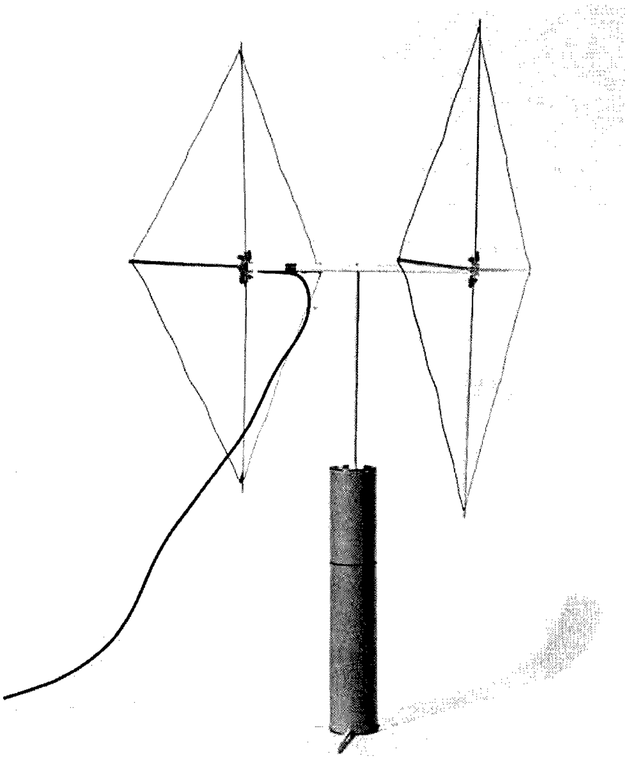
Karl T. Thurber, Jr. W8FX
317 Poplar Drive
Millbrook AL 36054

A Quad for Two Meters

—the Palomar portable power picker-upper

For the most part, we take the ease and convenience of two-meter FM operation for granted. Since it's possible to access a repeater in many areas with almost no antenna, there's a tendency to let the repeater do *all* the work, just getting by with an absolute minimum for a portable or mobile antenna—rubber duck, quarter-wave whip, or the like. This approach works most of the time, allowing casual operation through repeaters, but often falls far short of providing really good performance when working simplex and when used under demanding conditions of rough terrain, contest competition, and poor propagation paths.

If your fancy turns to backpacking, mountaintopping, and similar ham pursuits, the added forward gain and physical selectivity offered by a small beam will reap handsome dividends. Most apparent will be the improvement in transmitted and received signal levels, but—very important to whose who regularly operate from the higher elevations—the "physical selectivity" (front-to-back and front-to-side discrimination) offered by a beam will make such operation a great deal more orderly, reducing the tendency to key up several repeaters simultaneously and sorting out signals on the popular simplex frequencies. One of the most suitable antennas to do these things is the quad.



Portable two-meter quad from Palomar Engineers.

The quad is primarily considered an antenna for the HF bands, with its asserted element-for-element superiority over the yagi and its potential for use of low-cost construction materials. But the quad is a good performer on any frequency, and in recent years has received increasing attention as an effective and efficient VHF and UHF antenna.

There are a number of reasons for looking at the quad for VHF/UHF use. The antenna can be built of inexpensive and easily-obtained materials, and its performance can be equal to or better than other arrays of comparable size. Adjustments for resonance and feedpoint impedance matching are easily made, and the antenna readily lends itself to stacking either side by side, or one above the other, as with yagi arrays. Too, the quad is a relatively broadband antenna, making it particularly useful on the wider VHF/UHF bands.

The basic quad consists of a full-wavelength driven loop and a reflector, which is cut about 5% longer than the driven element and spaced between 0.15 and 0.25 wavelength. Closed loops can also be used for the directors, in which case they are made 5% shorter than the driven element. Any reasonable number of directors can be added, until the antenna becomes too bulky and unwieldly and a point of diminishing returns is reached.[1]

As a rough guideline, when compared with the half-wave dipole, the two-element quad shows a gain of 6-7 dB, as opposed to a 5-dB gain for a two-element yagi. The three-element quad (reflector, driven element, and one director) is capable of about a 10-dB gain, while a five-element quad—generally considered impractical at HF frequencies except by the hardiest "antenna farmers"—checks in with a gain of 13 dB.

[1]For a specialized discussion of the quad on the higher bands, refer to the RSGB *VHF/UFH Manual*, by D.S. Evans G3RPE and G.R. Jessup G6JP. A British publication, the book is readily available in the United States.

Besides the plain-vanilla quad, there are several specialized configurations popular on VHF and UHF. The so-called Swiss Quad, pioneered by HB9CV, is an all-metal, mechanically-excellent, all-driven array having a radian pattern comparable to that of the ordinary quad. The expanded or bi-square quad is a takeoff on the basic configuration, in which dimensions are expanded to two wavelengths for each loop (for added gain); dimensions are still practical even on the lowest VHF band, 6 meters. The Super Quad describes virtually any combination of standard (one-wavelength) or expanded (two-wavelength) quads stacked in various arrangements to yield very high gain figures. Finally, the Quagi, which is a hybrid antenna blending features of both the quad and yagi into a single design, uses a standard one-wavelength quad driven element and reflector in combination with dipole (yagi) director elements. The result is an antenna boasting high gain, simplified construction, and easy feedpoint matching.

Regardless of type, simple quads scaled to VHF and UHF dimensions are increasingly popular in mountaintopping, Field Day, backpacking, and portable operation for reasons of economy, bandwidth, high gain, portability, and relative ease of construction. An interesting commercial two-meter portable unit—perhaps the first commercially produced—is the Palomar Engineers collapsible quad. Designed particularly to extend the range of low-power two-meter transceivers by providing the gain and front-to-back discrimination of the two-element quad, it is a good candidate for serious in-the-field work when one would like to have the effective gain of a linear amplifier but without being saddled with additional battery power and weight requirements.

The Palomar design is based on one of the several portable quads described by R.J. Decesari WA9GDZ/6 in the September, 1980, issue of *QST*.[2] The Palomar antenna, presented as a good alternative to a standard 4-element yagi, is capable of up to 6 dB forward gain with an excellent front-to-back ratio.

The original WA9GDZ/6 designs were the results of a quest to construct a highly portable (non-yagi) antenna that packed a substantial gain into a small package; efforts to design a collapsible yagi had proved overly large and cumbersome. Several alternative designs were built, some with 45-degree diagonal polarization for good compatibility with both FM (vertically-polarized) and SSB/CW (horizontally-polarized) modes, and some with straight vertical polarization. Other models were built that used different methods of keeping the quad spacers erect. The Decesari antennas can be made from any of several hardwood, plastic, and Plexiglas™ material; the loops are constructed of copper wire.

Palomar Engineers are the exclusive manufacturers of the patented 2-meter version, which is based on the Fig. 7 design in the *QST* article.

The antenna uses quad driven-element, reflector, and spacing dimensions optimized for 146-MHz operation, with the feedpoint at one side of the driven element to yield a vertical polarization characteristic for FM work. These figures work out to a driven element about 1.72′ on a side, a reflector 1.80′ on a side, and an element spacing of about 16″. In this design, the elements are made of #18 PVC hookup wire, the quad "spider" is lucite, while the spacers, boom, and mast are of wooden dowel construction. The storage container/support is fabricated from cardboard and has a varnish coating. The antenna uses knurled brace thumbscrews to hold the spacers in place. Four wooden spokes at the bottom of the storage container form a stand to provide support for the antenna, both to keep it steady and to prevent its blowing over (mountaintopping, you know!). To aid in 50-Ohm feedline matching, a matching stub and trimmer capacitor are provided.

At present, the antenna is sold fully assembled. According to Jack Althouse K6NY of Palomar Engineers, they plan to furnish them unassembled in the future. Also expected are some changes in mechanical details to lower the cost.

We found the antenna to be an ingenious one, certainly worth consideration by the serious backpacker, to whom *portable* means just that. When collapsed, the antenna folds completely into the storage container/support tube, with the spacers folding along the longitudinal axis of the boom. Overall weight is but 1-1/4 pounds. We did consider the antenna stand to be a bit on the fragile side, so one must take care in carrying it, in its installation, and in its use.

Although rigorous antenna pattern and gain tests were not performed, the portable antenna exhibited a marked forward gain and front-to-back ratio. These characteristics were clearly evidenced when working through repeaters outside the local area, where rotating the antenna produced the anticipated signal strength changes. The quad antenna's superior performance was quickly noticed when making comparison checks between it and a 5/8-wave whip, when driven by a two-Watt handie-talkie (HT). When using several repeaters 25-35 miles distant, the HT-mounted 5/8-wave resulted in marginal performance on both transmit and receive, while use of the quad made operation into several of these repeaters almost full quieting. When the quad was compared with the HT's stock rubber duck, there was hardly any comparison at all: Some repeaters that were marginally readable on the rubber duck were very nearly full quieting, and it was often possible to access machines that were unusable before because of inadequate signal strength from the HT.

What about swr? We found that the standing wave ratio was quite acceptable across the entire frequency range covered by the antenna. Swr at the design center frequency of 146 MHz ran about 1.1:1 and changed almost imperceptibly over the 144-148 MHz range. These measurements were made without any pruning of the antenna or adjustment of the matching stub. Being very broadbanded, it's unlikely that any adjustments would have to be made.

We found the little quad to represent a novel idea as far as VHF antennas go. It's a highly compact but practical package especially suited for on-the-go operation. Perhaps a bit dear at $87.50, but with the price subject to downward revision when the antenna becomes available as a kit, it's a very nice range-extending accessory to have and use.

Who says hiking can't be fun?

For more information, contact *Palomar Engineers, Box 455, Escondido CA 92025.* ■

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[2]Decesari, R.J. WA9GDZ/6, "A Portable Quad for 2 Meters," *QST*, September, 1980.

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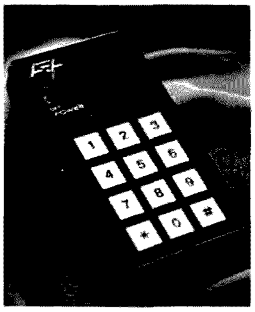

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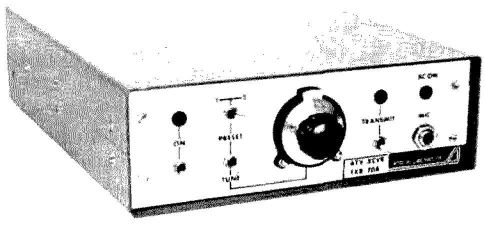

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Forward gain, forward gain: that's the ceaseless search in satellite work. It's a task that jumps to the forefront with the approach of a new breed of satellite—Phase IIIB.

The Phase IIIB satellite will be put into a "pseudo-synchronous" orbit—which means that it will offer many of the advantages of commercial synchronous satellites. It will swing around the bottom of the globe at a low perigee of 1500 km and then hurtle out to an apogee of 36000 km—and (here's the bonus)—its movement relative to an earth station for the 4 hours spanning this apogee will be small. For four hours there will be an almost-stationary satellite up there, covering half the globe.

For the first time, radio amateurs will be able to communicate on a worldwide basis using VHF + UHF, thus skipping many of the baneful problems of HF propagation. What's more, Doppler shift at the apogee will be very slight—so that the skillful searching and re-tuning so essential with low-orbit satellites will no longer be required.

But there is a price to be paid for these advantages! Path length at apogee is virtually the same as that for commercial synchronous satellites. While they counter this path loss by using giant 30-metre dishes and low-noise amplifiers on receive, cooled in liquid helium, no amateur can compete with this! But latest estimates for Phase IIIB suggest that we can get by with an erp of 500 Watts—a tolerably modest figure. Of course, a 500-Watt final is out of the question for most amateurs—so we have to get our gain elsewhere—notably from the antenna system.

Phase IIIB uplink will be centered on 435.215 MHz and will require clockwise circular polarization. So—how to make a high-gain antenna with circular polarization which can be hoisted into the air and pointed in the right direction without too much trouble? That is the question.

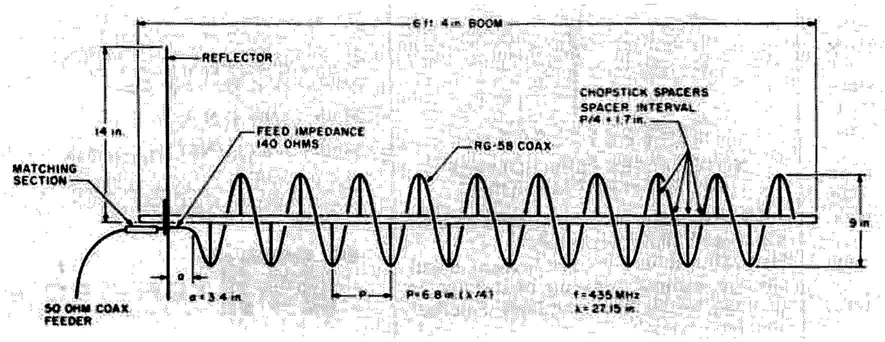

Fig. 1. Ten-turn "chopstick" helical: gain 15 dB, beamwidth 36 degrees.

Long-John yagis—crossed and phased—could offer one solution, but at 435 that phasing harness could present problems, while impedance matching is also a chore.

So, why not a helical? Here we have neatness, high gain, wide bandwidth and circular polarization—all in one. Scanning the handbooks for design info on helicals showed that a ten-turn helix looked promising: a gain of 15 dB would persuade my 10-Watt output to masquerade as 300 Watts, and a beamwidth of 36 degrees ought not to be too finicky to point. The boom length at 435 MHz would be about 6 feet, with a reflector 28 inches square—these seemed manageable dimensions. But what to use for the helix, how to form it, how to keep it in shape? All pertinent questions at this particular QTH—with the nearest parts or material stores some 70 miles away.

The boom was no problem. A 6'4" length of 1"×1/2" meranti timber, good and straight, looked just about right—with the 1" edge vertical to avoid

any bending (as it happened, the antenna itself turned out to be featherlight and easily supported by the 1″ × 1/2″). But what about the helix, and what about the spacers?

Copper tubing was unobtainable; in any case, it would have been expensive, heavy, and difficult to shape. Someone, somewhere had mentioned using coaxial cable: so why not RG-58? The outer screen would simulate a tubular conductor; the inner conductor is not needed but could be soldered to the screen at each end. Good grade coax has a tinned, close-mesh screen with an excellent weatherproof sheath. What could be better? I promptly hunted out a 25-foot length.

Spacers were now the problem. Most handbooks showed 3 spacers per complete turn of the helix, each spacer being set at a 120° angle to the last. Since the boom was rectangular, it seemed more sensible to opt for 4 spacers per turn, and to put them at 90° settings. The original plan was to use 1/4″-diameter plastic rod or wood dowel for the spacers, but nothing remotely resembling such material was available locally. Pondering the problem over a tasty meal of Fuyong egg, crispy chicken, and Cantonese bean curd, I suddenly saw the answer there in my right hand: chopsticks! Why not?

Chopsticks are available in a wide variety of designs and materials in Malaysia. I chose simple, wooden, everyday chopsticks (not bamboo)—undecorated—sold in bundles of 20 for 25 US cents a bundle. As with most chopsticks, the lower half has a circular, tapered cross-section, merging into a rectangular shape for the upper half. It couldn't be better! I marked the boom at 1.7″ intervals and drilled holes 3/16″ in diameter—consecutively at right angles for its entire length. The boom was long enough to allow 3 to 4 inches to stick through the reflector, for clamping purposes. A 3.4″ piece of the same boom material was fixed to the boom at the reflector end, and the 1.7″ intervals were measured from this. All this can be seen clearly from Fig. 1.

A drop of glue was put into each drilled hole, and the chopsticks were pushed in one by one until they wedged tight. A double-check made sure that they were put in with a clockwise spiral, as viewed from the reflector forward (that is, from the back of the beam). When giving the final push, each chopstick was twisted so that the square sides were roughly in line with the path that the RG-58 helix would take. This made it easier to file a small U-shaped depression in the top to allow the RG-58 to sit in neatly.

Chopsticks are generally about 10 inches long, and when pushed through the boom about 4 inches protruded on the other side. These bits were carefully sawn off. The helix diameter is 9 inches, so a mark was made on the last 4 spacers at each end of the boom, at a point 4-1/2 inches from the center line of the boom. A fine hole was drilled at these marker points and thread strung along from first to last spacer in each of the 4 rows. This enabled the other spacers to be marked to show where they should be cut off.

After trimming, the tops were filed into a U-shaped depression in line with the helix path. A small hole was then drilled, an eighth of an inch below the tip, so that a piece of waxed thread could be used to bind the RG-58 helix in place.

One end of the 25-foot length of RG-58 was bared for half an inch, the sheath and dielectric removed, and the screen and center conductor twisted together and soldered. Starting with this end, the RG-58 was bound to the short, straight, end section (3.4 inches) next to the reflector position. The soldered tip was placed so that it would mate with the center terminal of an SO-239 socket which would be mounted on the back of the reflector. The RG-58 helix was then wound carefully around the spacers, one at a time, binding in each spacer before moving to the next. In this way it was possible to ensure that an even, circular spiral was created—with no bulges or flat sections. As we neared the tenth turn, there was about 8 inches of surplus RG-58. This was cut off, the end trimmed, and the outer screen and inner conductor were soldered together as at the start of the helix. The thread bindings were touched with glue, and the boom and chopsticks given a coat of clear varnish and set aside to dry.

Colin Richards 9M2CR with the completed project.

The helical at work—note that the reflector frame is now a lightweight bicycle wheel rim, which is "neater, lighter, and better looking."

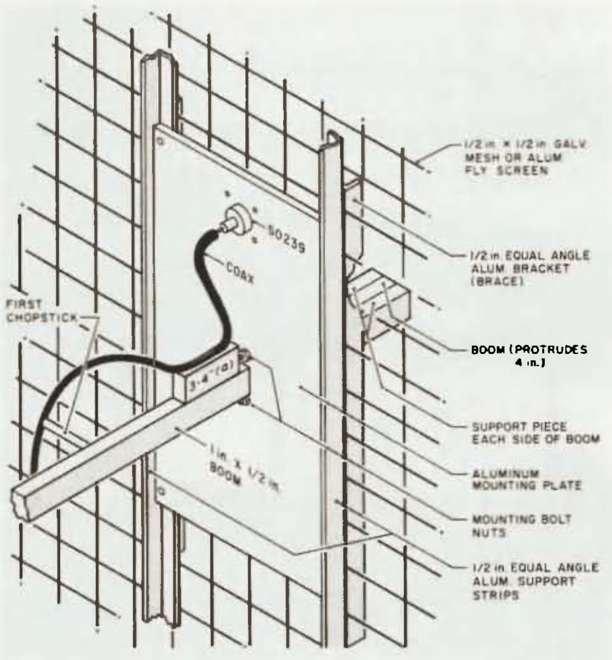

Fig. 2. Front-view details of mounting the bracket on the reflector.

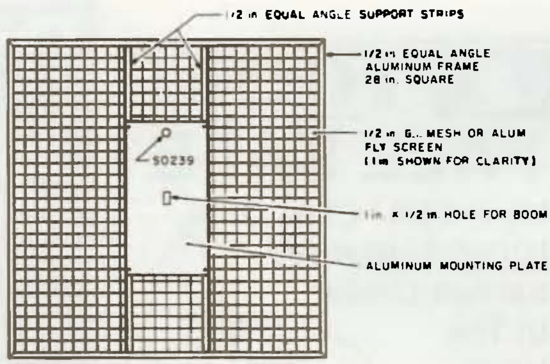

Fig. 3. Details of the reflector.

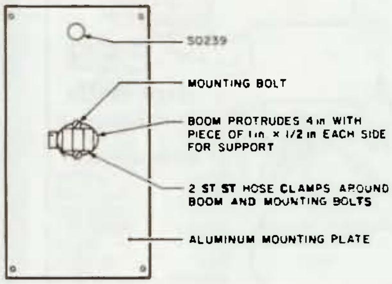

Fig. 4. Back view of the mounting plate.

The reflector came next. (Note the later improvement in the photo of the helical at work.) Half-inch-squared mesh GI screen was used, and a 28-inch square cut out and edged with 1/2″× 1/2″ aluminum angle. A small, sturdy aluminum plate was used as a center mount for the reflector (it was, in fact, an old door-lock plate!). An aperture 1″×1/2″ was cut in the center to allow the boom end to fit through and protrude 4 inches on the other side of the reflector. Above and below this aperture a hole was drilled for a 3″×1/4″ carriage bolt. The bolts were firmly screwed to the plate, with most of their length also protruding to the rear of the reflector.

Two more lengths of aluminum angle (1/2″×1/2″) were screwed across the plate in a vertical direction, to make the reflector rigid. The SO-239 socket fitted to the plate, facing rearwards, with its center terminal lined up with the end of the helix at section A in Fig. 1. The antenna boom was then pushed through the reflector mounting plate, carefully squared up, and fixed firmly in place with two stainless-steel hose clips around bolts and boom.

The reflector weighed about 8 pounds, whereas the antenna-plus-boom was only 2 pounds. A plywood bracket was therefore fitted at the balance point, just a few inches from the reflector. Minor dents in the RG-58 helix were pushed gently into shape, and the ten-turn "Chopstick" helical was ready for hoisting aloft! Almost ready, that is.

Securing the boom to the reflector.

The helix attached to the "chopstick" spacers.

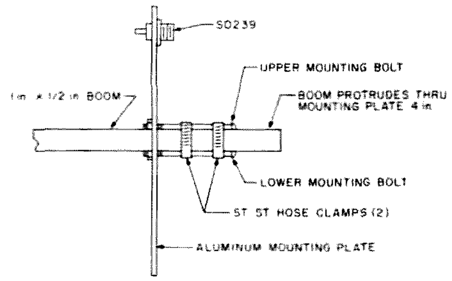

Fig. 5. Side view of the mounting plate.

There still remained the question of matching to a 50-Ohm feeder. The feed impedance of a helical antenna of this design is near enough 140 Ohms (this stays the same, by the way, regardless of the number of turns in the helix). A quarter-wave matching section should therefore have an impedance of about 84 Ohms. The nearest coax is RG-62, which has an impedance of 93 Ohms. A quarter wavelength at 435 MHz is 6.8", and the velocity factor brings this down to 5.7" (there's a trap here: solid dielectric coax like RG-8 or RG-58 has a velocity factor of 0.66, but is partly air-spaced and the factor is 0.84). After many "cuts and tries," the swr was brought down to 1:1.1. So this time the antenna was really hoisted in the air and put to work. Results? When used as an uplink antenna on OSCAR 7, Mode B, signal reports have been encouraging; downlink on Mode J, I can copy stations right down to the horizon. I think it works! ■

Reprinted from the December, 1980, *Amateur Radio* (Australia).

The Code Pet

—a Morse tutorial for Commodore's computer

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You're practically a shoo-in for that upgrade license if you can copy the code from this program written for the Commodore Pet™. You pick the speed from five to twenty words per minute and it sends perfect code in groups of five characters. Since this is a sound program, you will need an addition to the Pet such as can be found in *Kilobaud Microcomputing*, March, 1979. The article by Gregory Yob on page 71 explains several ways to connect sound. I strongly recommend the method in Fig. 4(b). By the time I isolated an amplifier with capacitors, I had distortion. The transistor seems to be best and also is easy to construct.

After you enter the speed, the screen is blanked and you copy the code with pencil and paper as you would if you were performing for the FCC. After 100 groups of five characters (or five minutes), the screen will show the text sent. A completely random text of letters, numbers, and common punctuation will assure you of receiving all characters equally.

Should you wish to stop before the computer is finished, type S and the computer will respond. Code is sent as near the input speed as possible for me to program. (If you make improvements, please let me know.) The basis for the time was reached by running the program, timing for five minutes, and then counting the groups of five characters. Speeds under 13 words per minute are sent at 13 words per minute with additional

Program for Morse code.

```
100 PRINT"" MORSE CODE PROMPTER PROGRAM"
110 PRINT "QQI WILL SEND MORSE CODE AT RANDOM.IN"
120 PRINT "QGROUPS OF FIVE CHARACTERS AT THE"
130 PRINT "QSPEED YOU DESIRE.  AFTER 100 GROUPS OF"
140 PRINT "QFIVE, A COPY OF THE SENT TEXT WILL"
150 PRINT "QAPPEAR.  IF YOU WISH TO STOP BEFORE"
160 PRINT"QI'M FINISHED, TYPE 'S'."
170 PRINT "QQWHAT SPEED WOULD YOU LIKE ME TO SEND?"
190 CLR
200 INPUT "Q(5 TO 20 WPM)";P
210 IF P<5 OR P>20 THEN 200
220 IF P>12 THEN K=1: GOTO 240
230 K=ABS(P*150-1900): P=13
240 P=ABS(P*3-80)
250 POKE 59409,52: REM TURN OFF VIDEO
260 PRINT "Ŧ"
270 PRINT "LETTERS.  HERE IS THE LIST TO CHECK"
280 PRINT "YOUR ACCURACY:Q"
290 POKE 59464,0: POKE 59467,16:REM SOUND
300 POKE 59466,51
310 A=INT(RND(1)*47)+44
320 IF (A=64) OR (A>57 AND A<63) THEN 310
330 PRINT CHR$(A);
340 FOR I=44 TO A
350 READ A$
360 NEXT
370 FOR J=1 TO P: NEXT
380 FOR I=1 TO LEN(A$)
390 D$=MID$(A$,I,1)
400 IF D$="L" THEN L=3*P: REM DAH LENGTH
410 IF D$="S" THEN L=P: REM DIT LENGTH
420 POKE 59464,211: REM TONE
430 FOR J=1 TO L: NEXT J
440 POKE 59464,0
```

spacing between characters. The timing for this is accomplished in lines 220 through 240. Line 270 is incomplete, but before the screen is turned on, line 610 will finish the sentence and tell you how many groups you have copied. Line 290 includes an extra POKE statement; however, without it, you would hear a false tone the first time you ran the program.

This program uses the inherent ASCII code in the Pet to reference a number to the corresponding ASCII character for display. Line 320 removes the holes in the ASCII code. Line 300 follows guidelines for sound pitch as in *Kilobaud Microcomputing*, February, 1979, page 9. If the tone is not right for you, change the 211 in line 420 to any number between 1 and 255.

Line 600 turns the sound off. If you have inadvertently pressed STOP, just type RUN 600. You won't see it on the screen until you have pressed RETURN. The program as shown will run until 100 groups have been sent. If you want to copy for only five minutes, add line 205 and change line 560 as in Version II.

Learning code isn't always that much fun, so anything to ease us through this period helps! Good luck on the upgrade. ■

```
450 NEXT I
460 REM END OF LETTER. CHECK 5 GROUP
470 RESTORE
480 GET E$: IF E$="S" THEN 590
490 C=C+1
500 IF C=5 THEN C=0: GOTO 530
510 FOR J=1 TO K: NEXT: REM WORD SPACE
520 GOTO 310
530 FOR I=1 TO P*6+2*K: NEXT
540 G=G+1: H=H+1
550 IF G=6 THEN G=0: GOTO 580
560 IF H=100 THEN 590
570 PRINT "  ";
580 GOTO 310
590 REM END
600 POKE 59464,0: POKE 59466,0: POKE 59467,0
610 PRINT "SYOU HAVE COPPIED";H;"GROUPS OF FIVE"
620 POKE 59409,60
630 PRINT "SQQQQQQQQQQQQQQQQQ"
640 END
1000 DATA LLSSLL,LSSSL,SLSLSL,LSSLS
1010 DATA LLLLL,SLLLL,SSLLL,SSSLL,SSSSL,SSSSS,LSSSS,LLSSS,LLLSS,LLLLS
1020 DATA B,B,B,B,B,SSLLSS,B
1030 DATA SL,LSSS,LSLS,LSS,S,SSLS,LLS,SSSS,SS,SLLL,LSL,SLSS,LL,LS,LLL,SLLS,LLSL
1040 DATA SLS,SSS,L,SSL,SSSL,SLL,LSSL,LSLL,LLSS
```

```
VERSION II ADDITION
    205 T=TI+18000
    560 IF TI>T THEN 590
```

```
CURSOR NOTATION
    [♥] CLEAR SCREEN
    [S] HOME CURSOR
    [Q] CURSOR DOWN
```


✓See List of Advertisers on page 162

Paul Grupp KA1LR
73 Magazine Staff

No More Two-Tone Sidetone

—modify your AEA keyer

The AEA CK-1 and MM-1 are spectacularly versatile keyers, and after many months of using both of them I have only one complaint, a complaint that many others have voiced. The problem involves the sidetone.

Let's face it—there aren't many keyers with a nice smooth sine-wave oscillator for the sidetone. On the other hand, most transceivers offer excellent sidetone characteristics. Moreover, when using the transceiver's sidetone, you can avoid the embarrassment of having the keying cable go bad while you are sending, or (heaven forbid!) forgetting to flip the "transmit" switch. In both cases the sidetone on your keyer would percolate along happily, giving no indication of the fault.

So what's the problem? If you want to use the sidetone in your rig rather than the one on the keyer, you can simply turn down the volume control on the keyer, right? Wrong! If you turn down the volume control on the keyer, you won't hear the audible confirmation of each entry you make on the AEA's keypad. This can lead to errors in message loading and speed selection if you don't depress the keys firmly, or there is keybounce.

The solution is ridiculously simple. Unlimber your soldering iron, and in less than five minutes you'll have your AEA keyer giving you audible confirmation of entry, but no sidetone. We'll start with the CK-1, since that keyer is nearest and dearest to my heart.

Remove the two screws on the sides of the keyer and carefully separate the two halves of the keyer. On the circuit board, locate diode D1, which can be found next to U3, just south of the 7805 regulator. Check the pictorial in the manual if you are not sure that you have the right one. Now here comes the hard part. Brandish your soldering iron threateningly before the keyer, and then unsolder one end of the diode. That's it! Tape the diode so it doesn't short out anything, and close up the keyer.

The MM-1 is equally simple to modify. The diode of interest in the MM-1 is the D1, located near the crystal. There are two diodes and a resistor in a row; the diode you're after is the second one from the resistor. Unsolder one end of the diode, and you'll have verification of key closure, but sidetone only from the rig.

If you wish to use the keyer's sidetone from time to time, you can simply install a miniature SPST toggle switch to switch the diode in when you want to hear sidetone from the keyer. In the MM-1, the switch can fit in one of the holes drilled for the Aux jacks. Space in the CK-1 is a little tighter, so you'll have to drill your own hole, but there is still plenty of room. ■

Dave Corner
6948 N. Ashland Avenue
Chicago IL 60626

Monodes

—harbinger of a new age

Everyone has doubtless heard, at one time or another, that there lurks at the far fringes of electronics an engineer's unicorn or will-o'-the-wisp known as the monode. Most of what you have heard is humorous and misleading in nature; this is simply a cover for a lack of hard facts.

But with recent developments promising to catapult it squarely into the limelight of the next wave of innovation, it has come time to broaden its acquaintanceship. Engineers and hobbyists alike stand to benefit greatly. Both will find the new information of prime interest. We will now proceed to unburden the monode of its undeserved myth of uselessness.

Monodes have left their mark through much of early history. This fact is now clearly seen from the new perspectives given to us by contemporary historians of technology, notably Y. Coyle Dunbar-Dexter and Isadora Pisa Ferniccia. Specimens of early ones range from bits of copper embedded endwise into clay beads (Chichen Itza, Angkor Wat) to bronze pin-shaped leads in wooden beads or buttons (Gizeh, Jericho). Fig. 1 shows representative pieces from these sites, circa 2240 BC to 1680 BC.

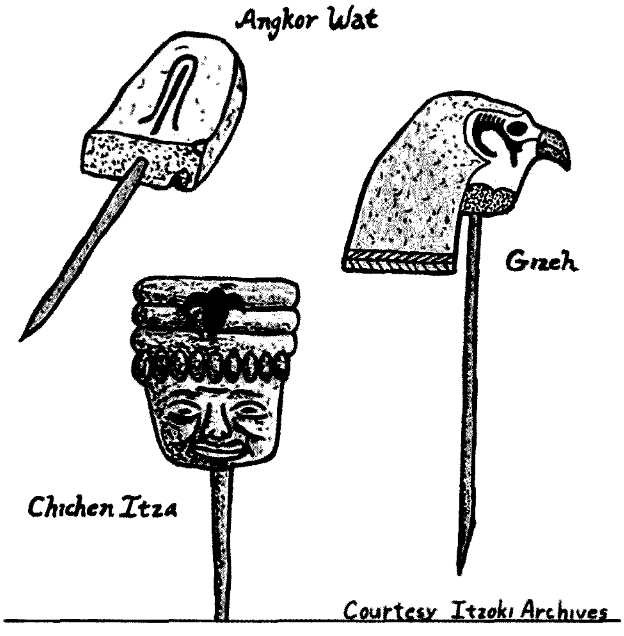


Fig. 1. Representative ancient monodes.

This graphic argument needs no further justification. The ancients' failure to extract a usable performance from them, however, led to their continual burial and rediscovery in widely scattered places and times.

There are historians who scoff at the ancient monodes theory, nonetheless. Most often, these are not technically oriented people, and so they put forth the rather tepid counter that the so-called monodes are often found in proximity to such commonplace articles as combs and brushes (who among the present readership has not built a Wimhurst or Van de Graff machine?); some are even found right in a mummified corpse's hair!

We can scarcely blame the ancients for burying these defiant devices with their frustrated and no doubt defamed inventors, perhaps wishing both a kinder break in the afterworld.

In point of fact, Puck's Staff, as we might well call it, had been a thorn in many a Skyptickal Experimenter's side all through the Renaissance, as well. The first relatively modern mention of them is found in a rough draft of a never-finished monograph, as it identified itself, by Evangelista Torricelli, in 1642. Fig. 2 shows this work. He had a vague notion that the strange forces found in amber, animal fur, and the like had an affinity for metals and proceeded to tackle electrode theory one electrode at a time.

Since an electrode's principal characteristic seemed to be its length, he assembled one by putting mercury in a glass tube and inverting it into a shallow dish of more mercury. This was to provide an easy means of varying its length, but he became so engrossed in the tricks the atmosphere played on it that he dropped further dead-end research in favor of the easier quarry. He invented the barometer the following year as a result.

Benjamin Franklin also delved into the matter for a

time. This has been determined by piecing together scattered interviews biographers held with younger contemporaries after his death. Franklin mounted ball-capped rods atop Leyden jars (the now-familiar ball and stem most static electricity devices sport), but found that, when capped with wooden or gutta-percha insulators as monode theory calls for, they became quite refractory to further experimentation. He, too, gave up in despair. Fig. 3 shows this relic of the lackluster side of science.

Many nineteenth century luminaries also wrestled with the "wicked one-legged beastie," as Samuel Morse referred to it. But, with so many highly successful endeavors proceeding forth, this was scarcely a time for championing the lame ducks of technology.

Michael Faraday attempted to derive the form of the Tubes of Force he would find around a monode. His subsequent nervous breakdown forever sealed off any chance of knowing just how close he may have come to the truth of the matter. He became so distracted that he could only talk about irrelevant trivia for years, never touching on the subject for a moment. Research is also in progress on the so-called heavy metal poisoning that afflicted Isaac Newton.

Heinrich Hertz came much closer than anyone to seeing the monode in its own right. He attempted to ascribe to most common arrangements of matter a "monopolar character" to account for the apparent lack of omnipresent electromagnetic activity as observable in his day. He was right, in that monodes do *not* make antennas, and vice versa. We will go into this in more detail.

As twentieth century physics unfolded, portraying a world in defiance of common sensibility, the monode began to fall into line as a viable entity in its own right. Engineers and scientists here at Bull Laboratories have detailed its operating principles, and applications research is in progress at a rapid pace, aided by the sophisticated support technologies available today.

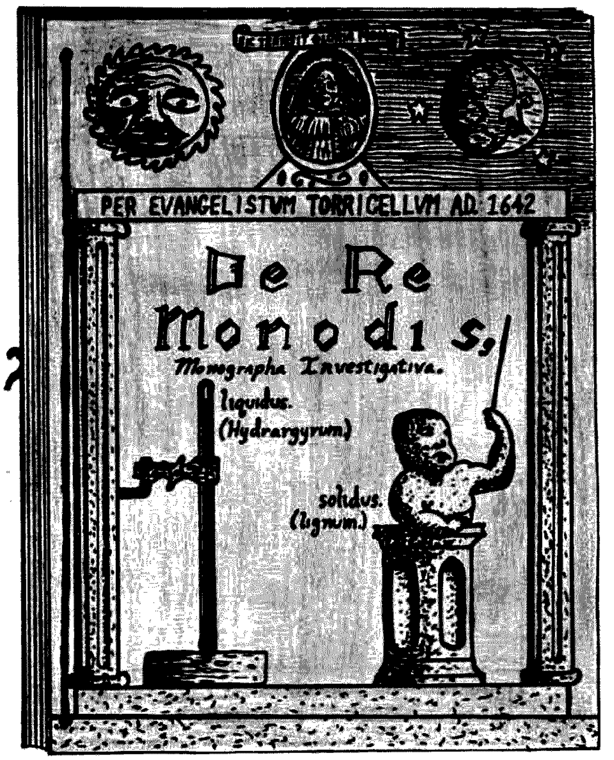
The basic stumbling block all along has been in the current mode assumed. Both monodes and superconductors, therefore, exhibit essentially surprising behavior in the macroscopic realm.

Rather than burden the reader with quillets of theory, we will here take the more pragmatic and intuitive approach and describe the appearance and measurement of basic monode circuit parameters:

Voltage—Voltage is a measure of electromotive potential difference between two points. The voltage of a monode with respect to any other point in a circuit can be measured readily enough, but the one-lead device cannot have a voltage drop as such. Monodes do not *drop* voltage, so much as they never *pick it up*.

Current—Current does not flow in monodes in the conventional sense. Kirchoff's Law still applies, however. The monode's voltage with respect to any other point in the circuit remains constant as long as currents flowing into the monode are equal in magnitude to the currents flowing out. The fact that both flow over the same lead simply means that conventional current meters register nothing.

Resistance—Since this is defined as voltage drop per unit current, we have a double dilemma, as witnessed



E.F. Bull-Private Collection

Fig. 2. Torricelli's investigation.

above. Is the monode's behavior independent of the resistivity of its conductor? Does it display a temperature coefficient of some sort? And what about heterojunction effects? One might well ask.

Ac measurements are also difficult. Since there is no externally definable current, how can it alternate? Ac monodics seemed a doomed cause until the invention of the alternating source in 1936 by Bull Laboratories founder General E. Fuller Bull. See Fig. 4 for operating details. Shown in the inset is a modern equivalent—an array of series connected photovoltaic cells is illuminated by an LED and mounted on a quartz crystal which is made to oscillate by a conventional oscillator circuit.

You might now see why Hertz' original notion about ac and monodes is true. If we try to make a monode antenna, say, by topping an automobile radio antenna with a decorative foam ball, we are in reality going to be receiving signals from the lower segments of the antenna, which act as unshielded conductors from the radio's coax connector to the top segment. It is this top segment which, together with the foam ball, forms the monode. Hoping to force the top segment to become a monode/antenna by removing the lower segments is of no use. Now, the lower half of this segment is needed to connect the upper half (the new monode) to the coax connector. It is this new unshielded conductor, of course, which picks up signals. Chopping away until only the foam ball remains, we at last see how poorly monodes func-

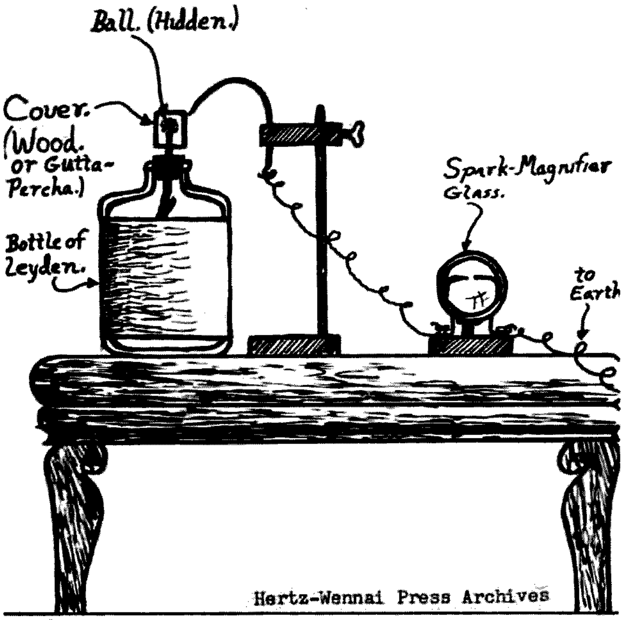


Fig. 3. Franklin's monodick apparatus.

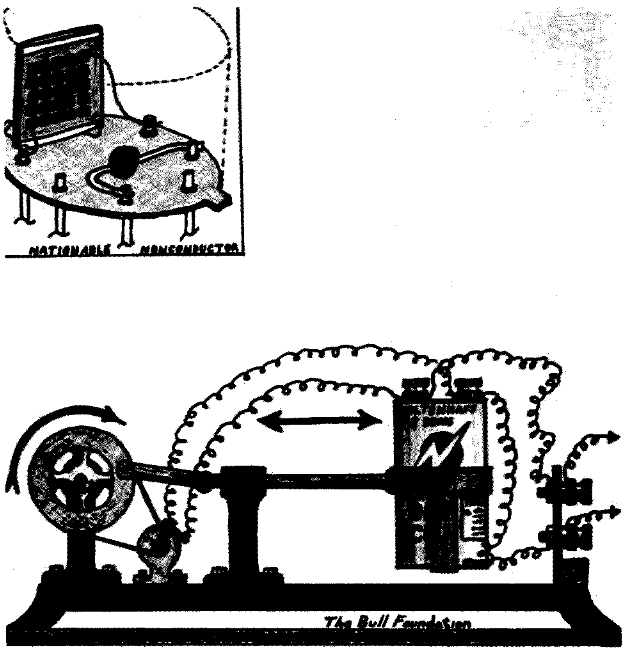


Fig. 4. Early and modern alternating sources.

tion as antennas.

The monode will see its first gamut of applications in the digital field, owing to its highly unary truth table and singularly consistent characteristics. Indeed, Buckminister Fuller has dubbed the monode "the unit of electrical behavior."

As an example of its almost trick logic, note Fig. 5, the data bandwidth doubler. This feedthrough device is crimped onto stranded hookup wire to increase its pulse bandwidth and functions as follows:

Logic ones are conventionally communicated as current pulses. (Complementary codes exist, too; we will stick to this one for simplicity.) These pulses obviously must flow over the low-resistance path offered by the wire. Logic zeroes, on the other hand, are represented by an absence of current and thus obviously prefer the *high*-resistance path formed by the two 100-megohm resistors in series, which prevent their being swamped by ones. Since negligible current flows over this path, the two monodes terminate the path at source and destination for a healthy cost and weight savings over twisted pairs or coax.

Monodes now largely use standard integrated circuit technologies owing to their availability. However, new and more appropriate variants are appearing, notably SEAMOSS (Superinsulating Epoxy And Metal Or Substantial Substitute), based on the valence-filled NC (no connection) junction.

Since monodes do not use conventional current, it must be bypassed. This was done at first in the power supply, using a hefty shunt resistor and an air gap or glass rod in series with the output.

The development of the powerless monode did away with this, however. This three-terminal device, in addition to dissipating heat from the bypassed current, also dissipates "peat," or powerless heat, the zero-energy equivalent of heat dissipated by conventional current. Thus, in addition to being mounted on an aluminum heat sink with silicone grease, the device must also be attached to a transite pad with asbestos grease, for peat's sake.

An even more recent development, allowing monode ICs to be used in conventional circuits, is the incorporation of bypass resistors into the IC case. These damp supply line ripple as an added benefit, since often they have values on the order of .03 Ohms or less.

The first digital monodics research was done in 1967. A team of Bull Laboratories scientists theoretically predicted the properties of a monode gate which they proposed to call a "dislatch." Upon fabrication and testing of the first unit, however, it was deemed a flop.

There are two kinds of flop, J and K, which are identical, which is simply to add variety to texts on monode theory and practice. Much of this would be stodgy pottage, indeed, without such details; the phenomenon is known as "monotony."

The flop possesses a unique ability to keep circuit complexity to a minimum. This is due to the fact that the output is independent of the input, folding its truth table down to a mere speck of ink on the printed page and making it highly noise-immune as well. The distinction between ripple-through and synchronous logic becomes superfluous.

Some digital functions served exclusively by the monode and its MSI derivatives include the Gunn Effect No-Shot Schmitt Trigger; its output is a blank when it is not loaded.

The flop is also the ideal matrix element for the WOM or Write-Only Memory. Far from being the white elephant many wags have painted it to be, it finds many useful applications. It is usually functionally organized as a set of interpenetrating spirals to form a circular file or data sink.

One use, which may have far-reaching consequences, is in the capacity of a data terminator. Not knowing the inherent capacity of the Bit Bucket, which we must assume on thermodynamic grounds to be finite, it is wise to provide for the dis-

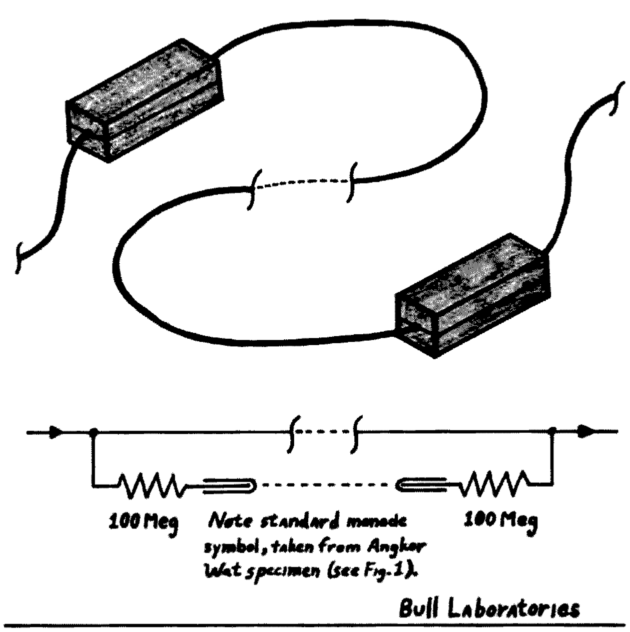


Fig. 5. Data bandwidth doublers.

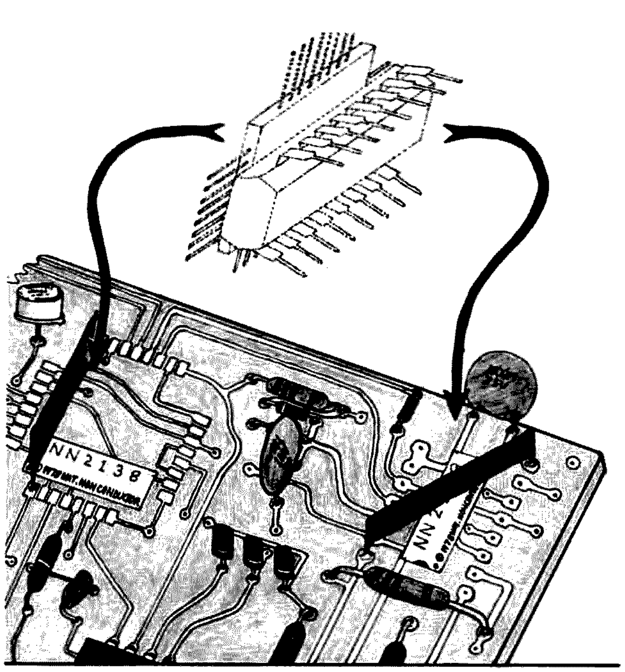


Fig. 6. Vanished "flop-flip" case WOM. Case design would be unwieldy if chip existed.

posal of spent data, rather than simply spraying it into the environment as noise. Future generations of computers will very likely be planet-sized, if not larger, and we are presented with the horrifying spectre of civilizations fighting over caches of transition-free space. Of course, this does not even take into consideration the cost of transporting it to work sites once it is staked out.

In the early days of computer technology, a programmer was as often as not a jumper jockey, wiring by hand the controller boards used to program line printers and the like. The distinction between program and data was painfully clear. This separation is referred to as Harvard Architecture. Those who toiled at these tasks may at least console themselves that the knowledge so gained has been of great benefit in present-day technology. Many MSI integrated circuits are in reality not logic circuits at all; like the controller boards, they are Read-Only Memories. The chip engineer's job in many cases is reduced from tedious design-from-scratch to literally writing functions onto standardized ROM formats.

With flop-based ICs, this is destined to become an even greater boon. Since flop outputs do not follow their inputs, many functions to be written into WOMs can be deleted without any functional impairment. This has been dubbed Dropout Architecture.

It is not difficult to prove that, using Dropout Architecture and conventional ROM table-folding techniques, WOMs can be progressively simplified to the point that they will vanish, making them extremely compact and versatile. Of course, *There Ain't No Such Thing As A Free Lunch*, as they say in the vernacular. In most cases, the IC's supply bypass resistors will not share in these logic-derived benefits. Hefty power supplies will thus remain the rule, given the degree of supply bypassing previously mentioned. Also, good design practice will still call for at least a label to indicate the choice of WOM not to be used. Fig. 6 shows a vanished WOM as it may appear and demonstrates an unusual benefit of the concept. Proposed case outline MO-223 is a "flop-flip" case which can be not used in either a dual-inline or quad-inline circuit board location.

Monodes entered the linear realm in 1972 with the invention of the Zero-Current Source. It is realized in chip form as two powerless monodes in a totem-pole arrangement, providing a 100% offset with respect to both supply and ground simultaneously.

This makes possible the infinite-output-impedance NOP-amp, which is ideally suited for unity gain applications since the output impedance matches the input impedance. As long as no disturbing input signal is present, distortion is extremely low.

Other unique devices are exemplified in designs now on the drawing board at Nationable Nonconductor, a Bull Laboratories subsidiary. For example, the NN3160 and NN3161 are, respectively, a suppressed-leading-zero-to-analog converter and its trailing-zero sister. The NN31246 is an Indefinitely Long Delay Line or "Collander Brigade." It is actually a 1xN analog shift WOM, of course. It is used to shunt signal quiescent periods away from sensing circuit inputs.

A German research group has recently achieved a combination theory/practice coup with the development of the G999. This Gottdeschaft device is a triple negator and is used to cast out nines in decimal arithmetic units.

We can expect the monode to flood the marketplace soon, one-upping many current two-lead devices. With the prospect in sight of a complete engineering revolution, as Dropout Architecture's characteristic philosophy of material economy is applied to many other disciplines, physical technology itself will become a thing to be avoided. We will be ushered into a new Eden and rejoice in Eternal Oneness. ■

Michael Sara
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Port Washington NY 11050

Breaking the Decibel Logjam

—how to cope with nothingness

The purpose of this article is to clarify what a decibel is and to explain why it acts the way it does. The average amateur seems to encounter difficulty when studying the subject. It is sometimes difficult to grasp the decibel because of its "nothingness." It has no weight, it cannot be seen, and its taste and smell are nonexistent.

Before going any further, it might be well to state that the decibel is a *ratio*, nothing more and nothing less. It merely represents the relationship between two quantities of energy. Unlike the meter, the pound, or the quart, it has no counterpart in wood or metal in the Bureau of Standards. It is an arbitrary standard originally set up by telephone engineers for their convenience in making measurements and calculations.

The decibel is similar to the old "transmission unit" used for measuring the efficiency of telephone circuits. The original unit was equal to the loss in a mile of standard telephone cable. This mile of cable was used to compare the losses or gains in a circuit.

The mile of standard cable was too bulky to keep around so it was replaced by its electrical equivalent: an artificial line with a resistance of 88 Ohms and a capacitance of 0.054 uF. For measuring purposes, the combination of these units was equal to a mile of standard cable. If the input to a circuit was increased, the amount of increase could be measured by the number of mile-units which had to be inserted to bring the output back to the original level.

The greatest defect of the mile of cable is that the cable, having a certain amount of inductance and capacitance, does not have a flat frequency response, and transmission efficiency depends upon frequency as well as power. In working with new types of circuits, there was a great need for a new unit of transmission which was *independent of frequency*. One was needed which was based on power alone, since the gain or loss in power is the true index of efficiency.

Another measurement scale was devised and the basic unit of transmission, by agreement among the engineers, was the *bel*. It was given this name in honor of Alexander Graham Bell, the inventor of the telephone. In common practice, one tenth of this fundamental unit is used; it is called the decibel and goes by the abbreviation dB.

The decibel is a natural unit based on the way our ears respond to various sound levels. We rate the efficiency and power output of apparatus in Watts, but our ears do not respond to sound energy the same way a meter does. Instead of responding in direct proportion to the wattage, our ears respond *logarithmically* with respect to the power.

For those who may have become a bit doubtful about their algebra, a little review may be in order before continuing with the discussion.

Use of Logarithms

The common system of logarithms uses ten as a base. The logarithm of a number is the power to which ten, the base, must be raised to equal the number. For example, ten squared, or ten raised to the second power (10^2), equals 100. Thus, the logarithm of 100 is 2. If we raise ten to the third power, we have 1000 ($10^3 = 1000$); so the logarithm of 1000 is 3.

The number which we have just found is called the characteristic of the logarithm and always has a value of one less than the number of digits in the given number. 1000 has four digits and so the characteristic of its logarithm is 3. Unless

the given number is a direct power of 10, its logarithm consists of the characteristic followed by a decimal number known as a *mantissa*, which must be found by use of a table of logarithms. If we want to find the logarithm of 775, we know that the characteristic is one less than the number of digits so that makes it 2. By referring to a log table we find the mantissa to be .8893 so the log of 775 is 2.8893. This means that if 10 were raised to the 2.8893 power, the result would be 775. Numbers may be multiplied by adding their logarithms or they may be divided by subtracting their logarithms.

Returning to the discussion of the decibel, suppose we had an amplifier with an even 1000 milliwatts output. If the output were reduced the least amount detectable by a sensitive ear, we would find that it had been reduced to about 794 milliwatts, or to 0.794 of the original power. If once again the power were reduced the slightest amount detectable by the ear (a *good* ear) and the output measured again, we would find that the power had been reduced to 0.794 of the 794 milliwatts, or to 0.630 of the original power. If we go so far as to reduce power another step, we find that the power has been reduced to 500 milliwatts, or to one-half of the original amount. It took three steps (reductions of power) to reduce the original power to one-half its value.

The decibel, which is the new unit of transmission or power ratio, is supposed to be the smallest change in power that is audible to the trained ear. The formula for finding the decibel of a ratio between two power levels is: $dB = 10 \log_{10} (power_1/power_2)$.

Power 1 and power 2 represent power before and after it has been reduced or increased. When substituting, if the larger of the two is always placed on top, it will simplify solution. If we substitute 1000 milliwatts for p_1 and 794 milliwatts for p_2, we will have the following:

$$dB = 10 \log_{10} 1000/794 = 10 \log_{10} 1.259.$$

The log of 1.259 is 0.100, so $dB = 10 \times 0.1$, or, $dB = 1$.

In substituting for the second and third reductions, we find that we have reductions of 2 and 3 dB, respectively. This then gives us an approximate scale that is easy to remember: One dB reduces the power to 4/5ths of the original, two dB reduces it to 2/3rds of the original, and a reduction of three dB brings the power down to one-half of the original.

Practical Examples

If these power ratios are memorized, almost any dB loss or gain can be figured quickly. For example, what power ratio would be represented by a loss of 9 dB? A 9-dB loss would be the same as three 3-dB losses. Remembering that a 3-dB loss equals a power ratio of 1/2 and also remembering that when the logarithms of a number are added the numbers are multiplied, we find the following:

$$3\text{ dB} + 3\text{ dB} + 3\text{ dB} = 1/2 \times 1/2 \times 1/2 = 9\text{ dB} = \text{power ratio of } 1/8.$$

To find the power ratio of a 7-dB loss we have the same as a 3-dB, 3-dB, and 1-dB loss, so:

$$3\text{ dB} + 3\text{ dB} + 1\text{ dB} = 1/2 \times 1/2 \times 4/5 = 7\text{ dB} = \text{power ratio of } 1/5.$$

When solving for gain, the problem is figured for an equivalent loss and the resulting power ratio is inverted. For example, to find the power ratio of a gain of ten dB, we have to find a change of 3 dB, 3 dB, 3 dB, and 1 dB, so it follows that

$$3\text{ dB} + 3\text{ dB} + 3\text{ dB} + 1\text{ dB} = 1/2 \times 1/2 \times 1/2 \times 4/5 = 10\text{ dB} = 1/10.$$

Inverting: 10 dB gain = power ratio of 10.

This is another common ratio that should be committed to memory, and it is easy to remember: 10 dB equals a power ratio of 10.

Voltage or Current Ratios

The formula so far has been for finding the decibel direct from the power measurements. When voltage or current readings are to be used in place of power, the formula must be changed to read:

$$dB = 20 \log_{10} (V_1/V_2).$$

The power in a circuit is proportional to the square of the voltage or current. As stated before, adding of the logarithm of a number to that of another multiplies the numbers, so two times the logarithm of the voltage or current ratio squares it and gives us the power ratio. Current values may be substituted for V_1 and V_2. When using voltage or current values in the formula it is considered that the *input and output impedances are the same*.

By substituting in the formula for power, we can work out the following table.

Decibels Gain	Power Ratio
0	1
1	1.25
10	10
20	100
30	1000
40	10000

By this we find that each time the level in decibels is increased by ten, the power is multiplied by ten. To increase the audio output of a piece of equipment by 40 audible steps, or by 40 dB, the power output must be increased 10,000 times. ■

HAM HELP

I recently purchased an old Hallicrafters linear amplifier, Model HT 41. I need to get a copy of the schematics and, if possible, operating instructions. If anyone can furnish these, I will gladly pay costs. Thank you.

Glenn Churchill KA2IOI
1 Meadow Rd.
Hudson Falls NY 12839

I need a schematic for a Navy RBH-2 general-coverage system CNA46188 receiver manufactured by National under its own model number NC156-1. I am willing to pay a reasonable amount for the schematic and manual. Thank you.

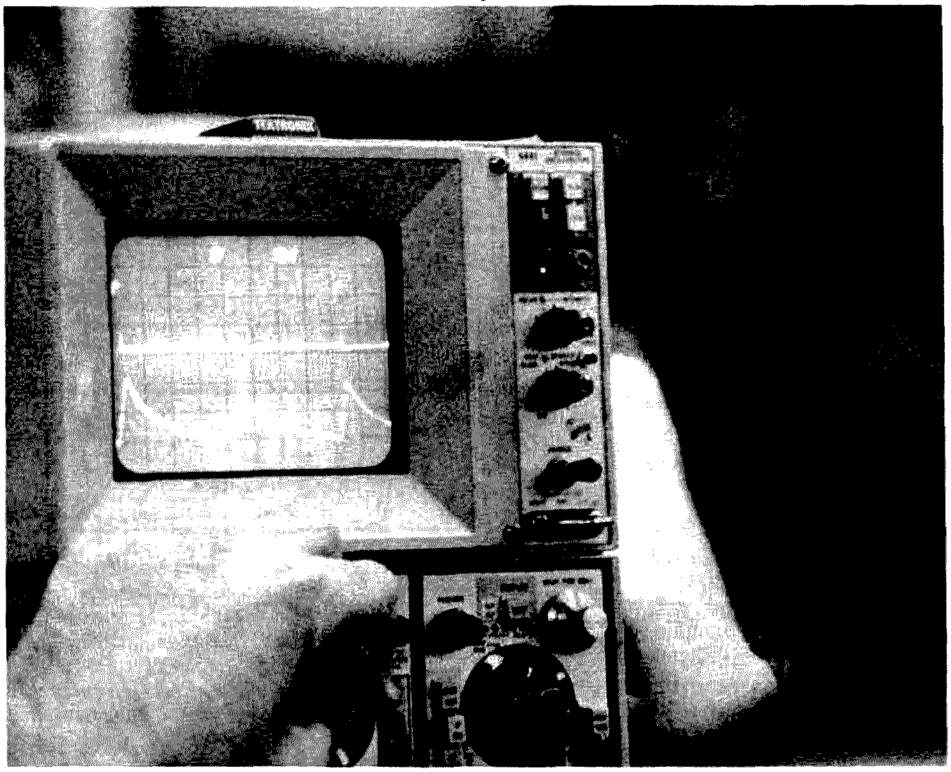
Terron
9301 SW 4th St., 219
Miami FL 33174

✓See List of Advertisers on page 162

Less Drain Is Your Gain!

—power-saving mods for the Wilson II and IV

Photos by N3IC



Scope display of power saver in action. Top trace—receiver power. Bottom trace—squelch voltage.

Robin Becker KA3W
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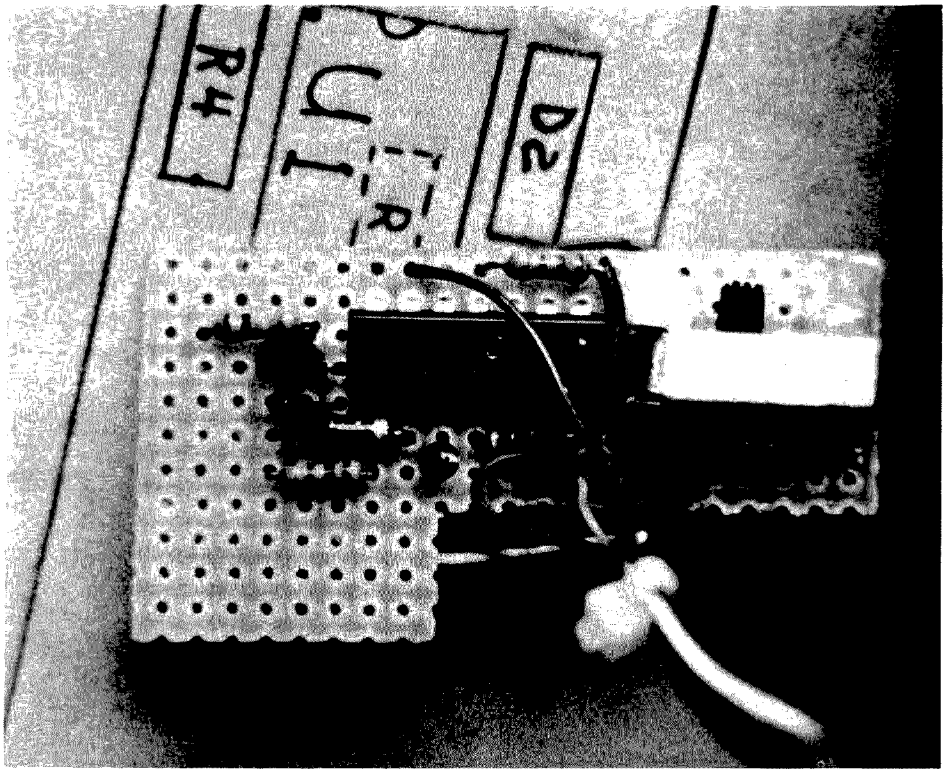
Wilson Mark II and Mark IV hand-helds are excellent performers. In many ways, they rival the premier Motorola HT-220s. One way in which the Wilson units come up short is on standby current. Wilson specifies the standby current at 15 mA; mine draws about 22 mA normally. A call to the factory confirmed that this is par. While respectable, 22 mA, or 15 mA for that matter, just doesn't compare to the HT-220's standby current of 3.5 mA. Recently, while making a modification suggested by Wilson to reduce distortion in the audio stages, I decided to do

something about this. The result was a reduction of the standby current to the outstanding level of 4 mA. Perhaps even more incredible, the modification requires only about $2 worth of parts and just a slight wiring change to the circuit board! The details of the modification are described below, along with two other changes which conserve power on receive and transmit.

The basic idea behind the modification is to switch off the power to most of the receiver as much of the time as possible, switching it on periodically for a brief instant to check for a received signal. When the receiver is powered up, the presence of a quieted signal keeps it on and the absence of a signal turns it off again. Once turned off, the receiver is powered up again after a delay and the process repeats. If the turn-off occurs quickly compared to the time between successive turn-ons, substantial power savings result.

To implement this idea, logically it would seem that checking the squelch voltage of the receiver would be sufficient to determine if a signal is present. In fact, this is the scheme that most scanners use to check for busy channels. However, to prevent noise bursts from coming through, squelch circuits open only after the presence of a continuous quieted signal for some fixed time period. Wilson set this time period to be from 40 to 120 ms, depending on the squelch control setting. The squelch action of the Wilson HT is depicted in Fig. 1, which shows the voltage at the collector of Q14 for various signal conditions. If the squelch control is set as tight as possible, the receiver would have to be powered for 120 ms before the squelch voltage would indicate the presence of a signal. Thus the minimum power-on time would be about 120 ms.



Top view of completed board.

To realize significant power savings, the receiver must be off for much longer periods than it is on. If the receiver power-on period is set to 120 ms, the power-off period must be set to 1 second or longer. This is not acceptable, since it results, on average, in the loss of the first 500 ms of any transmission. If the power-on period could be shortened, however, the power-off period could also be shortened, and hence the amount of any transmission that is missed would be reduced. A power-on period of 10 ms followed by a power-off period of 200 ms, for example, would result in the loss of only 100 ms of signal on average, while still reducing power consumption considerably. A loss of 100 ms corresponds to about one-half of a syllable and is not significant. In fact, this is comparable to the amount of signal lost in normal operation due to the response time of the squelch circuit (see Fig. 1 and note the time delay from signal onset to squelch opening).

Thus, to design a successful power-saving circuit, a method of reducing the required power-on time must be found. Although the squelch circuit of the receiver takes up to 120 ms to open, it closes in at most 15 ms (the squelch circuit closes in about 5 ms if the squelch control is set as tight as possible). Therefore, if instead of waiting for the squelch to open when the receiver is powered, we instead somehow start with the squelch open and only wait for it to close, the power-on periods could be reduced to 15 ms or less. This coupled with power-off periods of 200 ms would yield fairly fast response and dramatic power savings. Unfortunately, the Wilson's squelch circuit always closes after the receiver is powered. However, if the squelch circuit itself is always powered during receive and the rest of the receiver is powered up at intervals of more than 120 ms (the maximum time it takes for the squelch to open), then the squelch would

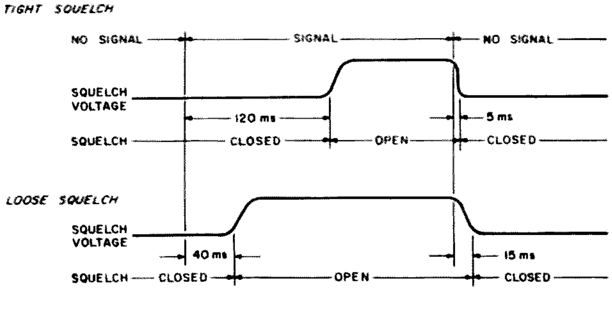
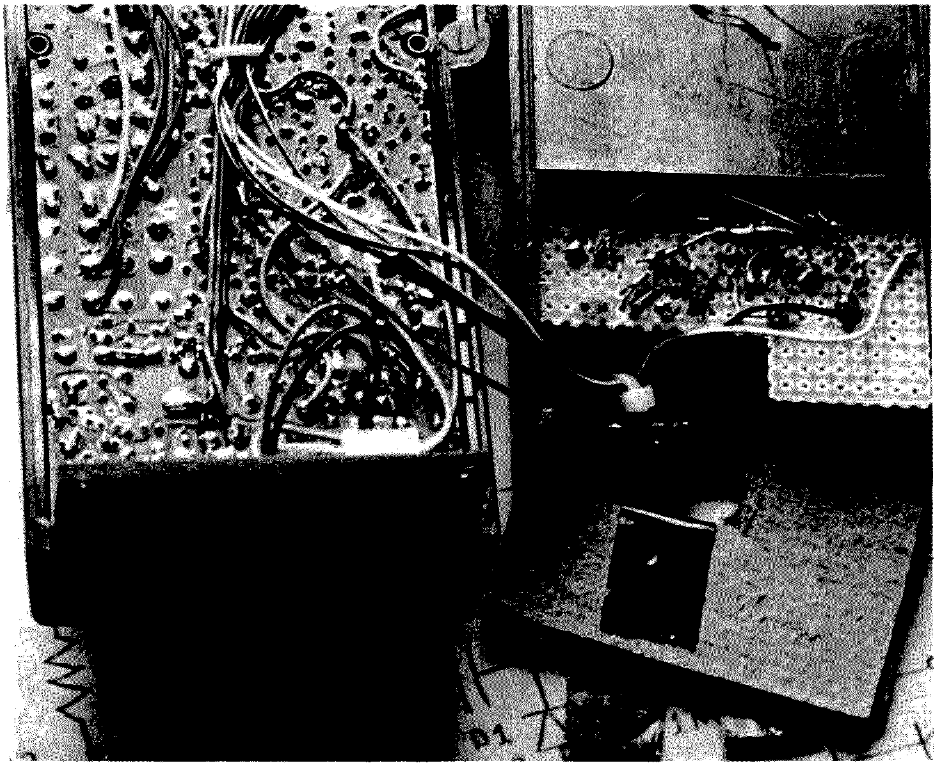


Fig. 1. Squelch action before modification.



Bottom view of completed board showing method of installation in HT.

always be open at the instant that the receiver is powered. The operation of such a system is shown in Fig. 2.

Although the system now seems complete, another problem has been introduced. Since the audio stages are turned on and draw power whenever the squelch is open, some additional method must be used to keep the audio stages turned off during the time when the squelch is open and the receiver is not powered. This problem turns out to be easily overcome by allowing the receiver power control signal to act as an auxiliary squelch control signal. In this way, the squelch control signal is kept closed when the receiver is not powered. When the receiver is powered, normal squelch action controls the audio stages.

A block diagram of the circuit is shown in Fig. 3.

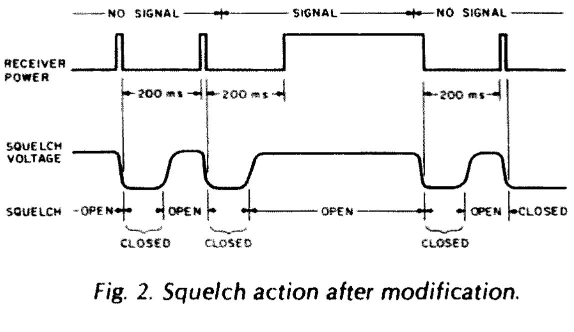


Fig. 2. Squelch action after modification.

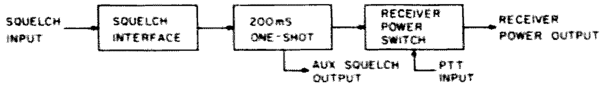


Fig. 3. System block diagram.

The squelch interface converts the squelch signal to logic levels and to some extent duplicates the squelch control stage of the HT. This is necessary because the solution to the problem mentioned above keeps the receiver squelch control stage clamped while the receiver is not powered. The squelch interface circuit triggers the one-shot when the squelch closes. The one-shot sets the length of the power-off period. It also is used to keep the audio stages off during power-off periods via the auxiliary squelch output. When the one-shot is inactive and the HT is in receive mode (PTT is high), the receiver power switch is closed and B+ is applied to the receiver. When the one-shot fires or when the HT goes into transmit mode (PTT is low), the power switch opens and the receiver is turned off.

The complete circuit is shown in Fig. 4. Transistor Q1 converts the squelch voltage to 0 - 12 volts. The one-shot is made from two Schmitt-trigger NAND gates, U1A and U1B. These gates are very useful for fashioning one-shots and oscillators, and the spare gate can be used in some future project. When the output of U1B is low, it shuts off the audio stages through diode D2. U1C controls the receiver power via transistor Q2. The power pulsing action can be disabled by closing switch S1. This keeps Q1 off, preventing the one-shot from firing.

The entire circuit easily fits into the area reserved for a tone encoder. Construction is quick using a perfboard, and a suggested parts layout is shown in Fig. 5. I soldered the IC directly into the circuit, although the board might still fit if a molex™ or a low-profile socket is used. Both unused gate inputs on U1 (pins 1 and 2) must be tied high or grounded. I used 1/4-Watt resistors and tantalum capacitors because of their small size. All parts are readily available from many suppliers. One supplier is Digi-Key, PO Box 677, Thief River Falls MN 56701.

The wiring is as follows: Disconnect the wire from the emitter of Q29 (upper right of the circuit board) to the junction of R5, R6, R9, R11, R13, R14, and C46 (middle of the circuit board). Connect +V on the new board to the collector of Q29. Connect the collector of Q2 on the new board to the junction of the components listed above. Connect the PTT input on the new board to the emitter of Q29. Connect the squelch input on the new board to the collector of Q13 (near the top of the circuit board). Connect the auxiliary squelch output of the new board to the collector of Q14 (upper left of the circuit board). Finally, connect the ground on the new board to the circuit board

ground somewhere near Q14 (the exact location is not critical).

If the disable function is desired, a small slide switch can be mounted on the perfboard. The switch should be bonded to the board (epoxy works fine). By cutting a notch in the case within the battery compartment, the switch can be conveniently reached without disassembling the case.

Circuit operation can be checked by observing the one-shot output (pin 11 on U1) on an oscilloscope. With the HT turned on and the squelch control fully clockwise, a pulse train should be observed. The pulse should be high for about 5 ms and low for about 200 ms. Next, rotate the squelch control to its fully counterclockwise position. The one-shot output should stay high and the receiver squelch should open.

If all is well, install the perfboard in the HT. The board may be glued in place if desired, although I have not found this to be necessary. Insulate the perfboard from the circuit board using cardboard, foam, etc.

The completed unit draws around 3.5 mA during power-off periods and normal receiver current (22 mA in my case) during power-on periods. With the squelch control pegged, the duty cycle is 5 percent or so, and as a result the average current should be approximately 4.5 mA. Measurement in the lab confirmed this figure. The HT was also tested on a Cushman, and no change in receiver sensitivity was observed when switching between pulse mode and normal mode.

Once installed, the operation of the circuit can be verified by rotating the squelch control until the squelch threshold is just reached. Periodic noise pulses should be heard from the speaker if the squelch control is set right on the edge between open and closed. Otherwise, you'll never know it's working unless you keep track of how often your batteries run down!

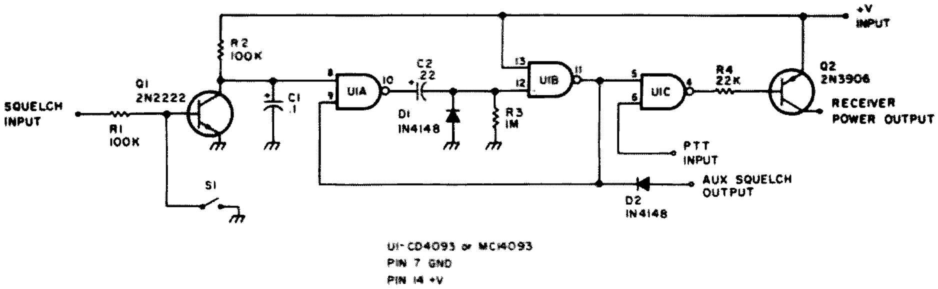


Fig. 4. Power pulser schematic.

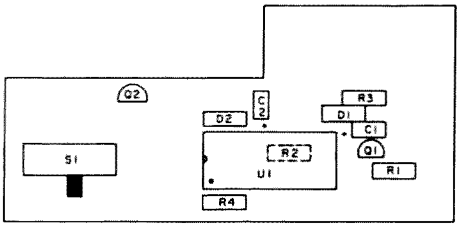


Fig. 5. Parts layout, top view.

Now on to some changes on the circuit board. These changes are not that easy and are only recommended for those persons experienced with tight circuit-board work. Although the changes only involve substitution of components, access is difficult due to the cramped quarters. With a little care they may be performed successfully.

The first change further reduces receiver standby current drain, although only by a little more than .5 mA (from 4.5 to 4 mA). Change R48 from 18k to 100k. R50 should now be adjusted so that the audio output clips symmetrically. A value of 270k worked for me. A side effect of this modification is that the time it takes the squelch to open is increased by about 20 ms. C57 could be reduced to compensate for this, but then the squelch would close on shorter noise pulses than it did originally. I suggest leaving C57 at 1 uF, since the added time is not significant. Although this modification can be made without installing the power pulsing circuitry, the benefit would be marginal in that case.

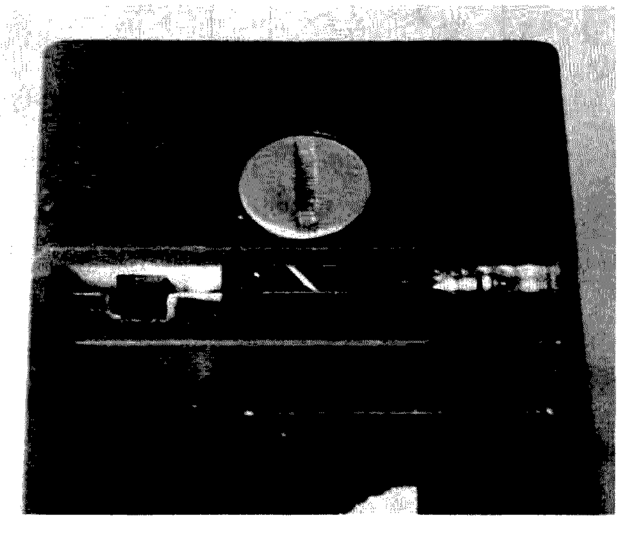
The second change reduces transmit current by about 20 mA. Change R93 from 470 to 4.7k. This change cannot be made unless the power pulsing circuitry has been installed. A similar savings in transmit current can be achieved without installing the power pulser, however, at the cost of about .7 V lower receiver voltage, by changing Q29 to a Darlington (such as an MPS A13) and increasing R93 to 10k.

In conclusion, I see no reason why the receiver power pulsing idea could not be adapted to other HTs. For synthesized HTs, power would have to be maintained to the synthesizer, since the lock-up times are probably on the order of 100 ms. Give it a try!

Finally, I'd like to acknowledge the help of N3IC in kicking ideas around, designing circuits, and taking the photos, and also thank N3TE for sparking the whole process. ■

Reference

Wilson Mark II and Mark IV Operation and Service Manual, Wilson Electronics Corp., 1978.



View of switch cut-out in battery compartment.

Joel Eschmann K9MLD
8204 North 93rd St.
Milwaukee WI 53224

A Positive Supply with a Negative Chip

—one way to solve the parts problem

From time to time you, like myself, have gotten into a situation where your junk box just did not have the right parts needed to build a project. You found yourself needing some critical components not immediately available from the parts store—or maybe it's 9:00 pm, Sunday night.

Well, this is a story about such a situation which I wish to share with you.

One evening, while working on a new ATV transmitter, I had a requirement for a good regulated power supply. A look into my junk box revealed a shortage of positive-reference regulators.

Again, one of Edsel Murphy's laws prevailed: "If working on a new design, the most critical part will be missing." (Well, if that isn't one of Murphy's laws, it sure is one of mine.) Staring into the junk box, I recognized some LM-337 regulators. This regulator is a negative-reference voltage device, but did this matter?

I walked over to the blackboard and quickly drew a schematic of a negative-regulated supply (Fig. 1). It became obvious that there was no reason not to use it. I located the other components needed for this power supply—which I was planning to make adjustable to 13.5 volts—and laid out a breadboard.

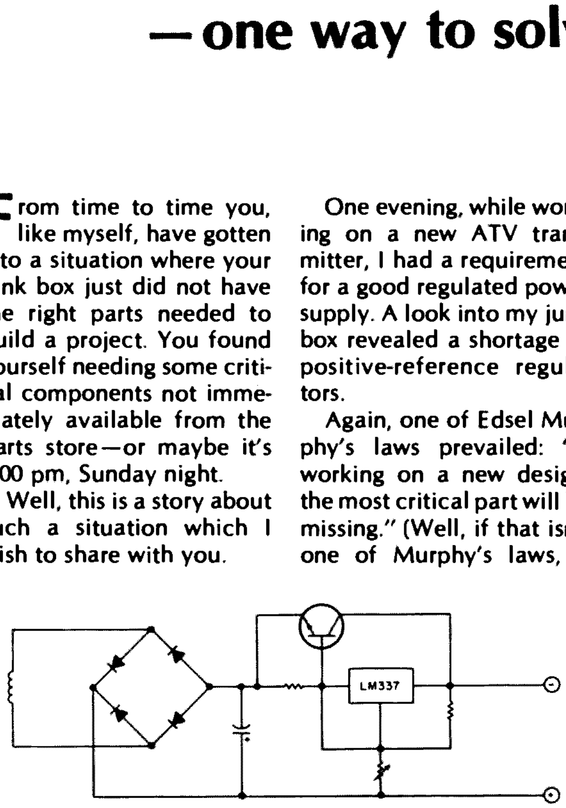


Fig. 1.

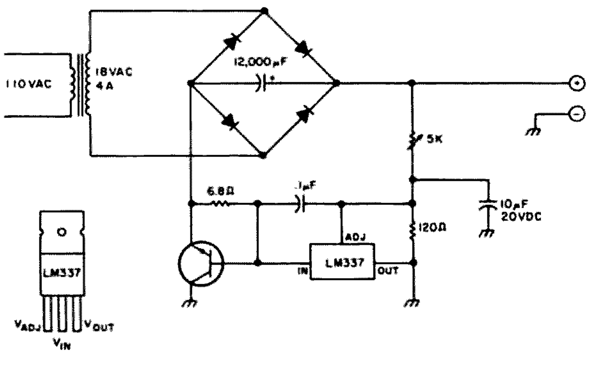


Fig. 2.

While working on the breadboard, certain benefits of this type of design suddenly became evident. Notice in the schematic that I have utilized collector feedback for good regulation. (Of course, this required a more available NPN transistor, as least as far as my junk box is concerned.) Now that is the first plus. The second plus in this design is the fact that we can ground to the chassis the collector of the pass transistor (Fig. 2). Plus number three: using a TO-3 package allowed me to eliminate any need for isolating the case of the pass transistor as is required by every other supply.

Wouldn't you think, with all these pluses, that although this supply uses a negative regulator it should come out plus? Hi!

In previous designs (see "More Power to You," *73*, August, 1979), I discussed details of regulated supplies, current limit, regulators, crowbar circuits, etc. I wish to keep this design simple and very basic. With that in mind, let's examine it briefly.

The transformer is an 18-V, 4-Amp unit purchased at Radio Shack (PN 273-1514). Referring to Fig. 3, we can see the calculations to the rectifier assembly. This rectifier bridge is from Radio Shack (PN 276-1171) and has a rating of 100 piv at 4 Amps.

A good rule of thumb for the filter capacitor is approximately 3000 uF per Amp. With this 4-Amp supply, I paralleled four 3300-uF units from my junk box.

Referring to Fig. 4, we can calculate the dissipation of the pass transistor to determine the proper heat-sink rating. Starting with a dc level of 25 volts from the unregulated supply and a regulated output of 13.5 V,

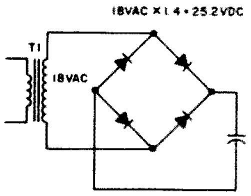


Fig. 3. Full-wave bridge, filtered and unregulated.

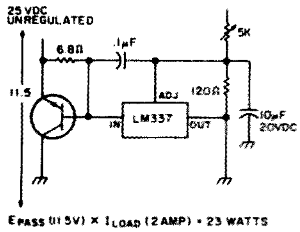


Fig. 4.

the difference voltage across the pass transistor will be 11.5 V. The product of the difference voltage and the load current will be the power dissipation, in Watts, by the power transistor. For example, 11.5 V × 2 Amps (load current) equals 23 Watts of heat in the transistor. With this in mind, I would recommend a 100-Watt power transistor like Radio Shack's PN 276-2039. A companion heat sink could be the Radio Shack Universal (PN 276-1361).

The remaining parts are not magic. Any ½-Watt resistor can be used for the regulator bias. Due to the fact that the supply was designed for 4 Amps, the LM-337 requires a heat sink to handle about 3 Watts (Radio Shack PN 276-1363).

The only cautions to be exercised to keep the 3-lead regulator stable are lead length, wire routing, and grounding. Ground loops and stray current paths can cause stability problems resulting in the regulator not functioning under load, so lay out your package carefully.

Edsel Murphy may have the corner on the unusual-situation market, but I have the first on a negative coming out positive! ■

✓See List of Advertisers on page 162

FUN!

John Edwards KI2U
78-56 86th Street
Glendale NY 11385

As the year draws to a close, our thoughts return home. The holiday season arrives, and one longs to be with family.

Well, it may not be family in the traditional sense, but "home" for the FUN! column is *73 Magazine*. This month, we take an affectionate look at the old homestead and contemplate, with some curiosity, what our hobby would be like without it.

ELEMENT 1—CROSSWORD PUZZLE (Illustration 1)

Across

1 *73*'s QTH
8 Pakistan prefix
9 Norway prefix
10 RTTY: ______cal
11 *73*'s digital section
12 KP4-land (abbr.)
13 Morse or ASCII
14 Contest columnist
15 Sweden prefix
16 *73*'s is 21
17 Test letters
18 A clear band space
19 Deface
21 An ARRL section (abbr.)
22 Cover artist: issues #1 and 250
24 Cell type
25 A *73* article, before published (abbr.)
26 K2AGZ
27 Mr. FUN! (abbr.)
29 Bolivia prefix
31 Poland prefix
33 Monthly feature (2 words)

Down

1 Belonging to "Looking West" columnist
2 When W2NSD/1 ________, hams listen
3 Iran prefix
4 *73*'s original QTH
5 *73* helped pioneer these machines
6 *Bonne chance*, on CW
7 *73* used to track him
11 Component
14 Former column (3 words)
20 Costa Rica prefix
22 Every pot has one—most repeaters, too
23 Say die?
28 Mexico prefix
29 Civil defense (abbr.)
30 Popular bootleg prefix
32 Postscript

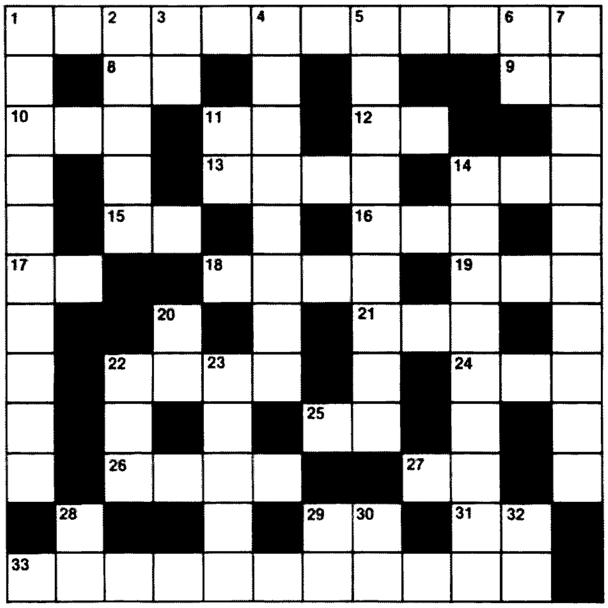


Illustration 1.

ELEMENT 2—MULTIPLE CHOICE

1) During this publication's early days, Wayne Green would often extol the virtues of his favorite car. It was:
   1. a 1912 Buick
   2. a Porsche
   3. a Volvo
   4. a Fiat

2) When this column first appeared, in October, 1980, it was written by WB2IBE. Whatever happened to him?
   1. He quit to write a similar column for *Creative Computing*
   2. He died
   3. He retired
   4. He upgraded and changed his call to KI2U

3) What was *73*'s original cover price?
   1. 37¢
   2. 73¢
   3. 75¢
   4. 88¢

4) How much did a life subscription cost in December, 1961?
   1. $30
   2. $50
   3. $75
   4. $100

5) Which person listed below has *not* been a DX columnist for *73*?
   1. James Cain K1TN
   2. Floyd Vivino WA2DCS
   3. Chuck Stuart N5KC
   4. Yuri Blanarovich VE3BMV

ELEMENT 3—TRUE-FALSE

	True	False
1) During this magazine's first two years, it was printed on green paper to differentiate it from the competition.	____	____

A	A	P	R	O	P	A	G	A	T	I	O	N	H	A
S	M	T	T	O	F	F	C	O	R	U	S	H	E	L
S	V	S	K	R	E	H	L	L	H	I	N	G	B	E
O	I	H	A	T	A	F	S	U	T	T	H	E	W	T
C	N	S	I	T	I	G	D	O	R	I	D	S	B	T
I	O	D	S	Y	S	S	R	O	V	L	L	I	K	E
A	C	F	E	L	J	E	A	I	G	G	F	A	T	R
L	F	C	W	O	B	T	W	E	S	T	G	G	O	S
E	E	W	O	O	I	B	A	G	E	Y	W	B	T	W
V	T	R	O	P	E	R	R	E	N	A	H	A	K	O
E	R	B	H	I	D	L	W	J	A	I	W	P	T	M
N	Y	J	P	L	E	H	M	A	H	W	K	O	M	J
T	A	Z	K	A	D	F	T	W	O	M	H	O	O	W
S	A	A	I	J	E	M	T	R	O	P	E	R	O	I
B	S	U	C	X	M	N	K	I	N	G	M	Y	D	L

Illustration 2.

2) From 1965 to 1971, the *Cigar Smoker's Journal* was a *73* publication. ______ ______
3) Wayne Green once edited *CQ Magazine*. ______ ______
4) The ARRL had a full-page ad in *73*'s first issue. ______ ______
5) A *73* FUN! editor once campaigned for ARRL office by handing out promotional rolling paper. ______ ______
6) *73* is available in microfilm from University Microfilm, Ann Arbor, Michigan. ______ ______
7) While this year's "FUN! Poll" counted 612 ballots, the actual response was closer to 1,000. ______ ______
8) "RTTY Loop" made its *73* debut in the June, 1977, issue. ______ ______
9) The first item ever described in *73*'s "New Products" section was an Allied catalog. ______ ______
10) Wayne Green, in addition to his many other responsibilities, is also the mayor of Peterborough, New Hampshire. ______ ______
11) YA1NSD was Wayne's callsign in Afghanistan. ______ ______
12) *73* also publishes *HR Report*. ______ ______
13) The ARRL subscribes to *73*. ______ ______
14) Mickey Mouse once appeared on *73*'s cover. ______ ______
15) In 1976, *73* published 13 issues. ______ ______
16) Someone once wrote to "Ham Help" asking for assistance in building a particle beam. ______ ______
17) A 1980 *73* profile of Dick Bash opened with the quote, "Morality? Man, who am I to judge morality?" ______ ______
18) Before this *73*, there were others. ______ ______
19) "*73* ON-THE-AIR" is the name of *73*'s monthly cable TV program. ______ ______
20) A *73* columnist was once interviewed by Johnny Carson on the "Tonight Show." ______ ______

ELEMENT 4—FILL IN THE BLANKS

1) You are reading issue #____ (no peeking).
2) Along with "Never Say Die," the other three original *73* features still being run are __________, __________, and __________.
3) "Well . . . I Can _______, Can't I?"
4) "ARRL: Love it, Hate it, _____ _____."
5) As editor of *Astounding Science Fiction*, he gave sci fi writers such as Isaac Asimov and Robert Heinlein their first national exposure. Later, he wrote an article for the first issue of *73* and was listed as a contributing editor. His name was _____ _______.

ELEMENT 5—HIDDEN WORDS
(Illustration 2)

Hidden in this puzzle are the name of ten past and present *73* features. The words are formed in any direction—horizontally, vertically, or diagonally, forwards or backwards. As you find each word, circle it.

THE ANSWERS

Element 1:
See Illustration 1A.

Element 2:
1)—2. Fun, if you can afford it.
2)—4. A truly remarkable fellow.
3)—1. Imagine a time when 73¢ was too much to charge for a magazine!
4)—1. Wayne told you it was a great deal.
5)—2. But he's available.

Element 3:

1)—False	Come on!
2)—False	Hardly.
3)—True	And it hasn't been the same publication since.
4)—False	Would you believe a classified?
5)—True	It seemed like a good idea at the time—but I lost.
6)—True	Yeah, but I have to squint to read it.
7)—True	Next time, I'll wait longer before counting.
8)—True	And it's still going strong.
9)—True	To the delight of amateurs everywhere.
10)—False	At least I think not.
11)—True	Not recently.
12)—False	Right state, wrong company.
13)—True	Of course. My *73* issue #1, by the way, is stamped: "Received: ARRL HQ." I got it this year at a local flea market. A real collector's item, no?
14)—True	September, 1977, being printed on a Teletype.
15)—True	The usual 12, plus a special year-end "Holiday" issue.
16)—False	If this one were true, OSCAR might be in trouble.

P	E	T	E	R	B	O	R	O	U	G	H
A	■	A	P	■	R	■	E	■	■	L	A
S	E	L	■	I	O	■	P	R	■	■	M
T	■	K	■	C	O	D	E	■	B	O	B
E	■	S	M	■	K	■	A	G	E	■	U
R	Y	■	■	S	L	O	T	■	M	A	R
N	■	■	T	■	Y	■	E	N	Y	■	G
A	■	L	I	N	N	■	R	■	G	E	L
K	■	I	■	E	■	M	S	■	U	■	A
S	■	D	A	V	E	■	■	J	E	■	R
■	X	■	■	E	■	C	P	■	S	P	■
N	E	W	P	R	O	D	U	C	T	S	■

Illustration 1A.

A	A	P	R	O	P	A	G	A	T	I	O	N	H	A
S	M	T	T	O	F	F	C	O	R	U	S	H	E	L
S	V	S	K	R	E	H	L	L	H	I	N	G	B	E
O	I	H	A	T	A	F	S	U	T	T	H	E	W	T
C	N	S	I	T	I	G	D	O	R	I	D	S	B	T
I	O	D	S	Y	S	S	R	O	V	L	L	I	K	E
A	C	F	E	L	J	E	A	I	G	G	F	A	T	R
L	F	C	W	O	B	T	W	E	S	T	G	G	O	S
E	E	W	O	O	I	B	A	G	E	Y	W	B	T	W
V	T	R	O	P	E	R	R	E	N	A	H	A	K	O
E	R	B	H	I	D	L	W	J	A	I	W	P	T	M
N	Y	J	P	L	E	H	M	A	H	W	K	O	M	J
T	A	Z	K	A	D	F	T	W	O	M	H	O	O	W
S	A	A	I	J	E	M	T	R	O	P	E	R	O	I
B	S	U	C	X	M	N	K	I	N	G	M	Y	D	L

Illustration 2A.

17)—True Morality? Man, I just take the cash and run.
18)—True As you may have guessed, *73* was a popular title for various club newsletters and other ham publications. The 1960 *73* stuck.
19)—False *73*'s Tuesday night skeds.
20)—True Johnny and I chatted back in 1969.

Element 4:
1)—255; 2)—Propagation, Letters, New Products; 3)—Dream; 4)—Don't care; 5)—John Campbell.

Element 5:
See Illustration 2A.

SCORING

Element 1:
Twenty points for the completed puzzle, or 1/2 point for each question correctly answered.

Element 2:
Four points for each correct answer.

Element 3:
One point for each correct answer.

Element 4:
Four points for each blank filled.

Element 5:
Two points for each word found.

Think you know this magazine?

1-20 points "*73 Magazine*? Oh, is that what I'm reading?"
21-40 points Once wrote a letter to Wayne complaining about a misleading question in the FUN! column.
41-60 points Bums issues off of friends.
61-80 points is an ardent subscriber.
81-100+ points Has memorized the yearly indices.

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

KOREAN AMATEUR RADIO LEAGUE AWARDS

This week I was the happy recipient of a very nice letter from the Korean Amateur Radio League. Two very attractive awards were among the material received and it's my honor to share the KARL AWARDS with you now.

AKA, the Worked All Korean Prefix Award, is issued to amateurs and shortwave listening stations worldwide on payment of a fee of 5 IRCs and an award application.

Each claim must be accompanied by a list of Korean prefixes worked in prefix order. Each list must be accompanied by a signed verification of two amateurs that the applicant has confirmation of each contact in his or her possession at the time of application. Please *do not* send QSL cards; the verified list will suffice.

Cards dated on or after January 1, 1959, will qualify. Contacts made from any location within your call area are eligible. Contacts with HL9 stations will be graciously accepted.

All correspondence should be sent to Awards Manager, Korean Amateur Radio League, CPO Box 162, Seoul Central, Korea.

The HM Award, formerly known as HMA, has identical application requirements, with the exception that the award is issued for total HM/HL QSOs worked in any one of five Award Classes. The following classes apply: Class K, O, R, E, and A. Spelling out the country's name, the classes require 5, 10, 20, 30, and 50 QSOs respectively to qualify.

When applying for either of these classic Asian awards, tell our friends in the "land of morning calm" that you read about it in *73 Magazine!*

BULGARIAN 1300 AWARD

The Bulgarian Federation of Radio Amateurs introduces the award, Bulgaria—1300, to commemorate the 1300th anniversary of the foundation of the Bulgarian State, in 681 AD.

This award will be issued to licensed radio amateurs throughout the world having the necessary score for established two-way radio contacts with Bulgarian amateurs. To be eligible, all contacts must be made in the period January 1, 1980, through December 31, 1981. This gives our readers only a month, so you'd better hurry and work a few contests before the deadline!

The award is available in three categories: Class 1—requires 1300 QSO points; Class 2—requires 1000 QSO points; Class 3—requires 500 QSO points.

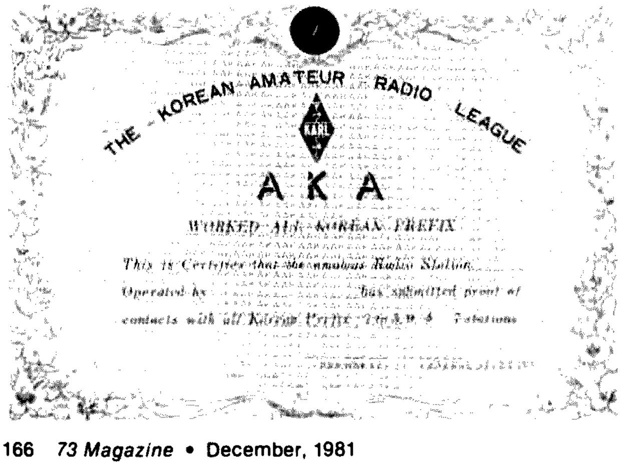
QSO points are earned as follows: 30 points for QSOs with any Bulgarian amateur located in the capitals of Bulgaria working with the prefixes LZ13. These are LZ13C (Sofia, The Central Radio Club); LZ13CSF (Sofia); LZ13CPL (Pliska); LZ13CPR (Preslav), and LZ13CWT (Veliko Tirnovo). Five (5) QSO points are earned for contact with any other LZ station irrespective of his or her callsign.

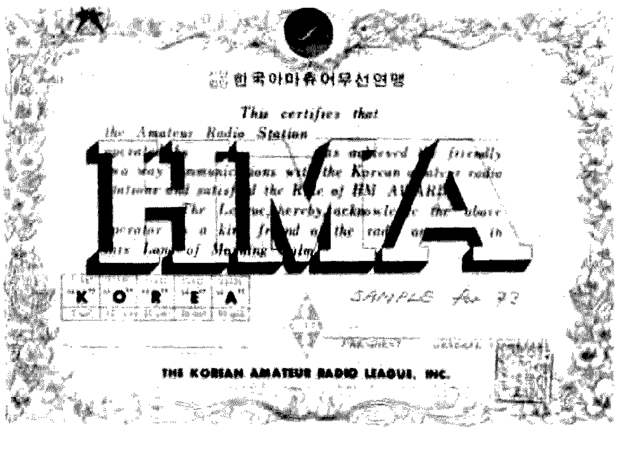
Regardless of operating mode, contacts may be made once per hand. The award is issued free of charge and the only requirements of major concern are that your contacts should be listed in prefix order, and the list be verified by at least two fellow amateurs.

Applicants may apply for this award any time up to December 31, 1982. Remember, however, that all contacts must be made *before December 31, 1981*, to be valid. Send your application to: P.R. of Bulgaria, Sofia 1000, PO Box 830, Bulgaria.

WORKED LA3FL/MM AWARD

The three radio officers aboard the *Royal Viking Sea*, a Norwegian ship which cruises





LA3FL/MM

all over the world, are offering free the Worked LA3FL/MM Award.

Applicants *must* work the station on CW in four different bands, minimum of 539 RST. A QSL card must be sent for each band to the LA bureau or to Per A. Mikalsen, Chief Radio Officer, *Royal Viking Sea*, Ruseløkkveien 14, Oslo, Norway.

ROYAL VIKING SEA

ROYAL VIKING LINE

WORKED **LA3FL/MM** AWARD

ISSUED FOR 4-BAND QSO

CERTIFICATE NR.——

THIS CERTIFIES THAT: ————————

———————— OF ————————

HAS MANAGED THE EXTRAORDINARY AND OUTSTANDING ACHIEVEMENT OF ESTABLISHING TWO-WAY CW CONTACT ON 4 AMATEUR RADIO BANDS WITH THE NORWEGIAN LUXURY CRUISE LINER

M/S ROYAL VIKING SEA

SAILING THE SEVEN SEAS

THE CONTACTS WERE MADE AS FOLLOWS:

DATE	BAND	QTH	LOCATION
1. ————	———— MHZ	————	————
2. ————	———— MHZ	————	————
3. ————	———— MHZ	————	————
4. ————	———— MHZ	————	————

VERIFIED AND DATED AT SEA: ————————

73, ———————— AWARD CUSTODIAN

PER A. MIKALSEN, LA3FL

CHIEF R/O

M/S ROYAL VIKING SEA

FESSENDEN'S 75TH

During the week of Christmas, 1981, AA1A will be operating most HF SSB phone bands to commemorate the 75th anniversary of the experiments by Reginald Fessenden, who made two-way contacts with Scotland as well as the famous Christmas Eve voice broadcasts. Fessenden also was responsible for many radio firsts as well as many innovations such as the heterodyne principle and high frequency alternators. He later was the developer of sonar.

Special QSLs will be sent out with more information to those who work us. We will be operating near the lower edge of the General class bands.

Two books are available for those interested in a famous early radio experimenter: *Fessenden, Builder of Tomorrows*, by Helen M. Fessenden, and *Radio's First Voice*, by Ormond Raby.

BETHLEHEM, INDIANA, CHRISTMAS EXPEDITION

The Clark County ARC, Jeffersonville, Indiana, will operate from Bethlehem, Indiana, from 1700 UTC, December 12 to 1700 UTC, December 13. Operating frequencies for W9WWI/9 will be 3.905, 7.240, 14.290, 21.365 MHz on SSB as propagation permits. The N9RM 146.25/.85 repeater will be used for local contacts.

A special 8½" × 11" Christmas season certificate imprinted with the unique Bethlehem postal hand stamps will be sent to all stations who QSL. Please QSL with a large SASE to Clark County ARC, PO Box 532, Jeffersonville IN 47130.

BETHLEHEM, WEST VIRGINIA, EXPEDITIONS

The Triple States Radio Amateur Club will operate from Bethlehem, West Virginia, from December 17 to December 21, from 1400 to 2300 UTC daily. Operating frequencies for WD8DDL/8 will be 7.275, 14.325, 21.425, and 28.550 MHz on SSB, and 7.110, 14.075, 21.110, and 28.110 MHz on CW.

A special holiday-season card will be sent to all contacts. Send an SASE to TSRAC, 26 Maple Lane, Bethlehem, Wheeling WV 26003.

BIG SKY WORKED ALL COUNTIES AWARD

Recently, the Lower Yellowstone Amateur Radio Club of the Sidney/Glendive area of Montana decided to sponsor a Montana Counties Award. The certificate was the idea of WB7UTJ and N7BMR.

To qualify for this award, any licensed amateur must contact and have received a QSL for all 56 counties in Montana on any band or mode of operation. Repeater contacts will not be acceptable, and all QSOs to be valid must have taken place on or after January 1, 1980.

To apply for the award, have your list verified by two other amateurs and send an award fee of one dollar (US funds) and two first-class stamps to either WB7UTJ or N7BMR.

The Kauai Amateur Radio Club is pleased to announce the establishment of five awards which are now available to amateurs worldwide.

WORKED KAUAI AWARD

The WK Award requires all contacts be made January 1, 1980, or later on any band or mode of operation. For applicants in all 50 states and Canada, five KARC member stations must be worked. DX stations need only three contacts with KARC members. General certification rules apply.

WORKED HAWAII AWARD

The WH Award has the same requirements of the WK Award

except that for US and Canadian amateurs 50 Hawaiian contacts must be logged, five of which must be KARC members. For DX stations, 15 Hawaiian stations must be worked and one must be a KARC member.

WORKED HAWAIIAN ISLANDS AWARD

To qualify for the WHI Award, five Hawaiian stations must be worked on the following Hawaiian Islands: Hawaii, Kauai, Maui, and Oahu.

WORKED ALL HAWAIIAN ISLANDS

The WAHI Award requires the applicant to work a minimum of one station on each of the following islands: Hawaii, Kahoolawe, Kauai, Lanai, Molokai, Maui, Niihau, and Oahu.

WORKED ALL HAWAIIAN COUNTIES AWARD

There are a total of five (5) counties in the state of Hawaii. To qualify for the WAHC Award, one Hawaiian station must be worked in the counties of Hawaii, Honolulu, Kalawao, Kauai, and Maui.

Be sure to enclose $1.00 for each award being applied for the help defray costs incurred in maintaining this program series. All correspondence should be directed to the Awards Manager, KARC, PO Box 548, Kalaheo HI 96741.

SANTA CLAUS, INDIANA

The Pike County Amateur Radio Club of Winslow, Indiana, and the Old Post Amateur Radio Society of Vincennes, Indiana, will operate a special events station from Santa Claus, Indiana.

The callsign will be W9CZH, and the dates, December 4, 5, and 6. Starting time is 0000Z on the 4th, continuing on through to 2300Z on the 6th. Frequencies (plus or minus QRM): 21.410, 14.305, 7.270, and 3.925 SSB, 14.090-14.100 RTTY, and 146.52 FM.

A special QSL/Xmas card postmarked from the Santa Claus post office will be sent upon receipt of an SASE. Send to Santa Claus, PO Box 111, Ireland IN 47545.

MOUNT SAINT HELENS AWARD

Down the road a mere 180 miles sits majestic Mount St. Helens. We here in Washington remember the historic Sunday morning very well. Supported in the community by a Naval Air Station, we thought for sure bombing maneuvers were underway here on Whidbey Island. Instead, what we were hearing was the explosion and the awesome eruption of Mount St. Helens, a devastating act of nature which had happened some 14 minutes earlier (took this long for us to hear it at the speed of sound). By this time, radio announcers had already received the unfortunate news over the wire services, and aftershocks were being experienced which were to continue for weeks and months to come.

The amateurs throughout the area performed marvelously in the hours of desperation. It behooves all of us, sometime in our amateur careers, to contact amateurs from the region and listen to the story they have to tell!

A unique photographic award of the Mt. St. Helens eruption on May 18, 1980, is now available. Two opportunities, with no mode or band restrictions, are provided to qualify for this very popular award:

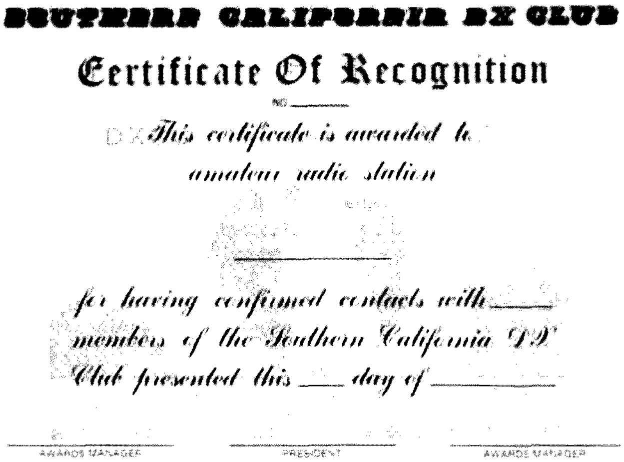
1) Contact 8 or more stations within the counties of Washington that surround Mount St. Helens (Clark, Cowlitz, Skamania, and Lewis counties). All contacts must be made on or after March 27, 1980, which was the actual first eruption of the mountain in over 123 years.

2) Report one contact with W7AIA (Clark County Amateur Radio Club) during its operation from 0200 UTC May 16 to 0200 May 18, 1981. That marked the first anniversary of the disastrous eruption that took the life of Reid Blackburn KA7AMF, who was a member of this sponsoring organization.

To apply for this award, send appropriate log information and $2.00 or more as a donation to the Reid Blackburn Scholarship Fund which has been established in memory of our dedicated friend and fellow amateur. Forward your application to Awards Manager, PO Box 1424, Vancouver WA 98668.

SOUTHERN CALIFORNIA DX CLUB AWARD

This week I received a very nice letter from Norm Friedman W6ORD, representing the Southern California DX Club, Incorporated. In his letter, Norm announced a Certificate of Recognition which is issued to amateurs throughout the world who can qualify.



Each applicant must work and confirm contact with 35 current members of the DX Club on any frequency from 1.8 to 30 MHz. This will qualify the applicant for the basic award. A bronze seal will be issued for 75 contacts, a silver seal for 100 contacts, and a gold seal will be presented for 125 contacts with Southern California DX Club members.

Verification of these contacts can be administered by any ARRL or IARU affiliated club. All contacts must be made on or after January 1, 1980, to be valid.

Send your list of contacts and $2.00 US funds or 10 IRCs to Norm Friedman W6ORD. For a current membership roster of the DX Club members, send an SASE and 2 IRCs to Norm and he will be sure a copy is rushed to your door.

CORRECTIONS

Figure 8 in "Folded Unipole for 160," on page 32 of the October issue, refers to an swr of "0". Such a value is impossible to obtain. The graph should have a low point of 1.0.

Also, the review of Kenwood's TR-9000, beginning on page 30 of the August issue, refers to measuring power over a range of 143.3 to 148.7 MHz. This should read: 143.9 to 148.7 MHz.

Tim Daniel N8RK
***73 Magazine* Staff**

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received two months prior to the month in which the event takes place.

FAIRBAULT MN
DEC 5

The Courage Center Handi-Ham System will hold its annual winter hamfest on Saturday, December 5, 1981, at the Eagles Club, Fairbault MN. There will be a flea market, a dinner at noon, a program, and prizes. For more information, contact Don Franz WØFIT, 1114 Frank Avenue, Albert Lea MN 56007.

HAZEL PARK MI
DEC 6

The 16th annual Hazel Park Amateur Radio Club Swap & Shop will be held on Sunday, December 6, 1981, at Hazel Park High School, Hughes Street at 9½ Mile Road, 1 mile east of I-75, Hazel Park MI. Tickets are $2.00 and tables are 75¢ per foot. Doors will open at 8:00 with the main prize drawing at 2:00 pm. There will be plenty of food and free parking, plus hourly door prizes. Grand prizes are included with the admission ticket. Talk-in on 146.52. For more information, send an SASE to Jack Field W8UPU, 1444 E. Evelyn, Hazel Park MI 48030.

SOUTH BEND IN
JAN 3

A hamfest swap and shop will be held on Sunday, January 3, 1982, at Century Center, downtown on US 33 one way north between the St. Joseph Bank Building and the river, South Bend IN. Tables are $3.00 each. There is a half acre of carpeted room in the same building as the industrial history museum. Talk-in on .52/.52, .99/.39, .93/.33, .78/.18, .69/.09, and 144.83/145.43. For more information, contact Wayne Werts K9IXU, 1889 Riverside Drive, South Bend IN 46616, or phone (219)-233-5307.

WEST ALLIS WI
JAN 9

The West Allis RAC will hold its 10th annual all-indoor Midwinter Swapfest on Saturday, January 9, 1982, beginning at 8:00 am at the Waukesha County Exposition Center. Advance tickets are $2.00 and tickets at the door are $3.00. Reserved 4-foot tables are $3.00, at the door, $2.00, and on the balcony, free. Included with the ticket will

be a 50¢ coupon toward a sandwich purchase. Prizes will be awarded. For more information, write 1982 Swapfest, PO Box 1072, Milwaukee WI 53201.

RICHMOND VA
JAN 10

The Richmond Amateur Telecommunications Society will hold its annual Frostfest on Sunday, January 10, 1982, from 8:00 am to 4:00 pm at the Virginia State Fairgrounds, Richmond VA. Admission is $3.00 plus a table charge for exhibitors and flea-market displays. Overnight trailer parking with complete hookups will be available at $7.00 per night. Various prizes will be given away during the day with three main prizes to be awarded at 3:00 pm. There will be approximately one acre of indoor heated and well-lighted space. Talk-in on 146.34/.94, 146.28/.88, and 146.52. For additional information, call Joe Stern W4LD at (804)-737-0333.

ARLINGTON HEIGHTS IL
FEB 7

The Wheaton Community Radio Amateurs will hold their annual hamfest on February 7, 1982, beginning at 8:00 am at the Arlington Park Race Track EXPO Center, Arlington Heights IL. Tickets are $3.00 at the entrance and $2.50 in advance. There will be free flea-market tables, expanded floor space, parking, awards, and a large commercial area, including the new computer section. Talk-in on 146.01/.61 and 146.94. For commercial info, call WB9TTE at (312)-766-1684; for general info, call WB9PWM at (312)-629-1427. For tickets, send an SASE to WCRA, PO Box QSL, Wheaton IL 60187.

LIVONIA MI
FEB 28

The Livonia Amateur Radio Club will hold its 12th annual LARC Swap 'n Shop on Sunday, February 28, 1982, from 8:00 am to 4:00 pm at Churchill High School, Livonia MI. There will be plenty of tables, door prizes, refreshments, and free parking. Talk-in on 146.52. Reserved table space of 12-foot minimum is available. For further information, send an SASE (4 × 9) to Neil Coffin WA8GWL, c/o Livonia Amateur Radio Club, PO Box 2111, Livonia MI 48151.

See List of Advertisers on page 162

DX

Yuri Blanarovich VE3BMV
Box 292
Don Mills
Ontario M3C 2S2
Canada

DX BULLETIN OF THE MONTH

As we have mentioned in the past, it is extremely helpful to subscribe to one of the bulletins in order to be in touch with what is happening out there in the DX jungle. To show what one of the better DX bulletins looks like, let's take a look at *The DX Bulletin.*

It's a weekly publication edited and published by Jim Cain K1TN, a well-known DXer, contester, and "well-cooked" ham. *TDXB* provides fresh and up-to-date information about DX activity, happenings that relate to DXing and contests, notes on equipment and conventions, records of stuff worked on the bands, QSL information, and notes on propagation. All in all, it's a very well-written publication. The subscription rates are $26 per year for W, VE, and XE (others: $35). The address is 306 Vernon Ave, Vernon CT 06066.

Well, Merry Christmas and Happy New Year! May you work all the new ones you still need!

WELL-COOKED OR INSTANT HAM?

During my summer vacations, thanks to the lousy rainy weather, I had the pleasure to visit a bunch of really nice hams on Long Island (NY). Among other things, I also had an opportunity to lay my hands on a Signal One CX11. What a machine! It's very tempting and makes you feel like mortgaging your house to get one.

The main thing I would like to highlight is the people—true hams—whom I had the pleasure to meet. What is the big deal about this?

What we are witnessing today is an influx of new "instant" hams who are the products of ham colleges which have all kinds of instant miraculous ways to get you legally on the ham bands and talking as soon as you can. Let's have a look at this group. Typically, they are an outgrowth of the CB generation in which, to get on the radio, all you had to do was pay your bucks and get the best (most expensive) radio, big "shoes," and a tower. Typically, too, they got fed up with all the regulations and quickly found that there were more frequencies around than those they were "forced" to be on. So here comes the vfo and 1- or even 10-kW amplifier. They start using their "freedom of speech" all over the bands, including commercial and amateur. They usually talk about nothing—and they can do that for quite a while.

Then comes the discovery that there are hams who can use vfo's and kilowatts legally and that things are more decent on the ham bands. You don't hear so many carriers. They get interested and some of them simply retune their rigs down there, pick a callsign, and you know the rest. Some go and take courses, "suffer" through the "nonsense," and finally manage to get their tickets. You can tell them from the crowd if you listen in the pileups: they usually call for five minutes without stopping.

Our compliments to those CBers who are basically law-abiding, got fed up with the mess around 27 MHz and then got genuinely interested in ham radio. They got their licenses and tried to learn as much as they could. They discovered a whole new world and enjoy learning more about all the aspects of radio communication: equipment, antennas, propagation, etc. They are a welcome contribution to the hobby.

If we look back a few years, when CB wasn't around, the situation was different. You usually started as an SWL or by seeing another ham's station. The process involved not only talking on the bands, but also a great amount of interest and activity in designing, building, and experimenting with equipment.

The DX Bulletin

ISSUE 106 SEPTEMBER 19, 1981

PROPAGATION: Sep 19, Below Normal; Sep 20, Low Normal; Sep 21, High/Low Normal; Sep 22, High/Above Normal; Sep 23, High/Low Normal; Sep 24, High Normal; Sep 25, High/Low Normal; Sep 26, 27, High Normal; Sep 28, High/Above Normal; Sep 29, High/Low Normal; Sep 30, High/Above Normal; Oct 1, High Normal; Oct 2, High/Low Normal; Oct 3, High Normal; Oct 4, 5, Above Normal. TNX N4XX.

A PIN DROPPED...

And you could hear it on 14225 last Saturday (Sep 12), even though it seemed the whole world was listening. "W7PHO, this is K7LAY/BY Shanghai, you're five by nine."

K7LAY/BY was a demonstration station in Shanghai by Bob Hudson and other members of the Boeing radio club; they were set up mainly to work a Chinese station in Bejing, which was signing "CIE." That contact lasted ten minutes, followed by the pre-arranged schedule with W7PHO and two other stations, including a club station in Washington state and a station on a Marianas chain island. It seemed that hundreds of DXers had heard of the planned schedule over the air and awaited the call from Hudson and his loaned TR-7 from Drake.

While some informal authorization for the transmissions had been obtained, it was realized that these contacts would not be counting for anybody's DXCC; that was not the idea. The idea was to make a further breakthrough toward real Chinese amateur operations in the future. Apparently in that respect the operation was a success. The station could be heard all over the U.S.

K1CC in POLAND

Rich Assarabowski, just back from Poland, reports the convention he attended near the SP9KRT club site in southern Poland was a success, with several hundred hams in attendance despite the increasingly desperate situation there. At the same time, the convention of the Solidarity Union was being held at the other end of the country, on the Baltic Sea coast.

Rich made about 2,000 contacts himself as SO3CC, from the home of SP3DOI, and operated a little fm on 2 Meters (simplex only, no SP repeaters yet). Despite mostly homebrew radios and severe TVI problems, among Poland's 7,000 hams (out of some 35 million citizens) amateur radio is alive and well. Rich's slide presentation dispelled a notion common in Europe that U.S. DXers are very loud due to running "big power." After seeing some of the tall towers and multi-element arrays several of the local DXers were heard planning new towers and quad antennas. Poles are also now getting interested in using their new privileges on RTTY and SSTV.

W9DXCC CONVENTION

Convention chairman K9KM reports about 150 attendees last weekend for this long-running event, down about ten percent from previous years. Special mention was made of the presentations by Dick Ehrhorn, W4ETO, of Alpha amplifiers, and by Dana Atchley, W1CF, who spoke on antennas for 80 and 160 Meters.

The DX HOG OF THE YEAR crown was placed on the deserving head of Al De Marre, K9RF, who was also awarded a special trophy dubbed the "Repeater Usage Award." The HOG is a fun award going back to the very beginning of the W9DXCC Convention.

ARRL was represented ably by Ron Search, W3AZD. While the meeting was marred by having only four representatives from Indiana (none from Indianapolis), Milwaukee looks like a growing DX hotspot, with many in attendance from that metropolitan area.

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OE2WL and OE1MXA have been very active on their Pacific operations, first /KH8 American Samoa, last week as ZK2TA Niue. They were slated to finish up there about Sep 15 and then operate from Tonga A35 or Tokelau ZM7 until the 21st. After that the last legs of the trip will include the Kiribatis and possibly Nauru. Their activity seems to have concentrated on CW and they have been workable easily on both 40 and 80 Meters.

DJ6SI started his African work on schedule from 5V7ML Sep 12 and was expected to appear from Volta as XT2AW Sep 16-18, then from the Cameroons TJ and finally his last two days Sep 21 and 22 from Gabon. He returns to Germany Sep 24. QSL to DK9KD for all.

Vince Thompson, K5VT, back in the States, says his 3V8VT operating was 20 Meters only due to antenna limitations, but he is hinting another stop in Tunisia may not be far off, and if so he will be prepared for all bands at that time.

Rumors concerning Albania now seem to center around EA5AK, who claims to have a license for ZA2HAM valid Dec 4-14 of this year. Other Spanish hams continue to be mentioned in connection with the effort.

Following their successful Juan de Nova operation, FR0FLO and F6IRP made a surprise appearance from Mayotte on their way home, signing FH0FLO; the operation seems to have run only a day or so.

A commemorative operation is planned from Hawaii's Pearl Harbor, to sign KH6SP Dec 4, 5, and 6.

ZD8TC is up to his ears in alligators on 160 Meters...Tom, whose technique is to call stations he hears on their frequency on Top band, finds that although East Coast U.S. stations are putting big signals into Ascension, they don't seem to hear him. Yet, when he does work someone he gets a good report. Perhaps those alligators have migrated down from 50 MHz; Tom also see some big signals are coming out of the States on 6 Meters, and he has been able to work a few of them.

he DXCC...it has been announced that ARRL's Headquarters Awards Committee will be setting a date (apparently a future rather than retroactive one) after which credit for single-mode awards will be given only for QSLs which clearly state "2-way QSO." As it takes several months for a formal announcement to appear in QST, a guess might be January 1, 1982 for the new rule.

That Bangladesh rumored for early this month may actually happen, but the dates are October 13-18, according to JA8CXE of the "JA8 DXGroup." They don't have a callsign yet. JH2HDK is the group leader, and will be accompanied by JA8MWU and several others, who will share operating chores on 80-10 Meters and possibly 50 MHz, CW and SSB.

Terry Baxter, N6CW, and friends will operate from Tortola, British Virgin Is., again this year for the CQ Phone Contest. This will be Terry's sixth straight effort from there (he is VP2VDM).

And St. Pierre will again be the destination of W8AH Oct 10-18, in the company of K8CJQ, W8HR, and W8NZJY. They will be on 80-10 Meters, no lists.

In Issue 107 mention was made of the ARRL Roanoke Convention later this month, and of a slide show on the 1980 PJ2CC CQ WW Phone Contest operation. That multi-multi operation was the 1980 top score but not an all-time record. That honor still belongs to the 1979 VP2KC multi-multi. Sorry.

What has happened to YI1BOO and LU3ZY on South Sandwich? Anyone know? No reports of either of these stations in some time. Many still need.

160 Meters is already getting very good in anticipation of the Winter DX season; VK and ZL stations have been coming through to the East Coast U.S. around 0400Z. At the same time, 10 Meters, at the other end of the spectrum, continues its stumbling act toward autumn propagation. For example, last weekend in the Worked All Europe 'test, 10 was excellent the first day but on Sunday only USSR stations had decent signals.

And as K5RC observed in a recent issue of the National Contest Journal, 160 is going to be very interesting this year with KWs allowed; now we will see who was playing fair in the past and who wasn't!

A number of inventions were made and hams contributed greatly to the art of communications. Quite often seemingly impossible things were done. This is the true nature of amateur radio—experimenting. These people appreciate the privilege of being able to communicate around the world and want to preserve and not to destroy it. They are self-policing and stick to the rules, regulations, and ethics. They are always gentlemen. They are not afraid to experiment.

This spirit is still alive and I had the pleasure to experience it during my visits while I was down in W-land. The "Old Ham" has some sort of home-brewed antenna, a scrounged tower, and good equipment which is quite often modified commercial or home-brewed. He is keeping up to date with technology and that gives him the edge in the pileup: His receiver has better selectivity and his antenna gives him an extra dB or two. This is what makes the Old Ham: experience and equipment. He hates lists because they are degrading the whole idea of the DX sport—chasing and nailing the DX.

It is a pleasure to meet such a bunch, because you can talk about all the aspects of ham radio and share your experiences. Among others, my hosts included Bob K2US, who is experimenting with antennas and decided to try one of the VE3BMV razor beams; Gary K2UU, who enjoys working on antennas, working DX and contests, and is involved with the big multi-multi station of K2GL (better known as N2AA); Ovie N2AJ, who is more technically-oriented; and Jack W2LZX, president of the LIDX Club and an old DX tiger. You can see that they can get excellent stations going by using their skills and experience when there is a lack of funds. In DXing, you can make up for the deficiencies in finances either by spending a little more time or by building and modifying equipment. A number of remarkable installations are around which rival some commercial radio stations. People such as K2GL, W2HCW, W2PV, KØRF, ABØI, and N5AU, to name a few, have stations which show a lot of work, love, and persistence. It is a sheer pleasure to talk to people like them. Because they love their hobby, these "well-cooked" hams work at it and enjoy it.

CHINA BREAKTHROUGH

The Boeing Employees Amateur Radio Society (BEARS) delegation arrived in the People's Republic of China on September 4, 1981, and departed on September 12. We were the first official international amateur radio delegation to visit China in more than 32 years. Our host was the Chinese Institute of Electronics, a branch of the 4th Ministry of Machine Building. The delegation members consisted of Pat West W7EA, Henry Oman K7HO, Bob Hudson K7LAY, and Bill Showers KC7CF.

Sponsors included Boeing and the Western Washington DX Club. Contributors to our expedition included the R.L. Drake Company, which supplied two complete TR7 stations, Telex/Hy-Gain, which supplied two dipole antennas, and the ARRL, which supplied a copy of the film "Wide World of Amateur Radio" and a few books.

Our delegation prepared and presented a four-hour slide presentation covering amateur radio in the USA. This presentation was made in each of the cities that we visited.

Although we did not expect to operate, we were permitted to set up a demonstration station in Beijing and communicate with our home city, Seattle. This historic event occurred at about ten pm, Beijing time, on September 6th. Our contact in Seattle, representing our two clubs, was W7PHO and our callsign in Beijing, also representing our two clubs, was K7LAY. We are very sorry that we could not talk to more stations.

The Chinese advised us that our transmissions were the first authorized amateur radio communication demonstration in more than 32 years—truly an historic event. This contact signifies the increasing friendship between our two nations.

A second historic event occurred on September 9th. With the assistance of our delegation in Shanghai, the Chinese in Beijing installed a Drake TR7 station and the Chinese in Shanghai also installed a Drake TR7 station. Successful communications were established between Beijing and Shanghai by Chinese operators, again for the first time in more than 32 years.

The operator in Beijing was Chen Ren-Mo, and the operator in Shanghai was Hsu Y.C. Mr.

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BANDPASS

AP2MB 14212 01E 11
A22GM 28530 16E 7
A22BB 28534 16E 7
A35JL 14285 07E 13
A71AA 14228 14C 7
A71AD 21280 18E 9
A71AD 28620 12E 13
A9XDO 28535 16E 12
BV2B 14215 11E 9
BV2A 14012 12W 9

CN2AQ 14040 06W 9
CN8EA 21313 23E 10
CO5DN 14022 02E 9
CR9AN 28576 14E 8
CT2AR 3790 07W 4
D4CBC 28608 16E 7
D4CBC 14210 02E 13
EA9JV 21015 22E 10
EI7CE 7005 07W 6
EL2F 14011 23E 10

EP2TT 28590 13E 10
FH8CO 14015 12C 6
FK8CK 14045 11C 7
FK8DR 14210 10E 11
FO8DP 14026 13C 4
FKØAD 14003 11E 11
FRØGOL 21035 20C 11
FWØHE 7010 10E 15
HFØPOL 14010 03W 10
HKØBKX 28010 15C 7

HKØBKX 14010 13W 9
HKØBKX 3505 03E 10
HL1CE 7010 11W 7
HL9IJ 21026 23C 8
HL1IJ 21027 01E 9
VK3GJ 21308 18C 8
HI1AB 21025 21C 10
HI1AB 14215 04E 10
JX5VAA 14245 03C 7
JX5VAA 21295 20E 9

JY9RV 28537 18C 7
J28CI 21035 14C 9
AH2L 7007 10W 5
AH2L 28720 22C 4
AH2L 14015 12E 7
AH3AA 21040 06W 8
AH8AA 14240 10E 12
KH3AB 28015 00E 8
KHØAC 21345 00E 7
KS6DV 14220 09E 9

K6HR/KH8 28530 22E 10
OD5QB 21288 22C 6
OD5LX 14030 02E 9
EI4EJ/OD5 14224 23E 10
OD5LX 14003 02E 11
OY9R 21315 20E 9
P29EJ 14007 12E 7
P29DI 14212 09E 8
DF9FM/ST3 28016 19E 5
SVØBF 14210 04E 10

KA1NSO/BV9 21275 19E 10
S79MC 21285 18E 8
TA1MD 14208 00E 7
TA2ES 14235 22E 8
TA1MD 14010 00E 10
TF3YH 21025 16C 7
TF3YH 21300 17E 10
TL8WN 28560 21C 7
TL8JM 28557 00C 8
TU2JJ 14202 05W 6

TU2DP 28400 15C 6
TU2HJ 14210 03E 7
TU2HJ 24600 10E 10
T3ØAT 14020 06W 9
T3ØDB 14265 07E 11
T5TI 21300 20E 5
T5TI 21290 19E 6
T5TI 21290 20E 9
UM8MAX 14020 01C 10
UK1PGO 21018 13C 7

UK1PGO 21290 15E 7
DA1PAM 14030 06W 9
UK1PGO 14025 05W 9
VK2AGT 14217 13C 5
VK2AGT 14220 13E 8
VK2AGT 14210 12E 13
VK9ZG 14270 12E 13
VP8AEN 14202 09C 6
(S. Georgia)
VP8AEN 14255 10E 11

VP8QP 21327 00E 7
(Falklands)
VR6TC 21350 01E 9
VS6CT 21340 01C 9
ZE9A 14225 15C 7
ZE9A 21375 17C 7
ZE5A 14222 12E 8
YC3BEX 21230 16E 10
YJ8BG 14235 10E 10
YJ8BG 14235 07E 13

HB9ASJ/ZB2 7013 04C 7
ZE1BG 21290 20E 11
ZK1CG 14225 10E 5
ZK1CG 28530 23C 4
ZK1CG 14210 10E 14
ZK2TA 7005 10E 15
3A2GL 21325 22C 7
3B8DB 14025 12C 7
3B8DA 14030 12C 10
3B8AX/3B9 14204 03E 11

3D6BE 14211 14C 7
3D6AX 14008 13E 7
4S7MX 14220 12E 8
4S7EC 14010 13E 11
4U1UN 28450 14E 13
4Z4DX 3501 03E 10
4Z4DX 7005 02E 10
5NØKUY 21280 22C 7
5V7HL 14025 02C 12
5W1DO 21295 04E 9

5Z4RL 21272 11E 11
KA1CFQ/4W8 28570 18E 7
7Q7LW 21290 19C 8
7Q7LW 21280 20E 10
7X5AB 28594 13E 7
8Q7AV 14215 11E 8
KA3BUJ/8R1 7008 04C 7
KA3BUJ/8R1 21025 11C 11
9J2BO 14030 13E 11
9K2DR 28530 11E 13

9L1CA 28540 15E 7
9M2GD 14215 14E 7
9M2CW 14208 11E 9
9M2NM 14250 11E 10
9M2ØGD 14215 11E 13
9M2ØGD 21274 12E 13
9M8PW 7003 12W 11
9Q5FL 28420 15E 5
9Q5FL 28820 17C 7
9V1TL 28827 11C 4

9V1OQ 14220 11E 5
9V1TL 14034 10E 10
9V1OY 14225 11E 13
9X5MP 21405 19C 7
9X5DR 14210 23E 10

W1, W2, W3: mail your reports by Saturday.

All others: mail your reports by Friday.

TDXB: 203-871-6251

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Convention	EXPO 81	Atlanta, Sep 19/20; I 103, 104, 107
Tonga or Niue		Sep 13-21 by OK ops; I 107, 108
Kiribati or Nauru		Sep 22-30 by OK ops; I 107, 108
Belize	VP1	Pfx change Sep 21; I 107
Jersey	GJ5	Sep 19-25 by German ops
Cayman Is	ZF2CZ/DQ	Thru Sep 25 by WA3s UPI, IZR
Bermuda	K1BPI/VP9	Sep 26-Oct 3, 80-10 CW/SSB
Convention	ARRL	Roanoke, Sep 26/27; I 107
Juan Fernandez	WB1GOQ/CE0	End of Sep; I 105, 107
Deadline	DXCC	For annual list, Sept 30
San Felix	CE0X	By WB1GOQ group first of Oct
Kiribati	T3	Again possible by OK ops; I 107, 108
Laccadives	VU7	Rumors fading for an October op'n
Convention	Houston	Oct 2-4; I 103
Convention	ARRL	Midwest, Salina, KS, Oct 3/4; I 107
Bangladesh	S2	By JAs, Oct 13-18; I 108
St Pierre	FP0	By W8AH group Oct 10-18
Crozet	FB8WG	Rumored for Nov; I 106

CONTRIBUTORS

W1DQH, K1XM, NØVX, KA1KD, N4VQ, KB1F, KA1LY, KA3K, WB1CC, WA1TPR, W3ODJ, K9HM, K9KM, K6IR, WA6YZF, W5DV, NG4S, WD5AAM, W7YF, W1VV, KB1F, WØTBY, NB8KB, KP4BQP, WB0OQV, VE1BHM, WA7OMB, NA2MMA, AD8J, WB8W, WB8ZRL, WA1JGK, WB0CZK, W5ODD, W2HAZ, KE1NI, W8AH, N8CW, KH6BZF, JA8CRE, KA3CMB, KF8K, KB2CV, K1CC, N4KY, K1HV, KH6BZF, N4NW, W3FU, Nelab Snorkle.

THANK YOU!

QSL ROUTES (CALL/MANAGER)

A22YV/JA2KLT	FR7BP/J/FRØFLO	KH6BI/W5RU	TR8GDG/W5RU	ZD8TC/N2CW
A22ZM/ZS6CU	FR7CB/DF2OU	KP2A/AF2C	TU4BA/W2TK	ZD8VO/KAVO
A6XJA/PAØLP	FWØBE/DJ9ZB	KP4A/DJ9ZB	TYA11/WA4FRU	ZF2AV/WBØIBW
A71AU/A7XD	HBØALO/HB9ALO	KP4AM/W7PHO	T3ØAT/G3XZF	ZF2DZ/WX3CPR
A9XDO/KA4S	HBØAQW/HB9AQW	KP4ID/KP4AM	T3ØDB/G8LGB	ZF2FF/WB3JWJ
CE0AA/CE3AA	HC8KA/HC5KA	KH6AY/KØVXU	T5TI/I8SSW	ZK1BD/ZL1SZ
CEØAC/CE3YY	HFØPOL/SP5EXZ	KX6LO/KX6BU	UK1PGO/UK3SAB	ZK2TA/OE2DYL
CR9JA/JA1UT	HH0N/WD4JHS	HP4A/W3HNK	VE1AMS/W3HNK	ZP5ZJB/JA1ODP
CSØCJC/CT4SU	HL9FR/WB9RGA	W1DV/WA2NKB	VE6SI/VE3PET	ZS5SF/WD4INV
C31LM/EA3BGW	HH1PW/W3GMB	WA4NAT/DJØUN	VP2LGR/W5RU	3B8AE/3B8CF
C31HN/PAØGIN	HF1EEK/DL1HH	WD4CEM/W5RU	VP2MIX/WØLJS	3C1BM/EA1QF
C31TE/EA3VM	05AK/WB2ULI	WB4AAA/W5RU	VP2MOM/AA7O	3V8VT/K5VT
C31UM/EA3BNM	JW4NT/LA6NT	WD5FTP/WB5ZAM	VP2MOM/KL7IHF	3X1Z/W4FRU
C5ACC/W4NGR	JW7XB/LA7XB	WD6ICB/WB6FSN	VP2VJ/VE3MJ	4N1R/YU1DZ
C5ACO/W2TK	JWØBS/LAØBS	OD5RZ/VE5QY	VP5FF/WB4OBN	4S7MX/SM3CXS
C5AK/G3LQF	JX5VAA/LA7JO	OK1KTA/OE2DYL	VP8AJL/GM3ITN	4Z4AB/K3STM
DL2VK/DF9FM	JY9RV/GW3RVG	OE2VEL/OE2DYL	VQ9JJ/W5RU	5B4KU/SM5ASE
EA8RV/K5NHZ	J3AB/W2GHK	OHØAM/OH2BH	VQ9FD/W1NSP	5R8AL/JA2KLT
EL2F/WD9DUF	J6LCV/WD4NBX	OHØBA/OH2BAZ	VQ9QA/N3QA	5T5DZ/W2TK
EL5G/K3RB	J87BK/WBPSD	OT8EH/W5RU	VS5MF/N2DO	5T5ZZ/W4FRU
FØARY/FC/OLAFF	J87BT/WBPSD	SM3ALE/SM2OLZ	VS6CT/KB9N	5W1DG/VK9NS
FB8YH/F3KR	J87RS/WB8KF	SU3CC/K1CC	VU2DOR/W5RU	5W1DK/VK9NS
FCØGQQ/DJ6ZB	J87WW/WBWW	ST0AS/DK2OC	VU2KM/N7UT	5W1DO/OE2DYL
FG7TD/W5RU	J88AG/NØAFW	SVØAA/5/DJØUN	XE2GDD/KN5H	5Z4NQ/WD9CIV
FK8CE/K2BOR	J88AQ/W2HIQ	S79MC/4K3F	YB8AKG/WA2JOC	6W8JO/W2TK
FK8CL/DJ9ZK	AH4AA/W5RU	S9VCT/K5VT	YB9AAT/W7KQH	7P8BZ/K5VT
FK8DH/DJ9ZB	AH8AA/W4FGX	TA7MM/TA1KD	YB9VA/W5GZI	8P6OR/K5NHZ
FK8DJ/DJ9ZB	KA2MZB/WB5WLH	TJ1BB/AF4B	YBØACP/K6DLV	9J2JN/KB2ZP
FM0EOM/F2VT	KA3BUJ/WB4ABK	TL8CN/W5RU	YC1GJ/W2GBX	9N1BMK/JH3LPT
FO8HM/XA3A	K5VKR/W3YY	TL8JM/W5RU	YJ8VV/ZL1VV	9Q5FL/KA4NB
FOØFB/WB6GFJ	KH3AB/KB7HO	TL8WN/W5RU	YOØMIG/YO3AC	9Q5L/K3FN
FOØDP/OH2KF	KH6LW/KH6JOB	TR8AC/W5RU	YV1DQU/WA1BD1	9U5WR/SP6FBR
				9V1UZ/N2JA

Hsu was licensed many years ago as XU8CH and C1CH.

Although propagation was not good between the cities, communications were established about 10:45 pm on September 9th. The station in Beijing used the callsign CIE and the one in Shanghai used K7LAY. Both stations were heard in many countries with strong signals. The Chinese asked us to tell the world that their top government leaders are solidly behind amateur radio, and that before too long, China expects to establish many friends throughout the world through the medium of amateur radio.

Our delegation was overwhelmed by the reception we received in China and very honored to be the first official amateur radio delegation to China and to demonstrate amateur radio. In China, we met many old-timers and our meetings with them were precious events in all our lives.

We are very appreciative of our host in China, The China Institute of Electronics, and also the China National Radio Sport Commission and the Shanghai Institute of Electronics.

Editor's Note: This report is based on a press release from the US delegation, filed on September 12 in Hong Kong. *73* hopes to be able to report more details on the China breakthrough in the months to come.

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

I've lost track of the number of times we've asked everyone to send in their information as early as possible, but I thought I'd better do it one more time. At least three or four contest announcements were received too late for the last issue. Some came as late as four weeks past deadline. Just to show you what kind of lead time is involved, the material for this issue had to be in my hands no later than September 20th. To be safe, it should be sent directly to my home address and not through the magazine as that only tends to slow things up. It might be several weeks before mail is forwarded to me from Peterborough. If material is coming from overseas, send it as early as possible and use air mail to avoid delays. In all cases, try to get the information in as early as possible.

In the results department... W1CCN finished third while K2SX finished fifth on CW during the 1981 RSGB 7-MHz Contest. They were the only USA amateurs listed in the official results. Maybe we can do a little better in '82.

CONNECTICUT QSO PARTY

Starts: 2000 GMT December 5
Ends: 0200 GMT December 7
Rest period: 0500 to 1200 GMT December 6

Sponsored by the Candlewood Amateur Radio Association (CARA). Phone and CW are considered to be the same contest. Stations may be worked once on each band and each mode.

EXCHANGE:

Send QSO number, RS(T), and ARRL section or Connecticut county.

SCORING:

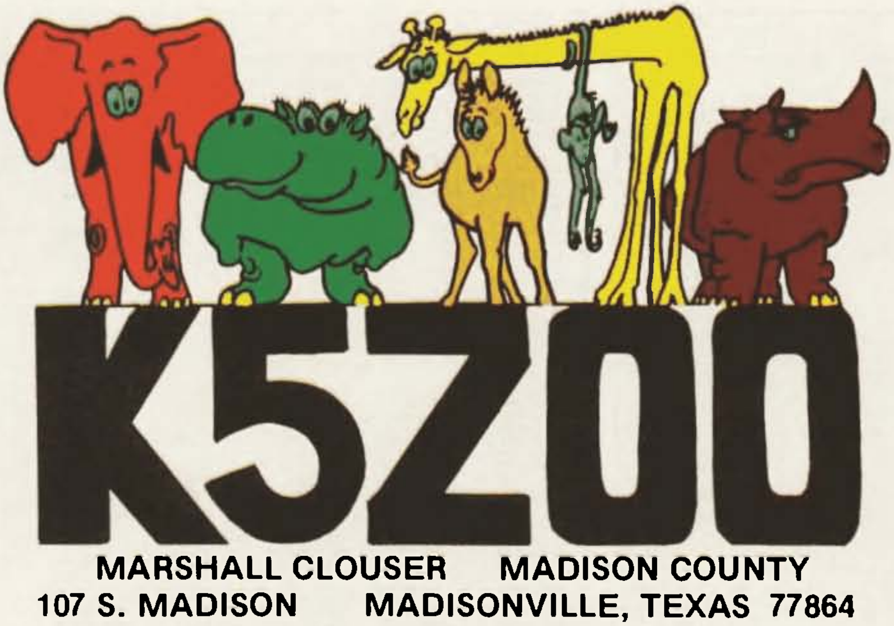
Out-of-state stations multiply total QSOs by the number of Connecticut counties worked (8 maximum). Connecticut stations multiply total QSOs by the sum of ARRL stations and provinces. Additional DX contacts count for QSO points, but only one DX multiplier overall is allowed. W1QI, the club station, will be operating CW on the odd hours and SSB on the even hours and counts as 5 points on each band and mode. Novice contacts count as 2 points each and OSCAR contacts count 3 points each.

FREQUENCIES:

CW—40 kHz up from the bottom of each band; SSB—3927, 7250, 14295, 21370, 28540; Novice—3725, 7125, 21125, 28125.

ENTRIES & AWARDS:

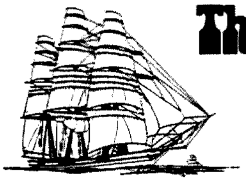
A Worked All Connecticut Counties certificate will be awarded to each station working all Connecticut counties. Other awards given as usual, minimum of 5 QSO points! Logs must show category, date/time (GMT), stations, numbers,



QSL OF THE MONTH

Bright, eye-catching color and humorous graphics made K5ZOO's card this month's winner.

If you would like to enter the contest, put your QSL in an envelope and mail it along with your choice of a book from *73's* Radio Bookshop to *73 Magazine*, Pine Street, Peterborough NH 03458. Attention: QSL of the Month. Entries which do not use an envelope (the Postal Service does occasionally damage cards) and do not specify book choice will not be considered. Each month we consider a new set of entries, so you may want to resubmit your card in another month.



The Scuttlebutt

yankee clipper contest club

NEWSLETTER CONTEST WINNER

This month, we salute the Yankee Clipper Contest Club (YCCC) and its publication, *The Scuttlebutt*. Despite the limitations of a small budget, editor K1GQ produces a good-looking, information-packed, 10-page newsletter each month. What's the secret of this low-cost success?

For starters, the editor leaves no stone unturned in his quest for club members with connections necessary to get *The Scuttlebutt* printed at the lowest possible cost... sometimes for free! Occasionally, he cajoles a local firm involved in the ham business to pick up the tab, in exchange for a page of advertising.

Typesetting for *The Scuttlebutt* is a volunteer effort, contributed by club members with access to the required equipment. Mailing labels are similarly handled by a member who keeps the YCCC membership list on the computer in his office.

The editorial content of the newsletter is a cooperative effort, too, with many club members helping out. The editor doesn't try to write the whole thing.

The lesson to be drawn from *The Scuttlebutt* is that there are numerous untapped resources both within your club and within your community. Editors on a budget (aren't we all?) must seek out these hidden assets. Quality on a shoestring—it *can* be done!

Proud of your club's newsletter? Send it to: Newsletter Contest, *73 Magazine*, Peterborough NH 03458.—WB8BTH.

CALENDAR

Dec 5-7	Connecticut QSO Party
Dec 26-31	G-QRP-Club Winter Sports
Dec 27	CARF Canada Contest
Jan 1	ARRL Straight Key Night
Jan 2-4	Zero District QSO Party
Jan 9-10	73's 40- and 80-Meter Phone Contest
Jan 16-17	73's International 160-Meter Phone Contest
Jan 16-17	International SSTV Contest
Jan 30-Feb 7	ARRL Novice Roundup
Feb 6-7	RSGB 7-MHz Contest—Phone
Feb 20-21	ARRL DX Contest—CW
Feb 27-28	RSGB 7-MHz Contest—CW
Mar 6-7	ARRL DX Contest—Phone
Jun 12-13	ARRL VHF QSO Party
Jun 26-27	ARRL Field Day
Jul 10-11	IARU Radiosport
Aug 7-8	ARRL UHF Contest
Sep 11-12	ARRL VHF QSO Party

RESULTS

RESULTS OF THE 1980 CANADA CONTEST

Class	Call	Score	QSOs	Points	Mult.
A	VE5DX	773,740	1194	7034	110
A	VE3GCO	299,390	549	3290	91
A	VE7SK	263,283	360	2831	93
A	VE2DZE	203,662	351	2578	79
A	VE7CMK	172,317	436	2427	71
MS	VE7WJ	600,516	602	4716	126
MS	VE7CNY	341,972	691	3638	94
MS	VE6ANC	251,251	397	3263	77
MS	DA2CF	31,220	185	1561	20
50	JR3SQZ	0	7	7	0
28	VE6CKW	39,160	294	1780	22
28	VE7CXC	35,000	463	1750	20
28	VE4VV	26,576	351	1208	22
28	WA5QBO	23,380	183	1670	14
28	VE6BFN	20,010	280	1334	15
21	DF1EI	1,000	20	200	5
21	JA6OKB	654	28	109	6
21	VE3KOY	705	42	141	5
21	JHØCXS	20	2	20	1
14	VE3DIJ	8,100	79	540	15
14	VE4YF	3,720	38	372	10
14	KL7JHD	3,240	360	540	6
14	KA2EPS	3,152	79	394	8
14	EA7AKQ	512	20	128	4
7	VE7BS	8,932	107	638	14
7	JL1CGL	64	14	32	2
3.5	VE2JV	8,000	78	800	10
3.5	KA8FAL	2,317	51	331	7
3.5	WAØDEL	1,872	35	234	8
3.5	VE3LXL	212	15	106	2

bands, QSO points, and claimed scores. Enclose a large SASE for results. Logs must be postmarked by January 2nd and sent to: Steve Grouse KA1ECL, 3 Queens Court, Danbury CT 06610.

G-QRP-CLUB WINTER SPORTS

Daily from 0900 to 2300 GMT
December 26 to December 31

All amateur radio operators interested in QRP are invited to take part in the club's activity. No special exchange information was mentioned in the information provided by the club. The operating schedule for each day is as follows:

- 3560 kHz—1200-1300, 1400-1500, 2100-2200 GMT.
- 7030 kHz—1100-1200, 1300-1400, 2000-2100 GMT.
- 14060 kHz—0900-1000, 1730-2000, 2200-2300 GMT.
- 21060/28060 kHz—1000-1100, 1500-1730 GMT.

Reports on the Winter Sports Activity should be sent to Gus Taylor G8PG, 37 Pickerill Road, Greasby, Wirral, Merseyside L49 3ND, England.

CANADA CONTEST

Starts: 0000 GMT December 27
Ends: 2359 GMT December 27

Sponsored by the Canadian Amateur Radio Federation (CARF), the contest is open to all amateurs. Use all bands from 160 to 2 meters, CW and phone combined, and everybody works everybody. Classes of entry include: single operator, all band; single operator, single band; and multi-operator, single transmitter, all band. All contacts with amateur stations are valid. The same station may be worked twice on each band, once on CW and once on phone. No crossmode contacts and no CW contacts in the phone bands allowed.

EXCHANGE:

Signal report and consecutive serial number starting with 001. VE1 stations will also send their province (NS, NB, PEI).

SCORING:

Ten points for each contact with Canada, 1 point for each

contact with others. Ten bonus points for each contact with any CARF official station using the suffix TCA or VCA. Multipliers are the number of Canadian provinces/territories worked on each band and mode (12 provinces/territories x 8 bands x 2 modes for a maximum of 192 possible multipliers).

FREQUENCIES (as applicable):

Phone—1810, 3770, 3900, 7070, 7230, 14150, 14300, 21200, 21400, 28500, 50100, 146520; CW—1810, 3525, 7025, 14025, 21025, 28025, 50100, 144100. Suggest phone on the even hours (GMT), CW on the odd hours (GMT).

AWARDS:

The CARF Canada Contest Trophy will be awarded to the highest scoring single operator entry. Certificates will be awarded to the highest score in each entry class in each province/territory, USA call area, and DX country, and to the highest score from those who have only their amateur certificates.

ENTRIES:

A valid entry must contain log sheets, dupe sheets, and a summary sheet showing a chart of multipliers per band/mode and score calculation. Send your entry with comments to: Canadian Amateur Radio Federation, PO Box 2172, Station D, Ottawa, Ontario, Canada K1P 5W4, postmarked within one month of the end of the contest. Results will be published in *TCA*, the Canadian amateur magazine. Nonmembers may include an SASE for a copy of the results.

ZERO DISTRICT QSO PARTY

Starts: 2000 GMT January 2
Ends: 0200 GMT January 4

Organized by the Mississippi Valley Radio Club. Stations outside of Zero District will work Zero stations only. Zeros may work any station. The same station may be worked once on each band and each mode. However, stations in the special mobile class may be worked each time they change counties.

EXCHANGE:

RS(T) and ARRL section. Zero District stations must also send county.

FREQUENCIES:

3560, 3900, 3725, 7060, 7270, 7125, 14060, 14300, 21125, 21060, 21370, 28125, 28060, 28570.

SCORING:

Add the number of Zero District ARRL sections worked plus the number of Zero District counties, then multiply by the number of contacts. Zeros score by adding ARRL sections, Zero District counties, and DXCC countries worked and then multiplying by total contacts.

ENTRIES & AWARDS:

Certificates will be issued to all entrants who submit a log and SASE. Endorsements will be given for high score in each ARRL section, DX country, Novice/Technician class, and Special Mobile class. Mail logs by February 15th to WØSI, 3518 W. Columbia, Davenport IA 52804. Include an SASE for log forms or results.

HAM HELP

I need an i-f transformer for a Hammarlund HQ-170 receiver. It is designated T1 on the schematic, and is Hammarlund part #K26402-1. It is a combination 455-kHz and 3035-kHz transformer that needs an exact replacement. I will gladly pay a reasonable price for a suitable transformer.

David Hansen KB6FI
7484 Tustin Road
Salinas CA 93907

Information and/or schematics wanted for conversion of Drake L-75 linear to 10 meters. Will defray all costs involved.

E.V. Schoonmaker N5CGE
792-A Fairview Avenue
Annapolis MD 21403

Wanted: work in Knoxville or Chattanooga, Tennessee, area. First class radiotelephone and Extra class license.

H.F. Schnur
115 Intercept Ave.
North Charleston SC 29405

I am in need of the following items: (1) manual/schematic for Hallicrafters HT32B; (2) a main power transformer for the HT32B (please state price), and (3) a manual or schematic for the Globe Electronics Hi-Bander VHF-62 transmitter.

I will pay for postage and copying costs.

Richard E. Duell W9LSD
4415 N. Florence Dr.
McHenry IL 60050

I am trying to locate an instruction manual and schematic diagram for a Model Memo 512 keyer made by K. E. Electronics.

I will pay for copy or copy and return original.

William Hartley K2RDS
1201 Paul Ave.
Schenectady NY 12306

I am in need of a Centralab switch, #PA-076. I'll be glad to pay for it.

Don Ramey WA4FQC
Box 217
Meridianville AL 35759

I need an antenna relay for the Hammarlund HX-50 transmitter. Also, information about any source for Hammarlund parts will be appreciated.

Arnold Irvine KAØELN
5 Drumcliffe Drive
Warren PA 16365

Please: I need the manual for a Peirson KE-93 receiver and an Elmac AF-67 transmitter. I will copy and return and pay mailing costs.

Robert F. Voelker WA2PCL
101-23 Lefferts Blvd.
Richmond Hill NY 11419

I am looking for a UA1LO QSL card from before 1968 for my astronaut autograph collection. (UA1LO was Yuri Gagarin, the first man in space.) Thank you.

Mike Smithwick AA6XI
25215 La Loma Drive
Los Altos Hills CA 94022

I am looking for a book or information on a 2-meter rig, the Setec-Elect FRT-203. It's an 8-channel rig and I have no idea who made it.

F. Whittier WB1CXX
RFD #1, Box 390
Madison ME 04950

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION (Required by 39 U.S.C. 3685). 1. Title of publication, *73 Magazine*. 2. Date of filing, Oct. 1, 1981. 3. Frequency of issue, Monthly. A. No. of issues published annually. 12. B. Annual subscription price, $25.00. 4. Location of known office of publication (Street, City, County, State and ZIP Code) (Not printers), 80 Pine Street, Peterborough, Hillsboro County, N.H. 03458. 5. Location of the headquarters or general business offices of the publishers (Not printers), 80 Pine Street, Peterborough, Hillsboro County, N.H. 03458. 6. Names and complete addresses of publisher, editor and managing editor. Publisher (Name and Address), Wayne Green, Peterborough, N.H. 03458. Editor (Name and Address), Wayne Green, Peterborough, N.H. 03458. Managing Editor (Name and Address), Jack Burnett, 12-C Granite St., Peterborough, N.H. 03458. 7. Owner (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent of more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given. If the publication is published by a nonprofit organization, its name and address must be stated.) Name, 73, Inc., Peterborough, N.H. 03458. Wayne Green, Peterborough, N.H. 03458. 8. Known bondholders, mortgagees and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages or other securities (If there are none, so state) Name, none. 9. For completion by nonprofit organizations authorized to mail at special rates (Section 132.122, PSM) The purpose, function and nonprofit status of this organization and the exempt status for Federal income tax purposes (Check one) Not applicable. 10. Extent and nature of circulation. (X) Average No. copies each issue during preceding 12 months. (Y) Actual No. copies of single issue published nearest to filing date. A. Total No. of copies printed (Net Press Run) (X) 70,810 (Y) 69,253. B. Paid circulation 1. Sales through dealers and carriers, street vendors and counters sales, (X) 11,964 (Y) 15,186. 2. Mail subscriptions (X) 52,747 (Y) 51,871. C. Total paid circulation (Sum of 10B1 and 10B2) (X) 64,711 (Y) 67,057. D. Free distribution by mail, carrier or other means, samples, complimentary, and other free copies (X) 359 (Y) 460. E. Total distribution (Sum of C and D) (X) 65,070 (Y) 67,517. F. Copies not distributed 1. Office use, left over, unaccounted, spoiled after printing (X) 5,024 (Y) 1,020. 2. Returns from news agents (X) 716 (Y) 716. G. Total (Sum of E, F1 and 2—should equal net press run shown in A) (X) 70,810 (Y) 69,253. 11. I certify that the statements made by me above are correct and complete. Signature and title of editor, publisher, business manager, or owner. Debra Boudrieau, Business Manager.

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

from page 8

development. In the past I've found older amateurs are generally resistant to new ideas and really hate to have to read about them. But after a while, though I lose readers in the process, interest does come and finally the other amateur publications reluctantly join me in publishing information on the new technology. It worked this way with sideband, with transistors, with ICs, and with FM, so we'll probably see the same pattern.

There are, obviously, far more benefits than just a wonderful emergency communications system which can come from this step ahead. If we are successful in establishing a system for getting the growth of amateur radio that we really need... and that will be on the order of 33% per year, not 3%... we are going to have to develop much more efficient communications modes. Anyone listening to the high end of twenty-meter phone any evening has to realize that new techniques are already needed... seriously needed. With high-speed ASCII communications, we could easily accommodate a thousand stations where we now have one and we could have room for the two million hams we should have right now and the three million we want to have by 1990.

This is a reasonable answer, too, for using the narrow bands available on our ham satellites.

If we develop the encoding techniques I discussed at the last NIAC meeting, our information exchange would immediately go from 8500 words per minute to about 26,000! All this would be done via a simple integrated circuit chip which would encode the 32,000 most used words before sending them... and then decode them upon reception. Further, the output could be in *any* language, allowing amateurs anywhere in the world to communicate with each other, regardless of their spoken language. Again, nothing has to be invented. We just have to write the computer programs to accomplish this and perfect our equipment, techniques, and protocols.

A word of warning, if I may. If we are going to turn around the disaster which has brought us to technological defeat at the hands of the Japanese, we are going to have to do more than nod our heads and adjourn until the next scheduled NIAC meeting. If we are going to be able to provide anything of any great value in the way of emergency communications ... if we are going to develop the systems which I have outlined... we need to really activate NIAC, using its communications with the FCC to bring this situation to the attention of the White House.

By the way, speaking of satellite communications: If we were to dedicate one channel of a satellite to a calling frequency, it would, using 9600 baud, be able to handle 216,000 different calls per hour for us, with each call consisting of the callsign of the station called and the calling station.

In terms of emergencies, tests have already been made which show that we can use relatively low-powered emergency transmitters, and by measuring the signals received through a ham satellite, it is possible to determine the location of the transmitter to a surprising degree. Digitizing and automating this service would provide an emergency locating system which would be simple and inexpensive and work anywhere in the world... whether it be used to locate a raft floating in the Pacific Ocean or someone lost in the jungles of Sumatra. It is the digitizing and automation which bring this emergency service to anyone who needs it.

So here we are, on the brink of yet another revolution in communications. Will this be brought about by amateurs or must we wait for commercial and military systems to do what we could develop? A good part of the answer for that lies, in my estimation, in whether we as a group will be able to start some action with the FCC and with our government which will result in a sudden and spectacular growth of amateur radio.

Most of you who are here today have made long trips and have to leave your businesses. You've carried the expense of this yourselves. Now, while it is obviously an honor to be a member of a government advisory committee, it is an empty honor... worthy of no more than a line in a *Who's Who* biography which will be read by few... unless we are able to actually accomplish something.

As the *only* official interface between the amateur radio community and the FCC, we have a responsibility to our fellow amateurs to speak up for them. As the group which I feel must shoulder most of the responsibility for the loss of our country's technological leadership of the world, we should speak up for radio amateurs and do our best to see that the FCC provides the incentive for amateur radio to grow again. We have to remember that even if we are able to spark a combination of events which gets amateur radio into a growth pattern which is three times our past highest growth, it will still take us at least ten years to catch up with the catastrophic losses we have suffered over the last 18 years.

I believe that the FCC commissioners will be interested in this situation and be responsive to our leadership, if we can provide it... and that, at the root of it, is the real purpose of this committee.

I suggest that we need more than an occasional meeting and minutes, more even than a report and recommendation. I suggest that we appoint an action committee to work with the FCC to develop both White House interest and the rules changes which might contribute to the goals we have in mind.

Since my business is growing at an ever-increasing rate, now numbering eight monthly publications plus a software publishing division, and with five more monthly publications in prospect, plus the opening of at least three more major divisions of the company, my own time is severely limited. I would be happy to serve as a member of an action committee, but I would not be able to provide the leadership and time that a chairman should devote to such a committee. Between my ham interests and my computer interests, I spend a good deal of time traveling. Last month I managed to get on the air for a short while as W2NSD/3D6, W2NSD/ZS, and as 7P8CA, all while setting up South American and South African editions of one of my computer magazines.

I did manage, just before leaving for Africa... and just after a trip to California setting up three prospective new publications... to visit with FCC Chairman Fowler and discuss briefly some of the ideas which I have just covered. I found him most enthusiastic and cooperative... so I believe that if NIAC will appoint a subcommittee, an action subcommittee, we will be able to more than be rewarded for our time and money spent as members of NIAC.

The job of such a committee and of the FCC is not an easy one. The polls of amateurs have shown clearly the strong feelings for maintaining the Morse-code requirement. Yet when one talks to people interested in becoming radio amateurs, this is always the major obstacle. Indeed, between the wealth of destructive code teaching systems now available and the ability of even the best of us to put off an unpleasant job if at all possible, it is a wonder that we have even maintained our present membership.

As I have mentioned in the past before this committee, I think I have heard every argument, both pro and con, on the subject of the code requirement for our amateur licenses. It is my belief, after giving consideration to all of these arguments, that we should have a technical license exam, not one measuring a skill. I see not even the remotest connection between a skill of copying code and being a good amateur. Despite the attempts of the plain language proposals, I tend to define a good amateur as one who is pursuing any or all of the four major reasons set out in our rules, 97.1, for the existence of the service.

It is increasingly difficult to remain blind to the success of the Japanese amateur radio system and I think we should put aside our "not invented here" emotions and take advantage of an innovation which has obviously worked. Just as American industry is taking the Japanese Type-Z management system seriously and finding that this brings about remarkable increases in productivity for their firms ... and a sudden drop in people changing jobs... we should look pragmatically at the Japanese no-code license system as a possible solution to our problems.

There will, I am sure, be resistance from older amateurs. I would be surprised if one or more of the ham magazines did not rush to take political advantage of the situation. But if we insist on trying to follow the system of doing only what the majority wants, we will have a technology as innovative as our television programs. This is a time for leaders... leaders with confidence. We have a good example of this in our Administration, which has not been afraid to push against the tide toward goals it sees as important in the long run. I am hoping that NIAC will form an action committee which can do likewise for the benefit of amateur radio and our country.

Despite my plea not to be made chairman of a committee to tackle the problem, the new chairman of NIAC, Charlie Dunn K7RMG, immediately established an Action Committee and made me chairman. I was serious about already having enough to do and was not pulling the old briarpatch tears. Well, okay, I'm chairman of a committee, and I'll do the best I can to get it organized and into action.

The goal of the Action Committee is to work with the FCC to establish a growth of amateur radio such as we have never seen before. I feel, as I said in my report, that we should aim at no less than a 33% growth per year and keep that up for a least ten years.

Another task of the committee is to work with the FCC to set up some system whereby amateurs can experiment and develop new modes of communications such as digital high-speed interactive networks as cited in my report.

Obviously, we have our hands full, so it is going to take a lot of work and cooperation with this committee... which consists of Dorhoffer of *CQ*, Imlay of *QST*, Curtis (who publishes books in the computer field), Harold Todd W7ZXM from Seattle, and me as chairman.

If you have spent any time mixing with would-be hams, you know as well as I that our Morse-code requirement is probably the major single obstacle which has been keeping down our growth. Yes, I know that most old-time amateurs are fiercely adamant about keeping the code test. But as I mentioned in my report, it has been years since I have heard a new argument on the subject and the balance, as far as I can see, is to-

wards making this a technical hobby instead of a skill hobby.

Some of the wheezes which come to mind are as follows:

1. *Code is a ham heritage.* So is QRM, but that's no reason to keep it. I am convinced that we will have more CW operators than ever if we make it a fun part of hamming instead of obligatory. Besides, with more and more operators using Morse keyboards, what do you mean by heritage? Those keyboards and Morse code readers are selling like crazy...if that tells you anything.

2. *Without the code test we'll be swamped with lousy operators.* Oh my goodness, since when did learning the code make anyone a good operator? If you want to hear really good operating, not the jamming and pileups we indulge in here, listen to the Japanese operators. They were taught how to operate by their clubs but had no code test.

3. *In emergencies, code can get through when phone can't, so everyone should know the code.* Well, that may have been true 50 years ago, but today most of your emergency traffic is on phone...and sideband gets through as well as CW almost anytime. In the future, we will be running most emergency traffic over high-speed digital networks, not on code or phone, anyway.

4. *CW rigs cost less than phone equipment, so by emphasizing code we are enabling even the poor amateur to participate.* In the pre-war years we could buy this baggage. When Heath brought out the HW rigs, that argument went out the window...where it still lies...and that was about 20 years ago. Let's try to get out of the past.

5. *With the current exams made stupidly simple by cheat books such as the ARRL Q & A* Manual *and the Bash books, we have to have SOMETHING to keep everyone out.* I partially agree...but let's make it something better than the Morse-code test. Perhaps we could change to a licensing system whereby new amateurs would have to qualify before a club board, showing that they know the rules and are able to operate a ham station. We might make the technical exam less vulnerable to circumvention by League and Bash Q & A books.

6. *If we don't keep the code in the ham test, code will just die out.* As I said, I think that once it is made fun instead of punishment, we will find a new enthusiasm for the skill. Our clubs and publications can intensify this with contests, certificates, and articles on the subject.

7. *Just because the Japanese have had such incredible success merely by removing the code requirement is no reason why we have to imitate them.* Well, I believe in learning. When someone does something new and it is a success and what I'm doing is an obvious failure, it is time to re-evaluate and not let *Not Invented Here* stop me.

8. *I had to go through all that misery, so why should I want anyone to have it easier than I did?* Golly, I don't have any real answer to that bit of garbage.

9. *Suppose you are stuck in a life-and-death situation where all you have is a CW transmitter for communications?* Having been in just such a situation, and having used CW to save 85 lives, my answer is that the likelihood of such a situation occurring is so remote that I really wonder if it is worth sacrificing the technology of America on such a remote circumstance.

Yes, I know that there will be crowds of old-timers at Dayton looking for me with ropes, tar, and feathers. Well, I've leveled with you down through the years, never taking the easy way out. In this case, I think it is time...way past time, actually ...to get serious about revamping our ham exams and making our hobby a technical one rather than one limited mostly by an easily learned skill.

Think of it like this. Sure, you and I know that it is not difficult to learn the code. Piece of cake, really. But you also have to admit that when you talk with nonhams, you probably make a big deal of it. If you put yourself in the shoes of someone considering being a ham, you will see, as they do, that the Morse code is a terrifying new language...one which they are not at all sure they can master. This fear is in itself enough to turn tens of thousands away from amateur radio each year.

Then, when someone decides that he or she is going to try anyway, the fear is enough to put off practice. Remember that nowhere in our magazines or in talking with amateurs is any reference made to code being fun. It is the major hurdle for newcomers and we make a big deal of it as such. So our talking generates terror in the hearts of newcomers and makes practice all the more difficult...even impossible. They *know* they are going to fail...and they find this self-fulfilling.

I've talked with thousands of people who wanted to be hams, but who were unable to surmount the code requirement. Most of them seriously tried but were conned into using a terrible code course and found themselves failing at it no matter how hard they tried. Indeed, many of the code courses are ridiculous...including the best-selling one of all. This single code course probably has lost us more hams that we've gained in the last twenty years.

In speaking out against the code requirement, perhaps I am sowing the seeds of my own losses. The *73 Magazine* code course, while it sells far fewer than does the ARRL series, has sold about 25,000 cassettes a year. Will I be out of the code cassette business if we get rid of that element of the license? I think not...in fact I'm betting that I'll be able to sell more than ever...as fun.

The recent *QST* polls showed that *QST* readers overwhelmingly are in favor of keeping the code requirement, so it's Wayne Green against the world again. *QST* has been pushing code for as long as I've been hamming—over 40 years. This got them into trouble in the late 40s when a large percentage of the amateurs deserted the League to go with the National Amateur Radio Council...a phone-oriented group which got us expanded phone frequencies on 75m, the 40m phone band, and more frequencies on 20m...over a lot of dead bodies. NARC, achieving its goals, went away.

So, if anyone has any other arguments which I have not enumerated, I'll be glad to publish them, along with my ripostes. Let's get this out in the open and fight fair on it...not let prejudices left over from 50 years ago continue to stop our growth. When I first got into amateur radio, there was still a lot of smoldering anger over being forced off spark. Then I watched the same thing happen with AM phone. I believe in being conservative, but there is such a thing as carrying it too far. If you disagree with me, I ask you to fight fair. If you agree with me, fight with me for the growth and health of the very best hobby ever invented.

FCC CASH-FLOW PROBLEMS

With the Reagan administration shaking every federal agency to reduce expenses and lay off people, the FCC...which has been underfunded for years ...is in particular trouble. Indeed, if they had not been so prudent in the past, they would be far better able to weather the current storms.

There has been some talk of getting government agencies to charge for services so they can get into the black. If this talk persists, we may again see a charge for ham licenses. Since amateur radio takes up a miniscule amount of the Commission's time, our charges should be minimal, as they were the last try. But I think I have some ideas which might cut the cost of the amateur service even further for the Commission.

A large percentage of the Commission time and money is spent on commercial broadcasters, so there is adequate reason to pass along this cost to them. After all, *they are* making a living out of the FCC work. I'd also like to see the common-carrier chaps pick up their end. It's about time...the television broadcasters using this service kind of snuck in through the back door. Indeed, I haven't seen any legal justification for them being allowed to use common-carrier channels for television. That service was not designed for that use and, as far as I know, it was never authorized for that. Well, let's see that go through the legalities and be made official...with the common-carrier boys picking up the full tab.

Perhaps I'm being a bit vindictive because this bunch of crumbs cost *73* tens of thousands of dollars in legal fees to fight their suit against us. A suit found without merit, which I feel was brought merely as an intimidation to try to prevent *73* from publishing 2300-GHz articles. I suspect that more is accomplished in our country via the threat of court cases than through the cases themselves. I know that few firms are large enough to absorb the costs the CCAT people put us through, and most would have shut up and blown away. I

happen to think that freedom of the press for amateurs to learn about these things is worthy of such an investment, so we put up the money needed to fight these stinkers.

Getting back to the FCC problems. During the Carter administration, the FCC commissioners were so upset over amateur radio as a result of the hearing over linear amplifiers that they virtually eliminated the division. Now what's left of the amateur division has to face across-the-board budget cuts. For those readers who are forgetful or inattentive, let me remind you that this alienation of the Commission came about entirely needlessly. It was the testimony of one amateur which did it... and he was representing a well-known group. He stood up there and insulted the new commissioners, putting us all in the doghouse for four years.

We have a new chairman of the Commission and several new commissioners, so we have a chance for a fresh start.

There are three ways in which amateur radio is costing the FCC money these days. One is the cost of giving license exams and issuing licenses. A second has to do with monitoring our bands. A third is the cost of handling our requested rule changes.

On the first item, I think we could set up a system which would cut their expenses enormously. I've written about this before, but not recently. What I would like to see is a system whereby qualifying radio clubs would be permitted to give license exams. In order to get around hokey pokey, I would suggest that there would have to be three licensed amateurs present during any test administration.

This could be almost completely computerized as far as the Commission is concerned, with machine-readable cards being sent in by clubs for the issuance of the licenses. This would enable field offices to cut back substantially on personnel no longer needed to give and monitor these tests on a regular basis.

This would enable almost every hamfest to have a licensing session, run by a local qualified ham club. It would further cut the cost for people wanting ham tickets since they no longer would have to make the long trip (for many) to a city having an exam center and lose a day or two of pay in the process. Most exams could be given at night or on weekends, at the convenience of the examinees and the club.

By automating the process, the FCC wouldn't even have to have data entry people at Gettysburg to enter the names and addresses of the licensees. This would be a further savings for them. And this move ahead toward automation would set the stage for almost instant licensing. The next step would be sending in the information over the telephone via a data terminal (or any microcomputer with a modem...which just about every club has at its disposal). The exams could be given, the data typed in at the club, sent by modem to Gettysburg, and instantly confirmed, along with the new call of the licensee. Gettysburg would forward the data to Washington, where the actual license would be printed out and mailed, much as is done at present.

If we get into a charge for our licenses, each club could set up an account with the FCC which could be debited each time a new license was issued by them. This would give the FCC a nice float with which to work. If we had, say, 5,000 clubs participating, with each depositing $500 (towards licenses at $10 each), this would give the FCC a two and a half million dollar float. That would earn them about $30,000 a month in interest at 15%. That in itself would pay the salaries of about 15 people at the FCC.

With membership to the League costing $25 per year, perhaps that is a more reasonable price for us to pay for our licenses. Certainly the benefits of our licenses are more than a club membership. That would put a price tag on a five-year license at $125, which might seem a bit steep for youngsters. Of course, we have very few youngsters coming in at the present cost (nothing), so it is difficult to get emotional over any drop that $125 might entail.

The fee would hit retired people hard...even though they seem able to come up with the money for the ARRL with no problem. It might come down to a choice between a license and a *QST* subscription.

So what would be reasonable for a ham license, considering where we are with inflation these days? If $25 a year is too much, how much isn't too much?

One way to look at this is from the other side. What is it actually costing the government to provide us with the license? Perhaps this makes more sense than going by how much it is worth to us...which is a lot in some cases...and not much in others. If we are able to help the Commission cut their expenses, we can rationalize paying less for the service we are getting... and that is the key, to my way of thinking. I don't mind paying *my* share. I don't want to pay the share for someone too lazy or cheap to pay, someone who wants to ride on my coattails.

If we are able to take the license examination administration off their hands, that will save them money. And, considering the usual government efficiency, cutting that expense at one end should save several times the cost by the time the whole organization is considered.

Then there is the matter of monitoring. Here we could certainly help and would benefit in several ways as a result. The benefits would be fantastic. First, we would stop hearing from the Commission that amateurs are not permitted to experiment with new modes of communications just because the FCC monitoring stations are unable to decipher our transmissions. That beauty of a rule...a rule, by the way, which was never written into any of our regulations, but was just decided unilaterally for us...has kept amateurs from developing any significant new modes of communications for the last twenty years or so. That has been one of the most destructive unwritten rules in the history of amateur radio, as well as a direct violation of 97.1c of our written rules.

Secondly, with a thousand amateurs available for monitoring for every present FCC employee, we could do a job of monitoring which would be almost infinitely better than is being done at present. I know there are thousands of amateurs who would jump at the chance to participate in such an operation. Indeed, amateurs could set it up, establish the computer communications which would make it work, develop automatic scanning equipment to monitor the entire spectrum, and so on. Between our retired hams, our handicapped hams, and the cooperation of several thousand ham clubs, we'd have a ball...and do a splendid job.

We also could save the FCC a bundle...passing along only those reports which were of importance to the few FCC monitoring stations still needed. You know as well as I that clubs would love to set up direction-finding systems to track down mysterious stations...to listen for emergency air or marine traffic...and so on. It would give us much more to do which would be both fun and beneficial to the country.

On the matter of cutting down on legislative expenses, let me bring up an idea which I have written about every now and then down through the last thirty years. This has to do with amateurs taking the responsibility for coming up with proposed rule changes...and working them out via a symposium similar to that run by the ITU in Geneva every few years. We could have as a responsibility for our ham clubs the generation and forwarding of proposed rule changes. Then we would have a meeting every two years where club delegates could discuss and decide what actual changes we really want.

We could, like the ITU, set up subcommittees to discuss and recommend action on each of the proposed changes. These committees would pass along their recommendations to a meeting of all club delegates for final voting and action. This process could save the Commission hundreds of thousands of dollars presently spent on trying to cope with proposed ham rule changes. It also would get us our rule changes while they are needed, not years later when they are a nuisance and long unneeded.

In these ways, we could get amateur radio off the back of the Commission, saving them most of their present amateur radio expenses. In return, our service would be much more flexible and able to grow and develop, keeping up with... and preceding...technology. I think we would start seeing inventions and pioneering of new ideas returning to amateur ra-

dio . . . with benefits to our country and the world.

It is a shame that in these days of digital communications amateur radio is held back by the FCC with the technology of twenty years ago.

CLUB RESPONSIBILITY

Just a few years ago, I ran a poll of ham clubs and found that only about 1% were spending time and effort to run ham classes to develop new Novices. Perhaps I got overly abusive about this in my editorials, but the response was good and we got to a point where over 50% of the ham clubs were running ham classes.

That seems to have dropped in recent months . . . probably due to the difficulty of finding candidates as interest in CB has diminished. Well, CB or no CB, we need massive numbers of new hams. You read about that in more detail in my piece about NIAC and its recent meeting.

Now, I can see where a small ham club, with perhaps a half dozen members, might have difficulty in developing the resources needed to teach new hams. But if there are any larger clubs which are not holding up their end of this, let's get going immediately. Get those classes started. There are plenty of teaching materials . . . and you have members who will help out . . . if you will get moving. I want to see our next poll show that over 90% of the ham clubs are generating new licensees.

What is a reasonable number of new hams to bring into the world? Well, since your club probably represents only about 25% of the available local amateurs in your area, at best, you should aim for at least matching the number of your present club members each year. We need an overall 33% growth per year in amateur licensees. If we are able to get 4,000 of our clubs to run classes, we need to generate 33 new hams per club this year . . . and 45 per club next year. Obviously it can be done . . . if your club will start doing it . . . and see that every other club in your area is working just as hard as you are.

FAKE QSL CARDS

The world of the DX Honor Roll is shaking as a result of the expose by W6NZX. In what appears to be a classic case of shooting the messenger, Bob has been singled out to be pilloried, thus making sure that no one else rocks the boat.

Since there is no known way to prevent cheating, either on the side of the Honor Roll amateurs or the DXpeditioners, perhaps it is time we gave some consideration to taking the heat off the whole situation by either getting rid of the lists in ham magazines . . . or making it purely a matter of "claimed" countries contacted. I hate to be the one mentioning this, but the whole matter is one of no importance whatever.

By attaching some importance to the number of countries contacted, we set up several undesirable effects. First, we have seen the development of a cult in amateur radio dedicated at almost any cost to staying on top of the list. This has gotten to unbelievable proportions, with the pursuit taking precedence over families and even over work.

As the importance has been magnified in the minds of the cultists, *any* stratagem has become accepted toward the goal of staying on top of the list. These chaps are well aware that many of the cards they have are fakes in one sense or another. Indeed, the awards committees know this too, but have played along with the cultists (whom *they* have generated), accepting fakes at face value when there was no question in their minds about the invalidity of the cards.

I've mentioned recently that I have a bunch of cards which I know to be fakes, but which I could submit for awards . . . and get them. I'm not talking about cards from almost unknown stations, but cards from some of the best-known DXpeditioners.

Now what is a "fake" card? As minds crazed with getting ahead of others on The List churn, more and more fakes appear. Some are transparent forgeries, where the cards have been turned out in a local print shop with not even an effort to copy the original. I used to get those in abundance when they were submitted for our Worked The World award. Fortunately, being active in working DX, I had the real cards on hand for comparison.

Others are copies of the real cards. Now how is a person checking through a stack of cards going to be able to tell the difference between the real card and an exact imitation? According to inside sources, the awards people have not figured this one out and so they have been accepting the cards at face value.

With QSL managers all over the place, there is no way for a QSL printer to know that an order for 500 cards is from a chap (or group) about to put them out as counterfeit cards. Most people who handle our QSL orders (and *73* turns out around a hundred orders a week) know nothing about amateur radio. They just set the type, proofread it against the order, make up the printing plates, print the cards, package them, address them, and ship them out. I'm sure that most of the QSL printers work pretty much the same way. It's mass production.

QSL managers, with thousands of blank cards, have often been known to hand out samples to friends. It isn't difficult to fill in a card and end up with something which is exactly like the real thing. With many cards coming in envelopes, even the lack of a postmark or QSL bureau stamp doesn't mean much. For the perfectionist, there are fake bureau stamps, brief notes from the real DX operator in answer to some question to provide the envelope . . . and so on.

It does appear that for many DXers there is more fun and work involved in fooling the awards people than in the chase of the DX. That has become a subset of the cult.

DXpeditioners who do their own QSLing have given little thought to the counterfeit problem and have often handed out souvenir cards to anyone asking. Many of these have been filled out later and passed through the awards people for full credit. I've visited a number of rare spots and often have handed my cards out as souvenirs at hamfests.

Some of the rarer spots from which I've operated are 3D6, 7P8, 5Z4, 0D5, JY, YA, EP, YK, 9N, VS6, HL, 3D2, FO8, FK8, 5W1, KS6, KC4, 4U, etc., so picking up a collection of my old cards could be of some help. You don't hear a lot of YA and EP stations these days.

Another type of fake card is the one from the DXpeditioner who isn't where he says he is. This type of cheating has been going on as long as I can remember. The first really wholesale case where I was shown proof of the cheating happened around twenty years ago and had to do with a chap operating out of a hotel in North Africa, signing the calls of one country after another as he went around on his imaginary DXpedition. He was saved the problem of getting licenses, travel expenses, sand in the rigs, and other unpleasantnesses of West African travel through the expedient of not bothering to move. This was an inexpensive and creative solution to what otherwise would have been considerable aggravation. The cards are still acceptable for awards.

The ruse was so transparent that it took no time at all before other hams were using it and expanding upon it. This was a far simpler and cheaper way of getting to those out-of-the-way islands . . . of operating from unfriendly countries. During the 60s, all of us DX hunters built up our collection of fake cards. The awards managers were well aware of what was going on, but didn't want to upset things by refusing to accept the cards, so a conspiracy of silence developed. The rules were tightened a bit to make blatant cheating more difficult.

Miller and his cohorts pushed things too far for even the conspiracy of silence to swallow. Of course he went a step further, not only faking his operating locations, but also charging the hell out of members of the cult, who by now would pay *anything* to stay on top. My understanding is that he charged $50 per new country for cultists and that this was bringing him a very nice income . . . on the order of over $50,000 a year . . . completely tax free.

I still run into hams in rare spots who remember Miller opening his mail, taking out the money and throwing away everything else . . . piles upon piles of mail. I know that when I wrote my editorial and exposed some of the things he was doing, he sued me for $650,000 for cutting down his income. He sued the League for only $500,000 for besmirching him . . . and lost when it was proven that he had been operating from places other than he claimed. Despite all that, I believe that my cards from Miller are still valid

for awards...and I have a lot of them.

Just as an example, I got a card from him from Burma. Hmmm, I thought that no amateur radio was permitted in Burma. So I went to Burma personally and looked into it. I asked the government about hamming..."no way." I asked the hotel where he said he had stayed and operated from... "impossible." I asked the local amateurs (who had been put off the air and their equipment confiscated)..."totally impossible." When I challenged Miller with this, he changed his story and said that actually he had operated from a hospital instead of the hotel, as he had claimed. Since the hospitals were under army control, not the control of doctors, that obviously was a lie, too. But I wrote back and had that checked out... "false."

If it were a matter of any significance about how many countries any of us has contacted, we might look into ways of trying to stem the cheating. But the importance of this as a goal in life is about on the order of that of the Trobriand Islanders and their fetish of growing pigs with reentrant tusks.

My own experience has shown me that an amateur with a decent station and some operating experience can whack off one hundred countries in one weekend (with the help of a contest). It takes about a month to get 200 worked...and perhaps a year for 300, with some diligence. That's what it took me. Beyond 300 you get into cheatsville and the DXpeditions. That's why I got my 300 and then stopped counting. Now and then I work a new one, but I don't know within 20 countries how many I've really worked...and I don't care.

If the DX awards would stop at 300, it would kill this whole cult and free up a few hundred people around the world to contemplate living more productive lives. We might be able to leave the world of counterfeiting to those who arrange for fake passports and wills.

Speaking of fake papers, I was in Asia one time and found that I had to have an authenticated shot which was not on my health record. A ham in the country fixed that easily. He scribbled in the shot information and stamped it with a checker and stamp pad. Looked great and got me through. I managed not to contract the disease during the visit... perhaps the checker did it.

There are 300 legitimate countries on the air and they are easy enough to contact, so the tendency to cheat might be avoided. It's the last few that bring out the worst in people. Remember that if any one of the Honor Roll chaps misses one new country which comes on the air, he is moved back one rung on the ladder...usually permanently. And that means falling way, way back.

If we could take the pressure off, we might find more DX stations on the air. I've mentioned frequently that when I visit rare spots I invariably find that the operators feel harassed and are not very enthusiastic about hamming. You can't blame them; they are never permitted to get on and rag-chew. They are always haunted by ferocious pileups and demanding DXers who feel it is their right to make a contact of at least ten seconds...and never mind what the operator in the rare country wants to do.

I've heard DXers cursing out ops in rare spots who had given up to go to bed or to work. Well, if you are going to take it all this seriously, then *you* have a problem, not the DX. You are the one who has to decide whether it is worth several days of your time to get a new country. I'll invest up to ten minutes trying for a new one, but that's about the limit for me.

At any rate, getting back to fake cards, it turns out that some of the West Coast gang have gone overboard and have been printing up rare cards wholesale and passing them around. Complaints to the awards people have gone unheeded. There is no question about whether they really care or not. So when one chap brought it to a head by submitting a pile of faked cards all in the same handwriting, *he* was given the shaft and everything else was quickly covered over. At least that is the story going around and, considering the history, it's difficult to find a serious flaw in it.

Even the change to computerized operating isn't going to make a significant difference as far as I can see. I can envision the day when a DXpedition will come on the air from Gherkin Atoll and make contacts automatically at the rate of several thousand a minute, with the logs being transmitted on a second channel as generated to the awards committees of several amateur radio societies. At 9,600 baud, we can pass information through at an effective rate of about 7,500 words per minute without special encoding, so we will be able to get DXpeditions over in a few hours instead of weeks. The QSL manager would also be tuned into the log channel and his computer would print out and send along the QSLs to the QSL bureaus.

But what is to prevent any ham from programming his station to make contacts for everyone in his DX club? Or even to have them check in over a two-meter link and make their contacts? And, if you want to be nasty about it, what is the difference? Any good station anywhere in the world can make contact with a similar station, so all we are measuring with our awards is the amount of time someone is willing to spend for the desired award. There is no real measure of the station, of the ability of the operator, or even of propagation conditions. The awards are, essentially, without any real merit.

So, if you won't get rid of the Honor Roll and its pernicious undermining of our hobby, I'll be pushing forward toward computerized contacts and the day when we can work 350 to 400 countries in a minute or so. Perhaps we will then set up awards for working 400 or 500 countries every day for a year.

Five hundred countries? Sure. That's part of the whole game. The awards groups set up their definitions of countries to suit themselves. No one likes it when he loses a country. The fun is in working ever more of them, so awards committees have to come up with new rationalizations to provide us with more and more. They can whet our appetites by temporarily refusing to accept this or that, generating great and enthusiastic controversy.

Years and years ago, I got together with Bill Orr in Nice and discussed the subject. He came up with a humor article on Countries Galore in '64. Well, most of those enclaves he joked about at the time are now accepted countries. With the SARL accepting Transkei and Bophuthatswana as countries, how long will it take for more of the IARU societies to accept them? Bophuthatswana is a great one, being spread out into a lot of enclaves. We could make that into twenty or more separate countries without even trying. South Africa, in an effort to wiggle its way out of segregation problems, has a lot more similar "homelands" which are being contemplated...each a solid-gold possibility for a new country for us.

Indeed, as I've hinted before, I have my eye on one such territory. As soon as it becomes a separate country politically, I'm planning to rush down there and set up a station and drive you crazy for a few days. I even have a call in mind for it...if this does not give anything away. Of course, we'll have to run it by the ITU first, but I think it is a winner. I've already asked for Q5R9 for my call. Laugh, I hope, but remember that I said it, when you hear me.

Though I am perhaps critical of the DX awards committees for accepting known fraudulent cards, I can understand their problem. With so many of the DXers submitting them, and with it being almost impossible to really know for sure which are the real and which the fakes, it is a no-win situation. But a simple returning of Bob's cards might have been more prudent, rather than making a martyr of him by trying to pillory him for forcing the issue and blowing the whistle.

Keep on accepting the fake cards and shut up. Most of us don't really care.

ZAP! YOU'RE IT!

The September editorial piece about police radar brought in quite a reader response. A lot of you have been zonked by the police, not for actual speeding, but because your transmitter indicated speed on their radar units. You really are going to have to learn from the misery of others and either cut out talking from your car or get a detector so that you know when to shut up.

In case you think that being right cuts any mustard with our court system, forget it. I even have a case of a ham judge who refuses to pay heed to the ham interference defense. Some of us get so wrapped up in our rosy

altruistic imaginations that we forget that the purpose of police radar is not to stop speeding but to make money for towns... and it is a fantastic money-maker. If they say you are guilty, you *are* guilty, and your best bet is to pay up and chalk another one up to our American judicial tax collection system.

Getting down to radar detectors, I've been testing a few more. The newest one is by Fox. It's the smallest one yet and is unobtrusive on the shelf where it can look out of your front window. It's as sensitive as any yet... even matching the famed Escort, which I mentioned in September.

The Super Fox Vixen is about 5" x 3-1/2" x 1-1/4" and comes with a plug for your cigarette lighter socket. Since you have no business smoking any more, this is a fine use for that otherwise wasted socket. On our new Datsun Maxima, where most of the Vixen tests have been run, the power socket is turned on and off by the ignition key, so I don't even have to remember to turn it off when I get out of the car. Most of the radar detectors draw enough current (300 mA) so you will find a dead car battery if you leave 'em on while not using your car for a few days... like at the airport during a trip.

The Vixen, in addition to being small, has the benefit of being distributed through car accessory stores and many electronic stores, so it should be simple to find. The cost is $250, right in there with the Escort ($245).

The only real difference between the Super Fox Vixen and the Escort is that the Vixen has a buzzer and light indicator of radar, while the Escort has those plus an S-meter. Perhaps it is the ham in me that likes to watch the S-meter and see when I am getting close enough to a radar unit to know that it can pick up my ham rig. The Vixen will keep you out of trouble, which is what you want. Be sure that you specify a Super Fox Vixen... the superhet model... as the firm also puts out a Fox, which is a passive detector unit and about 1/100th as sensitive. I have one of those in our RX7 and it generally goes off just as I am passing a radar unit, right at the last minute. Since I have both 2m and CB rigs in the car, if I waited for the passive unit to alert me I would be off the road by now with too many tickets to drive.

I've found that a small square of Velcro™ stuck to the bottom of the unit... and another on my dash shelf... allow it to be whisked off the shelf when I park the car in Boston or at the airport. There's no use dangling a $250 goodie right out there in front of thieves when you can flip it under the seat while parked in high-crime areas. Of course, in New Hampshire this just isn't a problem.

Small world department: The people who handle the promotion and advertising for Fox are the same people who handled DenTron... and are handling OSI, the computer firm. OSI, by the way, was bought by Macom, the firm which makes most of the Gunn oscillators for the superhet radar detectors... and which makes the 10-GHz gear I used for my DXing a year or so ago. Macom, formerly Microwave Associates, is where Sam Harris W1FZJ, the microwave genius, used to work before he moved to Arecibo. The president of Macom is an old-time ham, Dana Atchley.

LETTERS

DAY IN COURT

Thanks very much.

Your September issue of *73* arrived the day after I got an unjustified speeding ticket backed up by police radar. Armed with the information in your editorial, I immediately ordered the legal index and bought an Escort. The delivery of both was very fast and arrived in time to assist my court preparation.

You are too pessimistic. The court is an adversary relationship and the person with the best preparation (among other things) wins. A previously good driving record is also a must. In my case I was stopped for "37 in a 25 mph zone" based on radar. I was sure I was not speeding and so informed the arresting officer. His comment was "tell it to the judge." After obtaining the name of type of radar in use, noting the other traffic immediately before me, etc., and fuming, I read *73*. After obtaining and reading the Fuzzbuster legal index and spending a few more hours in the local law library and in technical reading, I called the Commonwealth's attorney. His initial view was: "Radar is infallible. Some states will listen to technical arguments but not VA."

After the roll was called in court (1½ hours of calling the roll, listening to shoplifter cases, etc.), the court got started on the docket. In a lull, I reminded the Commonwealth's attorney that I intended to plead not guilty and of the technical basis for my defense (RFI from the ham gear causing spurious readings as adequately documented in the manufacturer's handbook, Bureau of Standards tests, etc.). I also mentioned the other traffic in the pattern which was pulling away from me but not stopped. I was supported by diagrams, texts, etc., in a large bundle under my arms. When the case came before the judge, the Commonwealth's attorney recommended dropping the charges.

It took a few hours, but justice is worth the effort. The Escort works like a charm—I won't be surprised again. I may even not key the rig passing the radar next time.

J.D. Peters K1ER
Manassas VA

JD, you're not doing your homework completely. The Car & Driver *article on American justice is necessary reading to dispel your euphoria. Being totally and demonstrably right did not help when the editor of* Car & Driver *lost a clear-cut case ... including two very expensive appeals. When I get complaints from hams in African countries about the sad shape of the courts there, I refer them to the article to show that our courts are not any better... the occasional lucky chap like you notwithstanding.—Wayne.*

SURVIVAL

Your editorial statements and talks concerning the relationship between amateur radio and a productive electronic engineering industry such as that of Japan have intrigued me. I couldn't agree with you more! But I think that there is more to it than is indicated by the numbers of amateurs in a country, or the licensing structure encouraging or discouraging the growth of the hobby. In recent times, the professional literature in science and education has bemoaned what has been happening in our American society and its effect on school curriculum and the courses students take, both in the high schools and in the colleges. (One of the more recent articles for the general public appeared in the *Washington Post* on May 31, 1981, and was written by David G. Savage.) For some years now, many high schools have dropped math and science requirements for graduation. This is also true for many colleges. This is not true in Japan.

The Japanese educational system is rigorous, with mathematics instruction being given in a more concentrated form and with more students taking the advanced courses. By the ninth grade, the Japanese student has had three years of geometry and one year of trigonometry. High school courses include calculus, probability, and statistics. Is it any wonder that (as pointed out in the article by Savage) Japanese leaders often point to the rigor of their educational system as a key to their economic success?

In the United States, about 5% of all bachelors and masters degrees are in engineering. In Japan, about 20% of the bachelors and about 40% of the masters degrees go to engineers. Between 1963 and 1977, productivity in the US grew 39% and 1.6% of our students became engineers. Productivity in Great Britain during this period grew 51% and 1.7% of the British students became engineers. In West Germany, productivity was 114% and about 2.3% of West German students became engineers. In Japan, 4.2% of the students became engineers and

productivity went up 197%. Make what you will of these figures!!

As amateur radio operators, we look to the Japanese for much of our equipment and we are thus familiar with their engineering products and their quality. We hold long and friendly conversations with Japanese amateurs. Russian equipment, on the other hand and for the most part, is unfamiliar to us. The vast bulk of the QSOs between American and Russian hams appears to be a mere exchange of technical information. And nothing could be more deadly to a friendly QSL exchange than PO Box 88, Moscow! Yet their educational system and its productivity is almost awesome to an American educator.

In 1957, the Russians threw a piece of iron called "Sputnik" up into the heavens. America became frightened and began a frantic beefing up of its math and science programs. This lasted until the middle 60s. At that time, while our intense efforts began to go downhill, the Russians decided to go uphill. A recent study by the National Science Foundation indicates that the math and science program required for all Soviet students is far stronger than that of any other nation. Not only do a considerably greater number of Soviet students finish high school (our 75% to their 98%), but their requirements are quite a bit tougher. For example, a high school graduate has had five years of algebra, ten years of geometry, two years of calculus, five years of geography, five years each of biology and physics, and four of chemistry. By contrast in the United States, of the high school graduates, 9% have had one year of physics, 16% one year of chemistry, and 45% one year of biology. Savage points out that each year about five million Soviet high school students graduate with two years of calculus and, in contrast, about 105,000 American students have had one year of calculus.

One might argue that the forced curriculum of the Soviet Union does lead to a resentment of sorts among certain parents and educators, and ought to be tempered. But it might also be argued that lack of a rigorous math and science program in the United States may be at a price much more expensive than the diminution of the hobby of amateur radio. The price being survival.

Marvin D. Solomon WB8VNP
Okemos MI

Thanks, Marvin, for the statistics, which are interesting. Perhaps the lack of interest in science on the part of our students stems from a lack of motivation. If such is the case, if we could spark an interest in amateur radio within our high schools, then we might find our schools more pressed to teach math and science courses. And consider that, if amateur radio had continued its growth pattern from the 50s into the 60s and 70s, that alone would have changed our percentages of students becoming engineers. We're talking about a loss of around 60,000 technicians and engineers per year over the last generation. That magnitude of interest could have had a significant impact on our whole educational system.

If we had continued our growth, I'm sure that amateur radio would be vastly different...more advanced... than it is today. Much of amateur radio is stuck in the 30s, fifty years behind the times. The rest of it is hung up in the 50s, only thirty years behind technically. The amount of progress and experimentation with modern communications techniques is negligible. If I am to judge by ARRL surveys and my mail, most amateurs will fight hard to keep amateur radio from changing. Heck, I still hear AMers on 75m holding forth. Will we continue to be left behind as digital and high-speed communications systems are developed?—Wayne.

TRICKED OUT

We noted with interest the article in the September issue on "Tricking-Out the FT-901/902." It refers to a bandpass tuning feature developed by Bill Orr.

We believe this to be an error, as this feature was first developed by Buddy Alvernaz W6DMA when he was employed by Jennings Radio (now a division of ITT).

There was an article in the May, 1958, issue of *QST* (page 18) which described this feature and listed Buddy Alvernaz as the originator.

ITT Jennings
San Jose CA

WACRAL NETS

WACRAL (the World Association of Christian Radio Amateurs & Listeners—G3NJB) runs the following nets:

- Sunday at 0830 on approximately 3775 kHz, and at 1400 on 7075 kHz;
- Monday at 2100 on 3550 kHz (the CW net);
- Wednesday at 1030 on approximately 3665 kHz;
- Monday and Friday at 1900 on 21,350 kHz (the overseas net).

The purpose of all the nets is to encourage and spread Christian friendship and fellowship—the main aim and purpose of WACRAL itself.

Just as a point of interest, apart from the overseas net, the other nets have been in continuous weekly operation now for over seven years. There is always someone on, and most nets are controlled by me.

L.D. Colley G3AGX
Micasa, 13 Ferry Road
Wawne, Nr Hull
HU7 5XU England

ITALIAN LICENSES

We have the pleasure to inform you that on August 28, 1981, a reciprocal operating agreement between Italy and the USA regarding amateur operators was reached.

This department is ready to assist your military or civilian personnel holding a US amateur license to apply for a permit in case of a short visit in Italy or an amateur station license with allocation of an Italian callsign if resident.

Please write for further information.

Manuel F. Calero I4CMR
ARI (Associazione Radioamatori Italiani)
Reciprocal Licensing Department
Via Giorgione, 16
I-40133 Bologna
Italy

ROASTED FANNIES

For some time now, Radio Systems Technology has been designing hidden antennas for home-built plastic aircraft using the nonconductive structure of the aircraft to enclose the antenna radiating rod(s).

It has come to our attention that certain builders have been concealing the transponder or DME antennas in close proximity to the pilot or passengers. The usual location of choice has been directly under the passenger or pilot seat structure.

RST would like to point out that this places, in effect, high-powered microwave energy in very close proximity to a rather sensitive part of the pilot/passenger's anatomy. Bluntly, it may be a little like sticking your fanny into a microwave oven.

We are not clinical radiologists, nor do we have the equipment necessary to determine the backscattered field strength of these antennas. We do know, though, that there will be some leakage around any ground plane. Until a competent professional with the necessary training and equipment will volunteer to make the measurements for the rest of the home-building brethren, RST is suggesting that builders who wish to install transponder/DME antennas under the seats also laminate a sheet of plain old aluminum foil into the seat structure to shield the pilot from possible harm. (Microwave energy will not penetrate the thinnest of metallic foils.)

Radio Systems Technology
Grass Valley Ca

HAM HELP

I'm looking for information on an Ameco TX62 6-meter/2-meter AM/CW transmitter. I will pay any copying and mailing costs. Also, I am interested in any clubs in the Orange/E. Santa Ana, California, area. Thank you.

Dennis P. Breeden WB3KUM
4623 East Washington Ave., Apt. #19
Orange CA 92669

NEW PRODUCTS

LULY POLARIZER

Robert Luly Associates has introduced a new product for the satellite industry, the Luly Polarizer. The Polarizer is an electronic rotator (no moving parts) that replaces the mechanical rotator which was burdened with freezing or burning up, twisting cables, and weight problems.

The Polarizer enables polarity shift from horizontal to vertical automatically. The insertion loss is equal to an N connector, a mere .15 dB. Operating current is 12 to 15 volts at 50 milliamps (available from standard receivers). The polarity can also be varied 0-180°, allowing for dual polarization realignment after moving the antenna from one satellite to the next.

For more information, contact *Robert Luly Associates, PO Box 2311, San Bernardino CA 92405*. Reader Service number 481.

STANDARD COMMUNICATIONS TALKMAN

Talkman is a miniature, lightweight, voice-actuated, hands-free two-way radio; it is ideal for active bicyclists, snow skiers, hunters, and even those engaged in such pursuits as tower rigging and construction. Measuring only 2½" wide, 4½" high, and 3/4" deep, Talkman weighs less than one pound. It is available in any one of five channels in the FM 49-MHz band and will transmit up to a quarter mile. Power is provided with an easily obtainable 9-volt battery. The headset features a stowable whip antenna and an adjustable boom-mounted miniature voice-activated microphone.

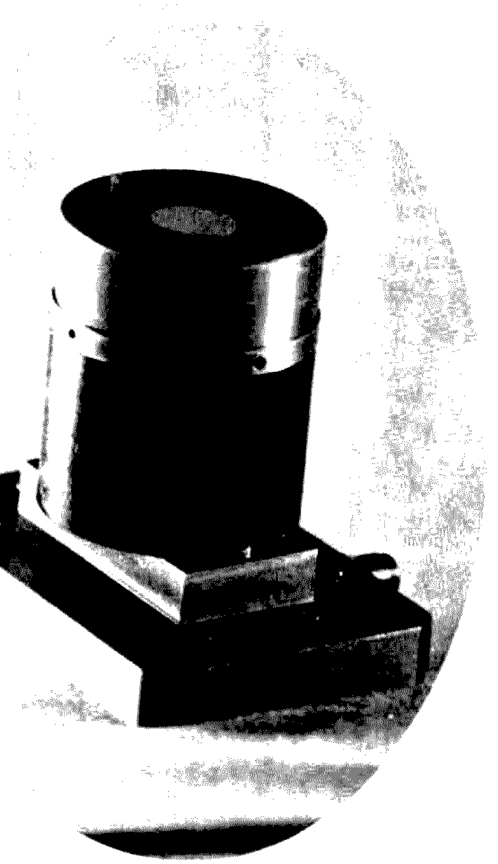
For more information, contact *Standard Communications Corp., PO Box 92151, Los Angeles CA 90009*. Reader Service number 486.

The Talkman from Standard Communications.

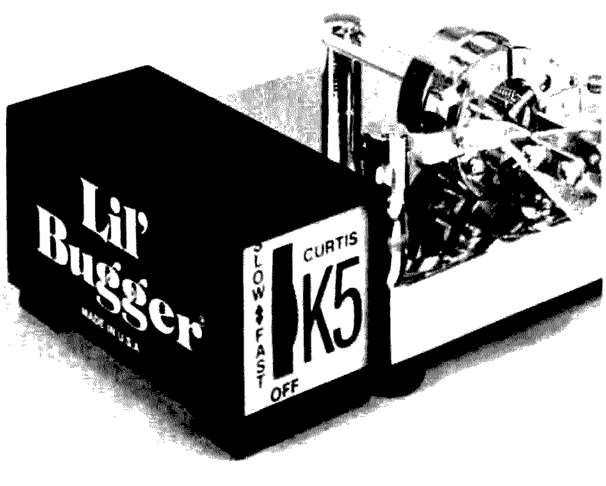
FLEA-SIZE KEYER FROM CURTIS

A rugged, low-priced keyer from Curtis Electro Devices promises to be the tiny, no-frills unit CW buffs have been waiting for. Although only 1.5" square, 3" deep, and 3.5 ounces in weight, the "Lil' Bugger," as it's called, offers many of the features found on full-sized keyers, plus a few of its own. The front panel contains only a thumbwheel speed control. Weighting, sidetone pitch, and volume are adjustable internally via small trimmers. The tungsten output relay will easily key any amateur transmitter, including really tough cases such as old shipboard transmitters. Jacks are provided for the keyline, sidetone output, and an external ac adaptor. The case also contains a compartment for an ordinary 9-V transistor radio battery.

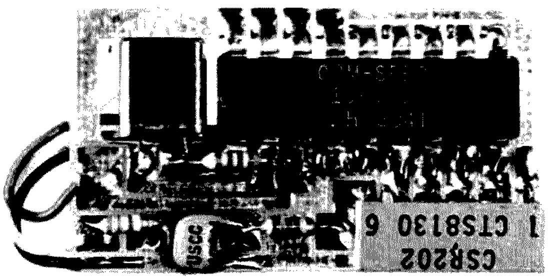
The standard model K5 is equipped with the Curtis 8044 chip. A second version of the unit (model K5B) uses the new Curtis 8044B IC which provides the squeeze-keying characteristics of the Ten-Tec, Heath, Nye, and Accukeyer. In these models, a squeeze released during a dot will automatically produce a following dash. Similarly, a squeeze released during a dash



The Polarizer from Luly.



The Lil' Bugger from Curtis Electro Devices.



Model SS-32M from Communications Specialists.

will produce a following dot. The standard 8044 produces nothing after a squeeze release. Squeeze-key operators are divided into two groups depending on how they learned, so the K5 series accommodates both. Non-squeeze operators can easily use either version.

The small size of the K5 plus the three-lugged leads provided for paddle connection allow the unit to be attached to the side of any standard paddle set with double-sided mounting tape. It is ideal for QRP, Field Day, DXpeditions, or regular station use. Provision for a straight key is also made.

For more information, contact *Curtis Electro Devices, Inc., Box 4090, Mountain View CA 94040.* Reader Service number 489.

TWO NEW VLF CONVERTERS FROM MFJ

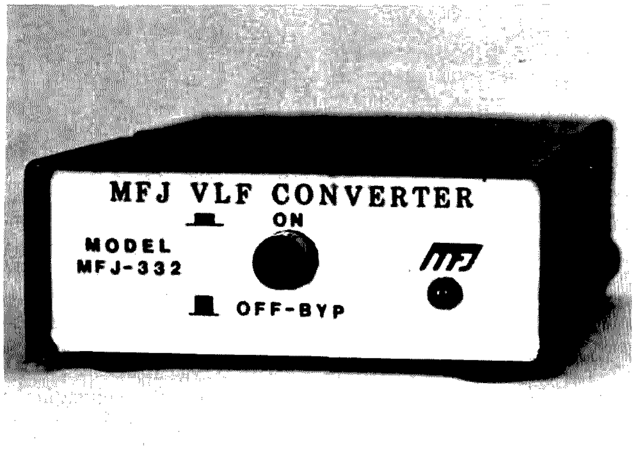
The MFJ-332 VLF converts an HF transceiver into a sensitive Very Low Frequency receiver. It converts 10 to 500 kHz to 28.010 to 28.500 MHz. The MFJ-331 SWL version converts 10 to 500 kHz to 4.010 to 4.500 MHz. Both give direct frequency readout on your receiver.

With a VLF converter, you can *hear WWVB*, ship-to-shore communication, navigation radio beacons, weather broadcasts, and even the standard AM broadcast band (with reduced sensitivity).

Both units easily connect between your transceiver/SWL receiver and antenna. Tuning between 28.010 and 28.500 MHz (4.010 to 4.500 MHz on the MFJ-331 version) lets you receive the longwave band from 10 kHz to 500 kHz. This gives direct frequency readout by ignoring MHz numbers. For example, 28.050 (4.050 MHz) is 50 kHz and 28.375 MHz (4.375 MHz) is 375 kHz.

There is a red LED that indicates "on." The unit is bypassed in the off position for normal operation. The MJF-332/331 VLF converters are housed in black and eggshell-white aluminum cabinets and require 9-18 V dc or 110 V ac with the optional ac adapter.

The MFJ-332 and MFJ-331 are available from *MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762.* Reader Service number 482.



MFJ-332 VLF converter.

CTCSS ENCODER FOR ICOM IC-2AT HAND-HELD

Communications Specialists introduces their new SS-32M micro-miniature programmable CTCSS encoder for use in the Icom IC-2AT hand-held. The unit is based on the popular SS-32 encoder and is programmable using jumpers. Measuring just 1.45" x .8" x .13", the SS-32M may also be used in other applications where size is critical.

For more information, contact *Communications Specialists, Inc., 426 West Taft Avenue, Orange CA 92667.* Reader Service number 488.

600 SERIES CES/MICROPAD

Communications Electronics Specialties introduces its new 600 series encoding micropad with DTMF ANI and numerous other features ideal for mobile amateur operations.

"The series 600 micropad," according to CES President Ron Hankins, "is compatible with any transceiver and offers a reliable and convenient design for the mobile radio operator, automatic PTT for 'one-handed' dialing, and ruggedized components."

The micropad incorporates a single-contact tactile keyboard for highest reliability. The series 600 is crystal-controlled and features a quality dynamic cartridge, adjustable tone level, and built-in tone monitor speaker. Noise-free dialing is made possible by a design element which mutes the microphone when the tone pad is in use.

600 series specifications include: 10-15 V dc; 13 mA operating current; −25° to 70° C temperature range; ANI speed of 5 tones/second, and an ANI capacity of 2 codes up to 15 digits each.

For more information on CES encoders and other quality CES products, contact *CES, PO Box 507, Winter Park FL 32790.* Reader Service number 487.

ICOM IC-3A/IC-3AT 220-MHZ HAND-HELD

Icom is very excited to announce a second cousin to the popular IC-2A series—the IC-3AT for coverage of the 220-MHz band. The IC-3AT is essentially identical in appearance, size, and operational features to the popular IC-2A series.

Most importantly, all accessories, including battery packs, chargers, microphone, etc., are completely compatible for the IC-2AT and IC-3A series, so a ham who has already invested in an IC-2A system with accessories can use those same accessories on the IC-3AT.

The IC-3AT also includes a 16-button DTMF pad. It covers the entire 220-MHz band from 220 MHz to 224.99 MHz and is set up for both repeater and simplex operation. The power output is nominally 1.5 W with the standard IC-BP3. The IC-3A system comes complete with IC-BP3 nicad battery pack wall charger, belt clip, rubber duckie, and wrist strap.

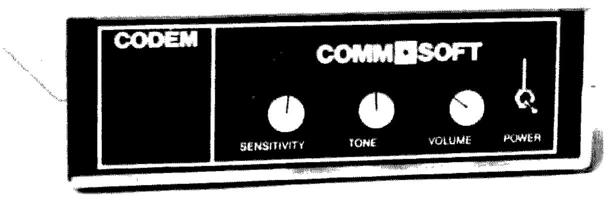
For more information, contact *Icom America, Inc., Suite 307, 3331 Towerwood, Dallas TX 75234.*

COMMSOFT CODEM

The COMMSOFT CODEM, a universal CW interface for personal computers, is now available for radio amateurs. The CODEM provides an easy way to get your Morse code software on the air. Converting received CW audio to RS-232 or TTL signal levels and RS-232 or TTL signal levels to transmitter keying, the CODEM doubles as a code practice oscillator and CW regenerator.

A sharp 800-Hz bandpass filter, AM detector, and low-pass filter are designed into the CODEM to provide outstanding noise and QRM rejection. CW can be monitored using an internal 2" speaker or an external high impedance earphone. Front-panel sensitivity, tone, and volume controls are provided. The CODEM comes with a comprehensive manual which includes operating details and connection instructions. The CODEM requires an external 9 V dc power supply.

For more information, contact *COMMSOFT, 665 Maybell Avenue, Palo Alto CA 94306.* Reader Service number 483.



CW Interface from COMMSOFT.

Model 2020 DMM from Sabtronics.

CODE SOFTWARE PACKAGE FROM COMMSOFT

Hams who own Heath computers can send and receive Morse code with the new CW89 software package from COMMSOFT. The program includes a split screen display, 4-99 wpm operation, receive autotrack, a 1000-character pretype buffer, 10 user-definable messages, unique break-in mode, on-screen system status, disk I/O, hard copy, and a versatile code practice section.

The CW89 program runs on the Heath H-8/H-19, H-89, or Zenith Z-89 computers under HDOS. One disk drive and 32K RAM are required. A hardware interface, such as the COMMSOFT CODEM, is also required. A complete package consisting of CW89, the CODEM, a computer interconnect cable, power supply, complete documentation, and shipping is available. For more information, contact *COMMSOFT, 665 Maybell Avenue, Palo Alto CA 94306.* Reader Service number 480.

REPAIR KITS FOR EIMAC TUBE SOCKETS

Varian Eimac announces PartsKits—emergency repair kits for popular power grid tube sockets used in many broadcast and communications HF/VHF transmitters worldwide.

PartsKits provide replacement items so the user can repair a damaged socket quickly and at a fraction of the cost of a new socket.

Presently available through franchised Varian Eimac distributors are PartsKit-300 for the SK-300/300A sockets, PartsKit-840 for the SK-840 socket, PartsKit-1300 for the SK-1300/1320 sockets, and PartsKit-1500 for the SK-1500/1510 sockets.

For more information, contact Bill Orr, *Varian Eimac, 310 Industrial Way, San Carlos CA 94070.* Reader Service number 485.

DMM FOR MICROPROCESSOR INTERFACING

Sabtronics announces their new model 2020 digital multimeter with microprocessor interfaces to adapt to all the popular home/personal computers.

Combining a high-quality multimeter with a microprocessor interface expands the Sabtronics product line to provide new, cost-effective solutions to data acquisition problems.

The model 2020 DMMM has an impressive 0.1% basic dc accuracy with 3½ digit large LED display for normal bench use. The new DMM is capable of directly measuring ac and dc volts up to 1000 V, Ohms to 20 megohms, and ac and dc current to 10 Amps.

Optical coupling between the DMM and the computer protects the computer from damage and also serves to isolate ground noises that can affect sensitive measurements. The model 2020 DMM will mate with most popular computers.

For more information, contact *Sabtronics International, Inc., 5709 N. 50th St., Tampa FL 33610.* Reader Service number 484.

FCC

BEACON EXPERIMENT AUTHORIZED FOR 10, 18, AND 24 MHz

The Federal Communications Commission has authorized the establishment of an experimental radio beacon on the bands 10.100-10.150, 18.068-18.168, and 24.890-24.990 MHz, these being the bands allocated for amateur radio use by the World Administrative Radio Conference, Geneva, 1979. The experiment is intended to permit amateurs to become familiar with the characteristics of these bands, simplifying the scheduled future changeover to amateur use, to improve amateur use of these new parts of the spectrum, and to provide data on sharing between different services. An important element is securing data on propagation under weak signal conditions, typical of natural disaster situations. It will be recalled that this use is one of the major reasons for these new authorizations, the first in many years.

The experiments will include two emission types, three operating modes, and two time phases. Basic emission is unmodulated carrier (A0), interrupted each ten minutes for an SSB (2.8A3J) identification and announcement, this occurring at 2, 12, 22, 32, 42, and 52 minutes past the hour. Announcement will be of the form: "This is FCC authorized experimental station KK2XJM, Daytona Beach, Florida. QSL via W4MB. Next operation will be repeated on ______ MHz starting on ______," and will be repeated.

Initial operations will be at 3 Watts ERP, on 10 MHz, commencing about the first of October. In stages, the schedule depending on results, operation will include 18 and 24 MHz. Later phases will include operation at 30 Watts ERP, with sequencing from band to band, sometimes weekly, sometimes daily, as

needed to make optimum use of the bands for propagation experiments, worldwide and to specific areas.

Licensee for the experiment is Robert P. Haviland, amateur call W4MB. The success of the experiment depends on participation by amateurs and SW listeners, and on their reports. Information needed is date, time, and location of reception, strength of signal and of other signals on the band, and nature of the receiving installation. All reports will be acknowledged by QSL.

In addition to reception reports, proposals for special tests will be welcomed, subject to the limitations imposed by the license and by regulations for experimental stations. At this time, there is no authorization for communication with amateur stations.

Reports, requests for schedules, and proposals for experiments may be sent to W4MB at the *Callbook* address, or to R.P. Haviland, 2100 South Nova Road, Box 45, Daytona Beach FL 32019.

ID RULE CHANGES

On October 1, the FCC announced a change to 97.84, the rule dealing with identification of an amateur station. Section (a) of 97.84 has been changed to read:

"Each amateur radio station shall give its callsign at the end of each communication, and every ten minutes during a communication."

The change deletes the requirement for giving the callsign of the other station at the end of the contact. However, *both callsigns must be given at the close of any communication involving international third-party traffic.*

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
4006 Winlee Road
Randalistown MD 21133

The original Wahl cordless clipper.

Let me take a look outside, at December in Maryland. Hmm. . . "The weather outside is freezing, and the RTTY machine is teasing. So since you've got nothing to do, call CQ, call CQ, call CQ!" Here we are again, with the holiday season fast approaching. Last year, I described several gift suggestions designed to gladden the heart of any RTTYer. By your response, I see that this outing was well appreciated. Let's do it again right now.

I'm going to start by telling a story. Once upon a time, oh, say about 1968, a company out in Sterling, Illinois, introduced a cordless hair trimmer to the barbers and beauticians. Featuring a nifty little case which housed a nickel-cadmium battery, it dropped into a stand into which a charger was built. Convenient, portable, and well designed, the clipper was an immediate success in the industry.

The company then decided to look around to see what other uses this little dynamo could be put to. Not having any preconceived notions, the engineers added a resistive element across the battery and came up with a cordless rechargeable soldering iron. Not only the company's own marketing people, but also many others greeted this new device with less than total enthusiasm.

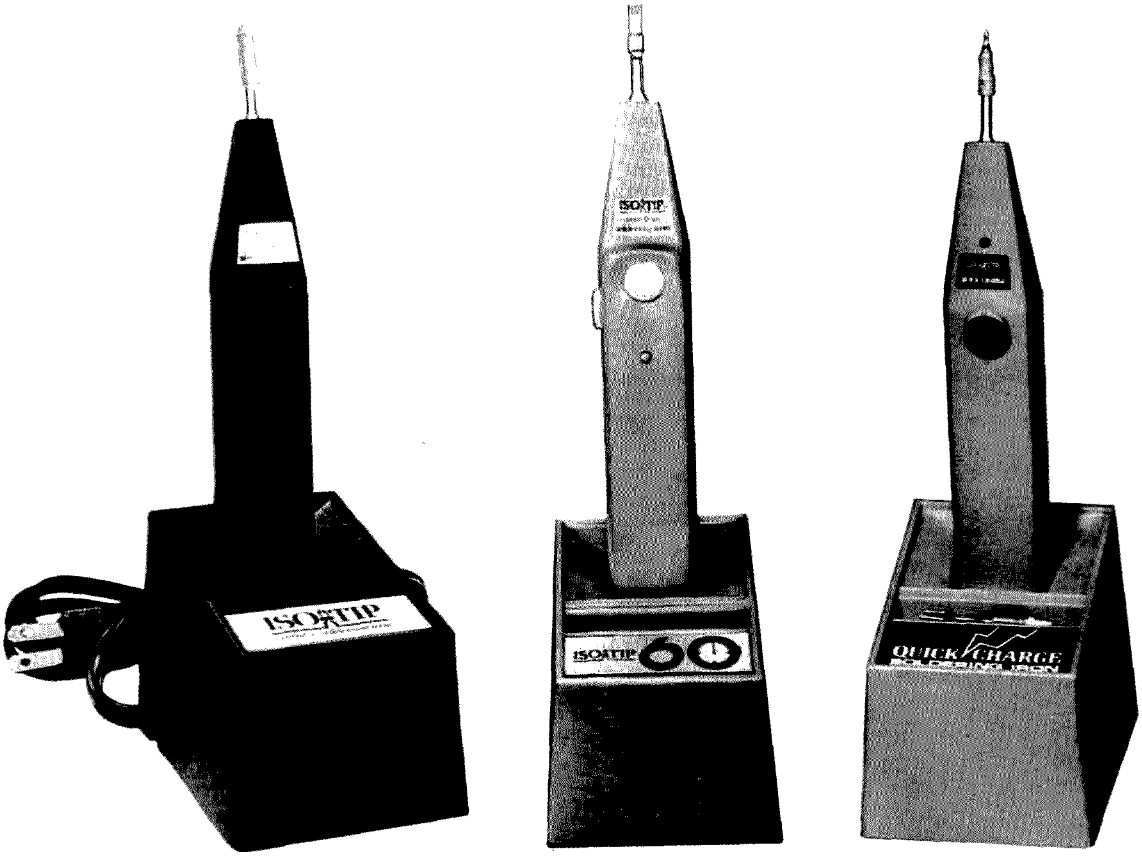
Nonetheless, in late 1971, the Wahl Iso-Tip cordless soldering iron was introduced. By mid-1972, the product began to trickle down to consumers and we hams became the biggest boosters. For working on printed circuit boards, especially with static-sensitive components, the Iso-Tip is hard to beat. Because it is not connecting to the line, the possibility of passing through a charge is minimized. Sitting in its charger, the iron is always ready, reaching soldering heat within seconds. My iron quickly became one of the most used tools in the shack, whether for revising a circuit board, fixing a plug, or using the built-in light to illuminate the recesses of a piece of equipment.

Since that time, the R & D boys at Wahl have not stood still. The original iron took 12 to 16 hours to fully charge. This is fine if all you are going to do is an occasional job or two. The capacity of the iron, fully charged, is about 125 solder joints. So, if you have to hot-wire a board or fix a chip, all is well and good. But there is no way to build something complex, without stopping after an hour or so for recharging. A "quick-charge" model was then introduced, which charged to capacity in three to four and one-half hours. By dropping the iron into the recharger between joints, larger jobs became more practical. The latest development along these lines came in 1977, when the "Iso-Tip 60" was introduced. This one will charge in only one hour, enough to keep anyone happy.

Continuing the search for innovative uses for that nickel-cadmium battery, other items have been added to the line. A nifty little drill is available that slips over the top of any of the soldering irons. The drill holds a fine bit ideal for drilling out holes in printed circuit boards. Automobile battery charger cords and various soldering tips and bits round out the portable line.

That nice little drill, by the way, is also produced in a self-contained version, powered either by a transformer from the ac mains or an automobile battery. Another fine addition to the line.

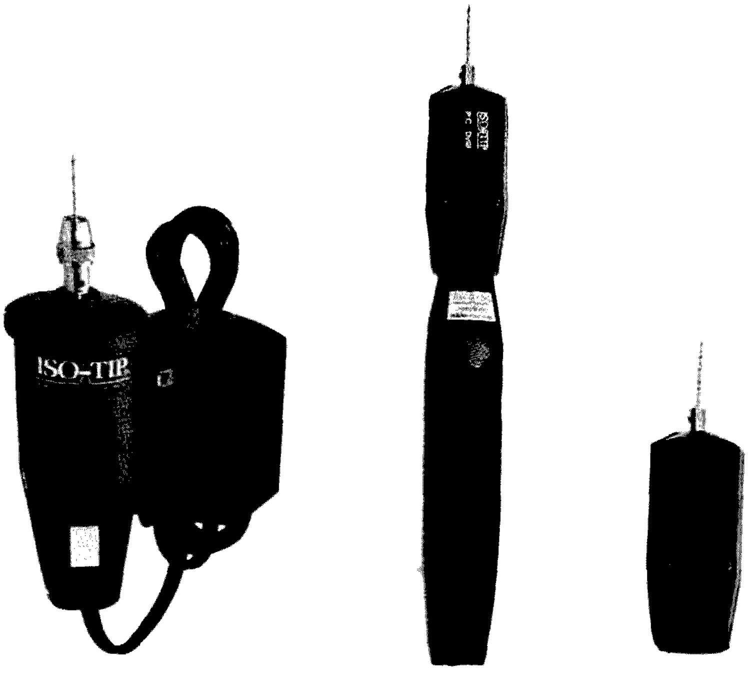
When looking for a gift idea to satisfy the ham involved in RTTY



The Wahl Iso-Tip line.

or computers, this line may just turn the trick. Prices range from a few dollars for a soldering tip to under thirty dollars for the basic iron with drop-in charger. The quick-charge iron is about five dollars more, and the drill attachment about twelve. Look for them at your local dealer, or write to the Wahl Clipper Corporation, 2902 Locust Street, Sterling IL 61081. Be sure to tell them you read about the Iso-Tip here, in *73 Magazine*'s RTTY Loop.

In the market for something a bit more, shall we say, meaty? How does this strike you: a hard-limiting FSK demodulator, capable of handling 170-, 425-, and 850-Hz shifts; of interfacing with 20-mA or 60-mA loops *or* RS-232 *or* TTL-level logic; with autostart and built-in tone keying; all in a case two-thirds the size of this page and costing under $250? Well, it strikes me just fine, and I call it (or more properly IRL calls it) the FSK-500. This demodulator looks like the way to go for the ham looking for a compact but effective unit for a modern RTTY station. Next month I will



The Wahl printed circuit drill.

go over this beasty in detail, but if you want to pick one up now, I am sure that the folks at iRL would be happy to oblige. Drop them a note at iRL, 700 Taylor Road, Columbus OH 43230. Don't forget to plug RTTY Loop, OK?

Now, let's look at a new RTTY activity. The Chicago Area RTTY Repeater Society (CARRS) has announced its first RTTY Art Contest. Running from November 1, 1981, through February 28, 1982, the contest seeks new RTTY art. All entries must be original to licensed radio amateurs and their immediate families and must not have been transmitted before November 1, 1981. Entrants must supply one unspliced five-level tape and three prints for each entry submitted. Format specifics include no limit on running time and a maximum of 72 characters per line. Entries must be compatible with machines running "downshift-on-space." Each line should be terminated with a minimum of three functions: CR-LF-LTRS sequence. Entrants agree that the submitted picture(s) may be used, duplicated, and published for any purpose by CARRS.

Judging will be by the CARRS Board of Directors and will be based on originality and technique. The winning entry will earn the winner a reconditioned Teletype® ASR-33 complete with modem, FOB Chicago. Send entries to Howie WA9KEK, 1752 North Austin Avenue, Chicago IL 60639.

As I mentioned a few paragraphs ago, the FSK-500 will be on tap for next month. Never one for organization, I might just scrape up another item or two—you'll have to wait and see. You never know what might turn up here, in RTTY Loop.

CORRECTIONS

Several readers have pointed out a potential problem using my program for transmitting and receiving Morse code with the TRS-80 Level I, appearing in the September issue ("TRS-80: Your Electronic Brasspounder").

If the program is to be used only for transmitting code from the keyboard without first connecting the 1NS8255 interface represented in Fig. 10 (page 94), the program will lock up within the downtime loop between memory locations 4607h and 4614h of Fig. 3 (page 91). This problem may be solved by substituting a JP TX statement for the CALL SKEY statement appearing at memory location 4583H. The resulting line would then appear as:

```
4583   C34047   JP TX
;Jump around SKEY
```

If at a later date you wish to utilize the receive program, the statement may be reinserted without any difficulty.

I have failed to provide the pin connection of pin 6 of the 1NS8255. This pin is the chip select, and for my purpose I have tied it to pin 7, making the chip always selected.

There have been inquiries as to whether I have modified the program for Level II. The modified program has the following improvements made to it:

- The buffer space is cleared to prevent a garbage, end of buffer, flag from being inserted.
- The video screen is cleared on program entry.
- Return to BASIC is allowed from the program.
- The operator is given a prompt for message entry.
- Program is written in Assembly language using Radio Shack's Editor/Assembler.

Anyone interested in obtaining a source listing may write to me.

Donald C. Downs N0AGX
1705 S. 5 Street
Marshalltown IA 50158

OSCAR ORBITS

SATELLITE NEWS

UoSAT-OSCAR 9 Launched

Satellite enthusiasts now have another "amateur" bird to chase. UoSAT, a British satellite that combines research and amateur applications, was successfully launched early on the morning of October 6. Listeners were able to copy a signal from UoSAT's two-meter beacon, starting with the first orbit. Once aloft, the satellite was dubbed the "UoSAT-OSCAR 9 spacecraft."

UoSAT is not a communications satellite but it will be transmitting on a variety of amateur frequencies. For a more complete description of the satellite's capabilities, which include slow-scan television, see "Phase III and Beyond" on page 96 of the September, 1981, issue of *73*.

OSCAR 8 Still Flying High

Despite the demise of OSCAR 7, hams are still communicating via satellite. Recent accomplishments made via the OSCAR 8 satellite include the first mode J Worked All States Award which is credited to WA6GVS. Following on his heels, W7UFE completed mode J W.A.S. In doing so, he has become the first person to accomplish W.A.S. on each of the satellite modes, A, B, and J.

The DX scene was busy, too, with a record-setting mode J QSO between W4AUZ and GM4IHJ. Details about tracking OSCAR 8 can be found in the November issue of *73*.

Phase III Looking Good

Plans are being made for the launch of Phase IIIB, a replacement for the ill-fated original Phase III satellite. The third test of the Ariane rocket was a success, representing a tremendous breakthrough after Ariane's failure on May 23, 1980. AMSAT officials are preparing for a Phase IIIB launch in the fall of 1982. For more details about the Phase III program and other aspects of the amateur satellite service, contact AMSAT, PO Box 27, Washington DC 20044.

An error crept into the calculation of the OSCAR orbits published in the October and November issues of *73*. As a result, the equatorial crossing times are incorrect. Hopefully, the December predictions represent a great improvement in accuracy.

ORBITAL INFORMATION

OSCAR 8 ORBITAL INFORMATION FOR DECEMBER

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
19063	1	0113:10	84.2
19077	2	0117:44	85.3
19091	3	0122:18	86.5
19105	4	0126:53	87.7
19119	5	0131:27	88.9
19133	6	0136:01	90.0
19147	7	0140:35	91.2
19160	8	0001:58	66.6
19174	9	0006:32	67.7
19188	10	0011:06	68.9
19202	11	0015:40	70.1
19216	12	0020:14	71.2
19230	13	0024:48	72.4
19244	14	0029:22	73.6
19258	15	0033:56	74.7
19272	16	0038:30	75.9
19286	17	0043:04	77.1
19300	18	0047:37	78.3
19314	19	0052:11	79.4
19328	20	0056:45	80.6
19342	21	0101:18	81.8
19356	22	0105:52	82.9
19370	23	0110:26	84.1
19384	24	0114:59	85.3
19398	25	0119:33	86.4
19412	26	0124:06	87.6
19426	27	0128:40	88.8
19440	28	0133:13	89.9
19454	29	0137:46	91.1
19468	30	0142:20	92.3
19481	31	0003:42	67.6

OSCAR 8 ORBITAL INFORMATION FOR JANUARY

ORBIT #	DATE	TIME (GMT)	EQ. CROSSING (DEGREES WEST)
19495	1	0008:15	68.8
19509	2	0012:49	70.0
19523	3	0017:22	71.1
19537	4	0021:55	72.3
19551	5	0026:28	73.5
19565	6	0031:01	74.6
19579	7	0035:34	75.8
19593	8	0040:07	77.0
19607	9	0044:40	78.1
19621	10	0049:13	79.3
19635	11	0053:46	80.5
19649	12	0058:19	81.6
19663	13	0102:52	82.8
19677	14	0107:25	84.0
19691	15	0111:57	85.1
19705	16	0116:30	86.3
19719	17	0121:03	87.4
19733	18	0125:36	88.6
19747	19	0130:08	89.8
19761	20	0134:41	90.9
19775	21	0139:13	92.1
19788	22	0000:35	67.5
19802	23	0005:08	68.6
19816	24	0009:40	69.8
19830	25	0014:13	71.0
19844	26	0018:45	72.1
19858	27	0023:17	73.3
19872	28	0027:50	74.4
19886	29	0032:22	75.6
19900	30	0036:54	76.8
19914	31	0041:26	77.9

HAM HELP

I would greatly appreciate any information (schematics, service manuals, performance improvement, etc.) on the following equipment:

a) Clegg Thor 6 transceiver;
b) Simpson Model T marine transceiver;
c) Konel Gemini III marine transceiver;
d) Johnson Ultracom 30-50-MHz FM transceiver;
e) Lafayette PB-50 30-50-MHz FM receiver.

I will copy and return manuals and refund postage costs. Thank you.

Gary B. Trustle WB8SPV
424 Franklin Ave.
Waverly OH 45690

Help, help! We have a Telrex beam, Model TBS-308, and need any information available on assembly details to permit correct operation on certain frequencies. It is a tri-band beam, traps *and all*, apparently two elements on each band. Any data would certainly be appreciated. Telrex Labs does not have data on this old a beam. I will cover any duplication costs if required and postage. Thanks for any help.

Paul Wiegert W8TH
1205 E. Franklin Street
Centerville OH 45459

I need manuals/schematics for the following units: EICO 752 dc power supply, Standard Communications SR-C803L VHF FM transceiver, Triplett 3434 TV-FM sweep/marker generator, and Clegg HT-146 2-meter handie-talkie.

I would prefer to buy, or copy and *return your* original, especially on the HT-146 as Clegg does not have an original. And does anyone have a battery for the Clegg?

John E. Carter WB4HLZ
2822 Rolling View Drive
Smyrna GA 30080

✓See List of Advertisers on page 162

TR-7730 *from page 27*

doesn't help matters much, but under most daylight conditions, the display is pretty hard to read. The other two problems I encountered involve the scanning circuit. There are an awful lot of 5-kHz split repeaters out there now, and it would be useful if the band-scanning circuitry stopped with the discriminator centered. There are currently only two rigs available that offer this feature (that I am aware of)—the Azden and the KDK 2025. Finally, for some reason the rig scans much slower in the memory-scanning mode than in the band-scanning mode. It should be easy to speed up the scan rate; the first person to come up with a good mod is guaranteed an article in *73!*

These last two points are purely personal opinion, and others may never complain. The dim display is another matter and has plagued almost every two-meter rig I have used. It's time for the industry to correct this problem. I'd like to see a blue display like the one on the TS-830S, with a dim switch for nighttime driving. I realize that it would be expensive, but the ultimate solution might be a light-sensing circuit like the one found on the IC-701.

Conclusions

Simply stated, the Kenwood TR-7730 is one of the best two-meter FM rigs for mobile operation I have used. I have used rigs that offered more features, rigs with better receivers, and rigs with brighter displays, but I have yet to test anything that combines the features, performance, compact size, and reasonable price of the TR-7730. For home use I might prefer something with more memories, like the new KDK, the TR-7850, or the Azden. For installation in the small cars that Americans are wont to buy, the TR-7730 is sublime.

For more information, contact *Trio-Kenwood Communications, Inc., 1111 West Walnut Street, Compton CA 90220.* ■

KAHANER REPORT

Larry Kahaner WB2NEL
PO Box 39103
Washington DC 20016

CORRECTION

For those of you who wrote to me about my column on competition for AT&T in the local and long-distance market (Oct., 81), I noticed the error also. Seven digits comprise a local phone number, not five as mentioned.

STALKING THE WILD BUCK

The buck never stops anywhere in Washington. It just kind of makes the rounds.

The FCC complains it lacks the power to do its job. It says the Communications Act of 1934 is too out of date to allow the Commission the legal leeway it needs to cope with our new technological age. The Act never envisioned millions of private radio users, large numbers of radio and TV sets, and an era where information would be a money-making, fast-trading commodity like rice and wheat.

According to the FCC, the Act doesn't give it permission to pull licenses of violators—they must trek through lengthy court proceedings—or set minimum standards for receivers making them less susceptible to interference.

Congress, on the other hand, has tried to rewrite the Act every session for the last 10 years, but so far has only succeeded in tacking on some satellite amendments in the early 1960s. In addition, Congress complains that the FCC doesn't use the powers it does have under the Act and is afraid to flex its muscles fearing some court will overturn the administrative decisions. The bickering is boring.

During the peak CB surge of 1977, the Commission logged more than 110,000 interference complaints. About 85% were traced to CBers overloading nearby TVs or assaulting them with harmonic radiation. Since then, the average number of complaints has never dipped below 80,000 per year. And that's half the actual count; the FCC estimates that that figure represents less than half of interference incidents.

Again the FCC laments that it doesn't have the legal right to set minimum standards for TVs. Congress doesn't amend the Act, so nothing happens at all.

But although the FCC supposedly wants that power, and some others, it's not helping Congress to rectify the situation.

In 1978, the FCC launched an inquiry into interference. It was to be the final word on the subject. Part of the reason for the investigation was to present Congress with facts about interference so when the time came for it to tackle the problem, the lawmakers would be well prepared.

The unfinished 3-year-old report, broached at a recent FCC meeting, stated: "Minimum standards for receiving equipment might be necessary." It offered no details, no technical standards.

FCC commissioner James Quello angrily referred to the sparse report during the June 17 meeting and said: "There hasn't been any movement since 1978, and the interference is getting worse. How many more years do we need?"

The Commission wanted to present the report to Congress in response to several recurring bills to regulate TV susceptibility to interference. Congress asked for FCC comments and guidance and this report was supposed to supply it. Said Quello: "And what do we tell them [Congress]?"

Commissioner Anne Jones responded sadly: "Let's start with an apology."

Even though the FCC is supposed to know more about communications than any other governmental agency, their input to Congress in this case appeared minimal.

This year, Congress seems closer to revamping the Communications Act than during any other session. Although most of the bill—commonly referred to as the Domestic Telecommunications Act of 1981 (S-898)—deals with common carrier and broadcast matters, some provisions affect hams, CBers, and other private radio licensees.

Now that the bill heads for the Senate floor, the FCC has jumped up and put in its 2 cents worth. If the FCC suggested any courses for Congress to follow during the writing, the lawmakers certainly didn't pay that much attention. Some FCC suggestions—called amendments—deal with semantics, others with substance.

Without going into the bill's details, here are some FCC amendments submitted to Congress:

- Give the FCC permission to employ volunteer amateur radio operators to administer tests to those seeking licenses of equal or lower rank.
- Allow use of volunteer hams and CBers to monitor airwaves for violations.
- Permit aliens to obtain operator licenses.
- Allow elimination of CB licenses.
- Allow suspension of licenses of those who aid and abet violators.
- Allow the FCC to issue cease and desist orders in cases of safety.

The FCC proposes many other items, but these most directly impact hams and CBers.

You might know that the FCC doesn't need Congressional mandate to permit volunteer license proctors. General class license holders and above now administer tests to Novice hopefuls. Nor does the FCC need permission to allow aliens to hold licenses. It does that now in some cases.

So, why bother? For one thing, a bill reassures the FCC that it really has all that power. Secondly, the Act ties it all up into one neat bundle, and the FCC doesn't have to take it upon

LATEST RECIPROCAL LICENSING AGREEMENTS

Hare's an updated reciprocal licensing/operating list:

Argentina	Italy
Australia	Jamaica
Austria	Jordan
Bahamas	Kiribati
Barbados	Kuwait
Belgium	Liberia
Bolivia	Luxembourg
Botswana	Monaco
Brazil	Netherlands
Canada	Netherlands Ant.
Chile	New Zealand
Colombia	Nicaragua
Costa Rica	Norway
Denmark	Panama
Dominican Rep.	Paraguay
Ecuador	Peru
El Salvador	Philippines
Fiji	Portugal
Finland	St. Lucia
France	Seychelles
West Germany	Sierra Leone
Greece	Solomon Islands
Grenada	Spain
Guatemala	Surinam
Guyana	Sweden
Haiti	Switzerland
Honduras	Trinidad & Tobago
Iceland	Tuvalu
India	United Kingdom
Indonesia	Uruguay
Ireland	Venezuela
Israel	Yugoslavia

LATEST THIRD-PARTY AGREEMENTS

The FCC issued an updated third-party list:

Argentina	Haiti
Bolivia	Honduras
Brazil	Israel
Chile	Jamaica
Colombia	Jordan
Costa Rica	Liberia
Cuba	Mexico
Dominican Rep.	Nicaragua
Ecuador	Panama
El Salvador	Paraguay
Gambia	Peru
Ghana	Trinidad & Tobago
Guatemala	Uruguay
Guyana	Venezuela

Also, ITU headquarters in Geneva, station 4U1ITU

itself, administratively, to change any regulations.

No one knows if the bill will pass, even though it seems well on its way. However, if it speeds towards the president for his signature, there's no guarantee that Congress will slow down and consider the FCC proposals.

At presstime, the Senate unanimously passed bill S-929 which gives the FCC absolute authority to set minimum standards for TV sets and other receiving equipment. Titled Amateur Radio Service and Private Land Mobile Services Act of 1981, the bill won't apply to existing equipment.

Other sections: License terms raised from 5 to 10 years, hams and CBers permitted to monitor the airwaves in their own services for violators, and hams may administer licensing tests.

The bill passed the Senate only after it added an amendment giving the FCC permission to eliminate CB licenses.

FCC chairman Mark Fowler lobbied for and received the last concession. He wants the Commission out of the CB licensing business and claims the move will save the FCC more than $½ million a year.

No one is sure if that bill will pass either.

Note the wording in each bill. Each gives the FCC permission to do all these new things, but doesn't force it to do so.

Perhaps it doesn't even matter. Each side has excellent excuses for not doing anything and neither wants to jeopardize that safe position. Make no decisions, make no enemies.

And the buck just keeps on passing.

LOOKING WEST

Bill Pasternak WA6ITF
c/o The Westlink Radio Network
Suite 718
7046 Hollywood Blvd.
Hollywood CA 90028

A CHRISTMAS PRESENT: SANTA BARBARA'S SUCCESSFUL REPEATER

We begin this year's Christmas special with a true success story, the story of a two-meter repeater located near the city of Santa Barbara, California. What puts this system a cut above the rest? Think in terms of other stories you have read in this column—stories depicting the rise and fall of other repeater systems. Also remember that the 2-meter FM scene in southern California has never been very stable. Rather, it's factionalized. Where else in the nation are 146.34/.94 and 146.16/.76 still simplex channels for the most part? Yet the WR6ANW repeater has survived and prospered. Not because it's away from Los Angeles proper, but rather because things were done right to start with. Here is the story as told by Jay Hennigan WB6RDV in the June, 1981, issue of *Key-Klix*, the monthly newsletter of the Santa Barbara Amateur Radio Club.

A HISTORY OF K6TZ/R

A Gift from Delco

The SBARC 2-meter repeater had its humble beginnings as a portion of a gift of surplus Motorola radio equipment donated by Delco Electronics. The equipment consisted of two 150-MHz dish antennas. All of the above was immediately scattered throughout the county, with the majority winding up in the garage of WA6OOO on Palisades Drive. This arrangement made it rather difficult for Darryl to put cars in his garage, considering that a certain individual had a Progress-Line autopatch and a jukebox or two stashed there as well. The dishes, and a lot of the less-immediately-usable gear, wound up in the backyard of Sonatech, Inc., work QTH of WB6RDV, WA6OQZ, and WA6LWJ.

Where to Put It?

Obviously, such a generous gift was destined to become a 2-meter repeater. The only remaining questions were at what location and on what frequency. Several physical locations were scouted out, with the final location picked as the city radio site on Lavigia Hill on the Mesa. One thing the city required was a statement by a licensed civil engineer that our tower, identical to several other towers installed by the city at the same location, would not fall down. This survey was provided free of charge by Dave Harris, father of KA6OFZ. The next question was one of frequency. Some people within the club felt that our repeater should be on a "common pair" such as 146.34/.94 or .16/.76. In those days, 99-plus percent of amateur 2-meter gear was crystal-controlled, which resulted in a conflict between having the repeater on one of these "common" frequencies, making it available to most amateurs passing through town, and the refusal of several hundred southern California FM pioneers to give up .94 and .76 as simplex frequencies. The club looked into several other pairs and eventually a tape recorder was installed at the site to listen to two different frequencies as possibilities (146.19 and 146.22). The selec-

tion was 146.19, having the least co-channel interference, and a sanction was received from the Southern California Repeater Association for its use. The club now had a location and a frequency. All that was needed was some personpower and a license.

A Taste of Root Bear

In the good old days, licensing a repeater was about as much of an ordeal as licensing a nuclear power plant is today. The FCC required numerous drawings, sketches, schematics, and calculations, and it seemed as if they were sadly lacking in the people needed to review and process all of this material. A thick packet was sent to Washington by the club's technical committee, and as we waited we were not idle. The duplexer, antenna, and tower were ordered and received, along with some 75-Ohm hardline, which was definitely *not* ordered. A call to the manufacturer revealed that it was their goof. UPS and the post office refused to carry the stuff back to LA for exchange, although it would and did fit in the back of a VW. Winnie, now KA6OFZ, ran it down to LA for exchange. After what seemed like an eternity with no word from the FCC, K6YX, our then-trustee, called on them in Washington (in person) and was informed that the license had been processed with a call of WR6ANW. The identifier was programmed and the repeater was tested. When the license arrived in the mail, it had the call of WR6ANW and the root-beer box was born.

Out of Control

Although we now had a working repeater, there was no way to control it. The club had installed a telephone line at the site for a dial-up control system, but no such control system had been built. The trustee stated that if there was no control system by January of 1977, the repeater would go off the air. WB6RDV and company worked feverishly on New Year's Eve and came up with a dial-up control system. No tone decoders were available at the time, so the control codes consisted of dialing an unlisted phone number. One call would turn the repeater off and the next call would turn it back on. Every so often, the repeater would mysteriously go off the air due to someone dialing a wrong number. This "temporary" control system was upgraded with the addition of some touchtone™ decoders to give a more positive on-and-off command, and was to be replaced when the new cactus-style control system was completed. Parts were ordered and meetings held with Alan Burgstahler WA6AWD, who agreed to sell us blank PC boards and plans to build the sophisticated control system that we have today.

The boards were farmed out to many club members for drilling and stuffing with parts. The temporary control system, it seemed, was going to be rather permanent as progress on completion of the new control system was exceedingly slow. A new receiver was donated by Dean Dods WB6IYW and installed to cure several problems which were developing with the old tube-type receiver. It became evident that the newness was wearing off and several corrective maintenance items were necessary. Our new antenna was taken down for repairs and the duplexer had one cavity go bad (which was sent back to the manufacturer). In addition, the city was in the process of expanding their building right over the area where the repeater was located. A work party retrenched the antenna cable and the repeater was moved to a wooden pallet about 10 feet from its former location. The electric power and telephone line were brought out by extension cords draped through the bushes, and the "temporary" control system was still in operation some three years later.

The Housing Crunch

It became obvious that some sort of permanent structure would be necessary to enclose the repeater. SBARC went to tremendous effort to build a very rugged plywood box large enough to enclose the repeater and duplexer. The box was delivered to Valley Telecom, Inc., the new business of WB6RDV, and it is still there. In the interim, the city had agreed to provide a separate building for the SBARC repeater. At some time during this period, the WR6ANW callsign expired and the new club call of K6TZ/R was programmed into the repeater.

The New Machine

As time took its toll on the older equipment and more frequent repair trips became necessary, it became obvious that the good old root-beer box might not stand up during an emergency. In addition, the club wanted features such as autopatch. A grassroots fund raising was spearheaded by WB6OBB and N6CPN and the club ordered a new all-solid-state GE repeater. The pace picked up on completion of the cactus control system. The new machine arrived and was installed in its new house, originally without the new control system. FCC rules had relaxed, allowing automatic repeater control, and the temporary control system was laid to rest along with the original repeater. The cactus control system, finally complete, was installed along with a 440-MHz control receiver and temporary autopatch on loan from W6YJO. The new control system functioned well for a time but was damaged by a nearby lightning strike during a storm. We are currently operating under automatic control once again.

The Future

Most of the problems with the control system have been repaired and a new, more sophisticated autopatch is in the design stage. The repeater now has full battery standby power as well as standby ac power provided by the city generator. The new control system is expandable to fulfill future needs, and the basic repeater has proved to be a very reliable machine. The SBARC repeater fund is still attempting to recover from the purchase of the new machine, and future improvements will be made as funds become available.

CHRISTMAS IN THE CITY OF THE ANGELS

I guess you all know that this is a special time of year. Even here in Los Angeles, most of the major thoroughfares are alive with holiday decorations and the spirit of the season is in the air. Also, on the air. Shortly, it will be time for "Operation Santa Claus 1981," in which amateurs from all over the area take their portables and hand-helds into local hospitals so that children confined in those institutions can get their chance to communicate with Jolly Old St. Nick.

We have written about this topic before. We told you how it was started more than 20 years ago on the old Mt. Wilson WA6TDD repeater by W6AOP and K6SJJ, among others, and how this event has withstood all forms of adversity over the years, including some organized jamming in recent times. No matter what, "Operation Santa Claus" will happen. It's become as important a Los Angeles area tradition as the decorations along Wilshire Boulevard. It will happen again this year, and it will succeed again this year.

Most hams belong to one or more radio clubs in their area. I wonder how many of you have ever thought of undertaking a project like "Operation Santa Claus," but failed to bring the idea to the attention of the rest of the members. True, it's a lot of work. You can't expect to start on Sunday with planning and be ready to roll the following Wednesday night. The logistics of this kind of operation are such that very careful consideration must be given to every detail. The obvious first step is to make contact with the hospitals in your area and simply offer the concept. Since this might be a bit of a job in itself, do give yourself ample lead time. Right now is a good time to plan for next year. The hardest part will be reaching the proper official with the power to make a decision. You may have to work through an intermediary, but if you've got the tenacity and can be convincing enough, you will probably get the green light. A good argument in favor of the project is the longevity of the Los Angeles area operation.

Next, you must select your operating mode. Here VHF and FM are naturals. This is because of the lightweight portability of equipment and the fact that no connection to power mains is needed. Avoid hand-helds unless they are equipped with external speaker-microphones. Many of the kids you will visit may not be ambulatory. As you know, using a hand-held while lying flat on your back is not the easiest thing to accomplish even for the trained operator. Now think of trying to be station in control for an invalid child who has never before seen a hand-held. If you don't have a speaker-mike for your rig, you might pluck that old TR-22 out of the closet and blow off the cobwebs. Radios like the TR-22, TR-33, and TR-2200 are best for this type of operation.

It's also necessary to avoid massive equipment installations which require outdoor antennas and connections to the ac power mains. If your particular site dictates that you must operate from a fixed location using ac power, be sure that all equipment is grounded properly using 3-wire line cords. Do not try to cheat the system with adapters and the like. Besides the fact that most hospitals will not permit this in the first place for safety reasons, you run the risk of personal liability if someone should be injured as the result of your negligence. Remember: You may be performing a public service, but you are still someone else's guest and you live by their rules.

What about Santa Claus himself and his North Pole home? Where should he be located? You play this one by ear. In Los Angeles, a large number of hospitals are visited every year. It would be all but impossible for Sid McCormack W6BWC, who is our Santa, to visit each. Sid operates from a centralized North Pole and communicates over a system of intertied repeaters to hospitals as far to the east as Riverside, to the west to the ocean, and to the south half the distance to San Diego. The logistics of the LA Operation San-

ta Claus seem to grow each year, but each independent geographic area and involved club will have to decide what's best for itself.

For example, if you can only visit one hospital, Santa can be on site. That is either in a vacant room, in his mobile, or anywhere near enough for full-quieting simplex operation. It's lunacy to tie up a busy repeater for an evening if Santa and his flock are within a few yards of one another. Also, avoid unintentional interference from outside. Stay off .52 or any other heavily used simplex frequency in your area. Choose some oddball away from the mainstream of 2-meter activity. True, you will lose your outside audience, but you will also avoid problems from outside your operation.

On the other hand, if logistics dictate the use of a repeater, possibly because your operation is quite large in nature, then try to find one that has a low utilization factor. While you might find this hard to believe, there are some hams who will object to having their favorite rag-chew session interrupted for any reason. These are the people who ratchet-mouth through tornado and hurricane alerts; unfortunately, we have our share of these un-public-spirited individuals among us. If you have no alternative but to use a specific system, then be sure to publicize the event well in advance. Make sure every member of the club knows that the repeater will be closed to all but the Santa Claus operation and emergencies during a specific time period. List the operating schedule in your newsletter and have someone make periodic announcements at least two weeks prior to the event. Make sure that hams from other repeaters and clubs know as well. Not only may you pick up some needed extra help, but you will also avoid hurting anyone's feelings the day of the operation when all on the frequency must be requested to vacate. Prepublication of your operating schedule will give all a chance to find alternate places to operate.

If your area is plagued with malicious interference—if the sick minds are out there just waiting to give some poor sick child a deluge of four-letter atrocities—then do not even consider the use of a repeater. Even a private tone-access system. Better you have a Santa on the run from hospital to hospital than demean the operation by letting some half-crazed jerk spoil the fun for the kids in order to get his own kicks. If the distance between locations makes having a Santa on the run an impossible task, then you might consider borrowing someone's remote base for operation from "Santa Central" to the field units. The very nature of a remote base, i.e., simplex channel operation, tends to minimize the kook factor. Also, even with a remote base, stay on some uninhabited simplex channel. Most potential jammers are not all that astute. Very few will go out and purchase a 220-MHz or 450-MHz synthesized radio in hope of locating your control channel just to cause you misery. Even so, be prepared for any eventuality, for any troublemaker who might come along. Some people no longer believe in Santa Claus. Some of these object to you or anyone else believing either. Need I say more?

What about your Santa? First of all, he should have the kind of voice and personality that kids already associate with St. Nick: warm, friendly, and understanding. It will probably be hard to choose from among the many volunteers for the position. Who wouldn't want to be "Santa for a Day"?

Since Santa is supposed to be live and direct from the North Pole, some North Pole sound effects might be in order. Nothing elaborate... and nothing you can't get from a Christmas sound effects record from your local five and ten cents store. Transfer the sounds you need onto endless loop cassettes and put the player within range of your mike. Adjust the volume to where the background on another radio seems real and there you have it—instant North Pole. Loop cassettes or, if you prefer, endless loop cartridge tapes, will keep you from having to rewind tape at an inopportune time. Make a few different tapes or carts. If you have the equipment, you might want to edit and re-mix sounds for greater realism. You might even approach a local radio station for help on this, which could bring a side benefit of news coverage as well. A bit of good public relations for our hobby never hurts. Also, in relation to publicizing your event to the general public, I suggest you read "Free PR for Ham Radio" in the September, 1981, issue of *73*. Rob Diefenbach WD4NEK has been very successful in this department and his article shares his secrets with you.

One note from someone in the business. If you make arrangements for TV coverage, keep that schedule to the second. Television news is a split-second industry and it's very easy to get an assignment editor irate by having his crew show up to find nobody ready or the event completed. Blow it once, and you might as well forget it in the future. In news, especially electronic journalism, that's the name of the game.

Finally, what should Santa say to the kids, and what should he avoid? In most cases, the kids will have a list of gifts they want. Unless your club has an unlimited treasury, there will be no way to deliver on promises made, so make no promises. One of the worst things an adult can do to kids is promise and not deliver. Let Santa respond by saying something akin to "we will put it on the list and see what we can do." No hard and fast promises. Above all, keep conversations light, seasonal, and filled with "ho, ho, ho's"...and don't forget to ID at prescribed intervals.

When your operation is over, hold a critique over a cup of coffee. If you are smart, you will have recorded your "Operation Santa Claus." Use these tapes to critique the operation. Videotapes are even better. If you received TV coverage, chances are that the station probably sent a mini-cam crew to record the event. They probably recorded a lot more tape than ever reached the air, and very quick action (within 24 hours, before the cassettes are bulk-erased for reuse) might get you a dupe of the raw or unedited shoot.

Last year's Los Angeles "Operation Santa Claus" was the biggest and best to date. It was a delight to listen to and it received good press coverage from local TV, radio, and newspapers. What about this year? It's only a few days before I will know the whole story on "Operation Santa Claus 1981."

SEASON'S GREETINGS

I hope you have enjoyed this year's Christmas special. Next month, it will be business as usual. We may have some information on FCC actions against alleged (or proven) jammers, and definitely will have the last part of the SCRRBA series on voluntary frequency coordination for the 1980s. In the meantime, from those of us who write on the late shift in Los Angeles, our warmest wishes for a very Merry Christmas, Happy Chanukah, and...as the voice on the old WA6TDD repeater ID tape used to say...a Happy and Preposterous New Year. See you in 1982.

HAM HELP

I will pay someone with exceptionally good reception to record shortwave programs and send me the tapes.

Owen Aldis
282 Camino Al Lago
Atherton CA 94025

I want a Polaroid CR-9 scope camera with #33-10 (87 × 119 mm) hood, former Allied #s 561-3301 and 561-3310. Or, just the CR-9 and lens, without hood. I will pay a good price for one in working condition.

R.W. Burhans
161 Grosvenor St.
Athens OH 45701
(614)-593-8207

I need an HP-2 matching unit for the Electrospace HV-5 antenna, no longer in production. I will pay any reasonable amount.

Also, I would like to hear from any Japanese ham interested in trading Japanese stamps for US stamps.

William H. Washburn W7LJI
291 Coachman Drive
Eugene OR 87405

I am looking for a manual for a Canadian Marconi DJ 30 and also one for an RCA Carfone 150. Can anyone help?

Fred Nordstrom N4EHV
Rt. 2, Box 26
Calvin KY 40813

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PROPAGATION

J. H. Nelson
4 Plymouth Dr.
Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7	7	7	7	7	7	14	14	21	21A
ARGENTINA	14	7	7	7B	7B	7	14	14A	21A	21A	21A	21
AUSTRALIA	21	14	7B	7B	7B	7B	7B	14B	21	21	21	21A
CANAL ZONE	7A	7	7	7	7	7	14	14	21	21A	21	14A
ENGLAND	7	7	7	7	7	7	14	14A	21A	14A	14	7
HAWAII	21	7A	7B	7	7	7	7	7B	14	21	21	21A
INDIA	7	7	7B	7B	7B	7B	14	14A	14	7B	7B	7
JAPAN	14A	14B	7B	7B	7	7	7	7B	7B	7B	14B	14
MEXICO	14	7	7	7	7	7	7	14	21	21A	21A	21
PHILIPPINES	14A	7B	7B	7B	7B	7B	7B	14B	14B	14B	14B	14
PUERTO RICO	7A	7	7	7	7	7	7A	21	21A	21A	21	14
SOUTH AFRICA	7A	7B	7	7B	7B	7A	14A	21A	21A	21A	21	14
U. S. S. R.	7	7	7	7	7B	7B	14	21A	21	14	7B	7
WEST COAST	21	7A	7	7	7	7	7	14	21	21A	21A	21

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	21	14	7	7	7	7	7	7	14	14	21	21A
ARGENTINA	14A	14	7	7B	7B	7	14	14	21	21A	21A	21A
AUSTRALIA	21	14	7B	7B	7B	7B	7B	7B	14	14A	21A	21A
CANAL ZONE	14	7	7	7	7	7	7A	14	21	21A	21A	14A
ENGLAND	7	7	7	7	7	7	7B	14	21A	14	14	7B
HAWAII	21A	7A	7	7	7	7	7	7	14	21	21A	21A
INDIA	7B	7B	7B	7B	7B	7B	7B	14	14	7B	7B	7B
JAPAN	21A	14	7B	7B	7	7	7	7	7B	7B	14	21
MEXICO	14	7	7	7	7	7	7	14	21	21A	21A	21
PHILIPPINES	21	14	7B	7B	7B	7B	7B	7	14B	14B	14B	14
PUERTO RICO	14	7	7	7	7	7	7	14	21	21A	21A	21
SOUTH AFRICA	7A	7B	7	7B	7B	7B	7	14A	21A	21A	21	14A
U. S. S. R.	7B	7	7	7	7	7B	7B	14A	14A	14B	7B	7B

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	21A	14	7	7	7	7	7	7	7	14	21	21
ARGENTINA	21A	14	7	7B	7B	7	7B	14	21	21A	21A	21A
AUSTRALIA	21A	14A	14	7	7B	7B	7B	7B	14	14A	21	21A
CANAL ZONE	21	14	7	7	7	7	7	14	14	21A	21A	21
ENGLAND	7B	7	7	7	7	7	7B	14B	21A	14A	14B	7B
HAWAII	21A	14A	14	7	7	7	7	7	14	21	21A	21A
INDIA	7A	14	7B	7B	7B	7B	7B	7B	14	7B	7B	7B
JAPAN	21A	14	14B	7B	7	7	7	7	7	7B	14	21A
MEXICO	21	14	7	7	7	7	7	7A	14A	21A	21A	21
PHILIPPINES	21A	14	7B	7B	7B	7B	7B	7	14	14	14B	14
PUERTO RICO	21	7A	7	7	7	7	7	14	21	21A	21A	21
SOUTH AFRICA	14	7B	7	7B	7B	7B	7B	14	21	21A	21A	14
U. S. S. R.	7B	7	7	7	7B	7B	7B	7B	14	14B	7B	7B
EAST COAST	21	7A	7	7	7	7	7	14	21	21A	21A	21

First latter = day waves Second = night waves
A = Next higher frequency may also be useful
B = Difficult circuit this period F = Fair G = Good
P = Poor * = Chance of solar flares; # = of aurora

DECEMBER

SUN	MON	TUE	WED	THU	FRI	SAT
		1 G/G	2 G/F	3 G/F*	4 F/F*	5 G/F
6 G/G	7 G/G	8 G/G	9 G/G	10 G/F	11 F/F	12 G/F
13 G/G	14 G/G	15 F/F*	16 F/P*	17 G/F	18 G/G	19 G/G
20 G/F	21 G/F	22 G/F	23 F/F	24 G/F	25 G/G	26 G/G
27 G/G	28 G/G	29 G/G	30 G/F	31 F/F		